ALPINE SHIRE COUNCIL

Telecommunications Strategy (Mobile and Internet)

GRAVELROAD

Executive Summary

Building digital infrastructure for 21st century rural and remote regions

As the world becomes more digitised, the need for connectivity to advanced digital services is ever increasing, as is the risk of a sharp new and wider digital divide. With bushfires and COVID-19, we have seen how much we depend on connectivity, with traffic up 80% or more at some points during the pandemic crisis.

Government at all levels acknowledges the vital economic value of high speed broadband infrastructure being universally available to business and residential customers. It is also important that competitive services are available as far as possible to support price and service quality competition. Broadband services are now a universal communications medium for voice, video and data services for both business and residential users.

In many parts of Australia, particularly regional and remote areas, economies of scale do not permit the provision of high density services seen in larger metropolitan and urban areas. The National Broadband Network (NBN) initiative was intended to deliver 21st Century telecommunications broadband services across the country to close the gaps in telecommunications' infrastructure and facilitate a competitive retail services market through acting as a wholesaler, but significant telecommunications connectivity issues remain.

The recent bushfires in NSW and Victoria have demonstrated the vulnerability of regional and isolated communities when left without reliable mobile network coverage.

Many of the areas impacted by the 2019-20 bushfires were communities with a high number of mobile black spots which created major issues for public safety and emergency response. Other areas were covered only by a single operator, and when their network went down there were no alternatives. In addition, power outages typically left mobile sites without electricity. Emergency Services have expressed major concern that interrupted mobile connectivity puts lives at risk when seconds count in an emergency.

Being able to communicate warnings in a timely way to communities at risk from devastating bushfires and other emergencies is crucial. Mobile coverage is also critical for both the safety and operational effectiveness of emergency responders. Gaps in mobile coverage can severely compromise the ability to get emergency warnings out to people who may be in harm's way. The Strategy will need to consider bushfire resilience principles, and the resulting implications for Network improvements.

The purpose of this project is to identify current gaps, overlay them with other relevant telecommunications' infrastructure that may assist, and then provide advice on what actions can be taken to alleviate the potential problems in the lack of modern telecommunications services in the Alpine Shire region.
The following challenges have been identified:

The importance of highly connected service centres

In the Alpine Shire region, there are several very important 'service centre' townships (Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford) with a

growing resident population that serve local areas with essential services. It is essential that advocacy and prioritisation efforts are concentrated on the provision of better connectivity to these centre's than towns with higher populations that are easier to reach due to their geographic proximity and more attractive for investment by telecommunication providers.

Mobile Network Coverage, Capacity and Choice

Due to the nature of the Mobile Network Operator market, it is not commercially feasible for these operators to build ubiquitous mobile networks across any region in Australia including Alpine Shire. Whilst some lower populated areas are not expected to have access to 4G networks for the foreseeable future, several higher population growth locations have been recommended for prioritisation to improve mobile network coverage, capacity and choice.

NBN Infrastructure access & suitability

Several key townships in Alpine Shire are currently only served by NBN Fixed Wireless and Satellite. Additionally, other key centres are currently served by Fibre to the Node (FttN) infrastructure. Whilst these technologies are essentially fit for purpose for 2022, it is arguable that by 2030 and the subsequent decade that Fixed Wireless, Satellite and Fibre to the Node technologies will not serve the capacity demands of households, businesses and other connectivity requirements such as growing Internet of Things connections.

Solving 'Last Mile' connectivity alternatives

The NBN enjoys a monopoly position as the last mile fixed line network provider in Australia. However, in many areas there is evidence of frustration with service delivery and connection issues that result in either a diminished outcome or the inability to access an NBN service outright. More populated areas are seeing the introduction of alternatives to NBN such as high-speed wireless services and 5G Fixed Wireless.

Improvements to Satellite access

For rural and remote Australia, satellite networks have the attraction of offering additional bandwidth to connect these regions to international destinations. Satellite broadband services provide 100 per cent coverage of Australia's land area. However, the high costs and low speeds of satellite technologies have relegated them to be truly a last-option broadband technology. New low-earth orbit (LEO) satellites could potentially offer significant speed, performance and latency improvements towards the middle of the coming decade. Early LEOSat services such as Starlink are becoming available as 'beta' services but may need to be accessible at lower pricing in the future.

Lack of access to LPWAN networks

Low-power wide area networks (LPWAN) is a wireless wide area network technology that interconnects low-bandwidth, battery-powered devices with low data rates over long ranges. Created for internet of things (IoT) networks, LPWANs operate at a lower cost with greater power efficiency than traditional mobile networks. They are also able to support a greater number of connected devices over a larger area.

Ensuring future connectivity is fit for purpose

As digital connectivity continues to embed itself as an essential 21st century utility, the importance of ensuring connectivity infrastructure is fit for purpose for not just now but for coming decades in the most efficient way possible is paramount. Policies such as 'Dig Once' can ensure that the required passive infrastructure such as Ducts and Pits are installed in new development areas and construction projects enabling easier and cheaper installation of effective and competitive telecommunication infrastructure.

Condensed list of Actions

The list of actions we have recommended throughout this report is presented in the condensed table below

Page Number	Action	Actioning Organisation(s)	Partnering Organisation(s)
76	**Advocate for Telstra to** • **provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain** • **provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**	Alpine Shire Council	Telstra Australian Government Victorian Government
77	**Advocate for Telstra to** • **prioritise resiliency upgrades to each of these sites including Improved backup power and other infrastructure hardening measures, such as improved facility design at key telecommunications facilities (such as mobile base station feeder sites and exchanges) and backhaul transmission redundancy.**	Alpine Shire Council	Telstra Australian Government Victorian Government
83	**Advocate for Optus to** • **provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain** • **provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**	Alpine Shire Council	Optus Australian Government Victorian Government
83	**Advocate for Optus to** • **prioritise resiliency upgrades to each of these sites including Improved backup power and other infrastructure hardening measures, such as improved facility design at key telecommunications facilities (such as mobile base station feeder sites and exchanges) and backhaul transmission redundancy.**	Alpine Shire Council	Optus Australian Government Victorian Government
88	**Advocate for TPG Telecom / Vodafone to** • **provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain** • **provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 1800MHz, 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**	Alpine Shire Council	TPG Telecom / Vodafone Australian Government Victorian Government
88	**Advocate for TPG Telecom / Vodafone to** • **prioritise resiliency upgrades to each of these sites including Improved backup power and other infrastructure hardening measures, such as improved facility design at key telecommunications facilities (such as mobile base station feeder sites and exchanges) and backhaul transmission redundancy.**	Alpine Shire Council	TPG Telecom / Vodafone Australian Government Victorian Government

92	**National Broadband Network** **Areas for Alpine Shire advocacy include specific items outlined in the Action Plans in this strategy and generally the following:** • **NBN infrastructure improvements and extensions** • **Business grade NBN access** • **Satellite technology improvements**	Alpine Shire Council	NBN Australian Government Victorian Government
92	**Mobile Network coverage, capacity and choice** **Areas for Alpine Shire advocacy include specific items outlined in the Action Plans in this strategy and generally the following:** • **Mobile network blackspots and Commonwealth Mobile Coverage Blackspot program funding** • **Uplift of Mobile network capacity in key centres** • **Shared infrastructure opportunities** • **Low Power Wireless Networks for Sensors delivered by mobile networks**	Alpine Shire Council	Telstra Optus TPG Telecom / Vodafone Australian Government Victorian Government
93	**Last mile connectivity alternatives and Fibre Backhaul** **Areas for Alpine Shire advocacy include specific items outlined in the Action Plans in this strategy and generally the following:** • **High speed Network alternatives to NBN (Fixed Wireless, Microwave etc.)** • **Low Power Wireless Networks for Sensors delivered by non-mobile networks** • **Increased opportunities for Fibre Backhaul connectivity**	Alpine Shire Council	Australian Government Victorian Government
101	**Telstra Resiliency upgrades**	Telstra	
103	**Optus Resiliency upgrades**	Optus	
105	**TPG Telecom / Vodafone resiliency upgrades**	TPG Telecom / Vodafone	
107	**NBN Business Fibre Zones & NBN Fibre to the Premise upgrade** **Advocate with the Commonwealth Government and the Victorian State Government for NBN to** • **implement NBN business fibre zones and NBN FttP for the major service centres of Alpine Shire (Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford);** • **Harrietville's NBN upgraded from Satellite to Fibre to the Premise;** • **Dinner Plain NBN upgraded from Fixed Wireless to Fibre to the Premise;** • **Tawonga / Tawonga South NBN upgraded from Fixed Wireless to Fibre to the Premise; and** • **Wandiligong NBN upgraded from Fixed Wireless to Fibre to the Premise.** **Priority – High** **Action for Council – Advocacy and potential Regional Communications funding applications** **Community outcomes – Delivery of improved broadband infrastructure**	Alpine Shire Council	NBN Australian Government Victorian Government
111	**Upgrades to Mobile Networks using Shared Radio Access Networks** **Advocate for Shared Radio Access Networks to be rolled out by the Mobile Network Operators for improved coverage and capacity for Alpine Shire Council.** **Priority – Low to Medium** **Action for Council – Advocacy** **Community outcomes – Delivery of improved mobile network coverage and capacity in various areas of Alpine Shire**	Alpine Shire Council	Australian Government Victorian Government
111	**Open Access Duct investment in key centres** **Engage assistance to review current designs to ensure that appropriate telecommunications pit and pipe and associated infrastructure is correctly dimensioned and develop a commercial**	Alpine Shire Council	

	and facilities access framework to promote open and equitable access. **Priority – Medium** **Action for Council – Implementation of Open Access Duct strategy (approximate investment: $20K to $30K)** **Community outcomes – Delivery of improved broadband infrastructure over time through investment in Duct infrastructure available for usage by Telecommunication Providers**		
112	**Whole of Region Policy – Common Telco Facilities Access and New Duct in New Development and Construction projects** **Engage assistance to develop the Policy based on best practice and engage with relevant stakeholders** **Priority – High** **Action for Council – Implementation of Open Access Duct strategy (approximate investment: $20K to $30K)** **Community outcomes – Delivery of improved broadband infrastructure over time through investment in Duct infrastructure available for usage by Telecommunication Providers**	Alpine Shire Council	
112	**Scoping of Mobile Network Repeaters & Boosters for low coverage areas across the Alpine Shire** **Engage assistance for site surveys and high level network planning** **Priority – High** **Action for Council – Scoping for low coverage areas across Alpine Shire Council (approximate investment: $20K to $30K)** **Community outcomes – Delivery of improved mobile network coverage and capacity in high priority rural areas of Alpine Shire**	Alpine Shire Council	
114 & 115	**Various Near Term, Medium Term and Long Term Mobile and Internet Telecommunications upgrades**	Various	Various

Alpine Shire Councils regulatory role for Telecommunications

The power to regulate and control telecommunications in Australia is vested in the Commonwealth through Section 51 of the Australian Constitution.

With the arrival of the Telecommunications Act 1997, the Commonwealth limited the exemptions and powers available to the carriers and permitted only 'low-impact facilities' to be deployed without scrutiny of State and Territory laws and Council approval.

These exemptions were enshrined in the Telecommunications (Low- Impact Facilities) Determination 1997 (the Determination), which was amended in 1999, 2018 and 2020.

Low-impact facilities include some radiocommunications facilities, underground and above-ground housing, underground and some aerial cables, public payphones, emergency and co-located facilities.

If a facility is not in one of these three groups, then carriers must comply with state and territory laws and planning regulations.

In the case of Alpine Shire Council, the approval pathway for Telecommunications is limited to where Development Approval is required.

Addressing community concerns around Telecommunications

Alpine Shire Council conducted a community survey in January 2022 to obtain vital community input to help identify priorities to improve telecommunication issues.

Two workshops were also conducted with the Alpine Shire Community Panel on 2 March and 9 March 2022 to obtain further input into the priorities to improve connectivity issues.

There were a number of key themes that emerged from the community survey and community panel consultation, being:

- **A sharp focus on not just mobile network coverage but also capacity of networks at peak usage times**

Our recommendations for the Mobile Network Operators (MNOs) to provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain;

and;

for the MNOs to provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain;

will greatly improve this issue.

- **Requirement for existing NBN infrastructure to be upgraded in various areas but with a particular focus on major service centres**

Our recommendations for NBN to upgrade all service centres (i.e. Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford) to be served by NBN business fibre and NBN fibre to the Premise;

Dinner Plain NBN upgraded from Fixed Wireless to Fibre to the Premise;

and:

Wandiligong NBN upgraded from Fixed Wireless to Fibre to the Premise;

will greatly improve this issue.

- **Numerous mobile network coverage issues across Alpine Shire**

Our recommendations for the MNOs to provide for the following -

The regions 3G Footprint is upgraded to 4G by each of the three MNOs by potentially using Shared Radio Access Network (where common radio units and antennas are shared by multiple MNOs);

New or Improved 4G Mobile Network coverage and capacity for –

- Harrietville (Telstra, Optus and TPG Telecom / Vodafone)
- Wandiligong ((Telstra, Optus and TPG Telecom / Vodafone)
- Happy Valley (Telstra, Optus and TPG Telecom / Vodafone)
- Dederang & Gundowring (Telstra, Optus and TPG Telecom / Vodafone);

High band (mmwave) 5G from each of the three Mobile Network Operators for all service centres (i.e. Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford);

and;

New or Improved 5G Mobile Network coverage and capacity for –

- Buffalo River (Telstra, Optus and TPG Telecom / Vodafone)

- Buckland Valley (Telstra, Optus and TPG Telecom / Vodafone);

will greatly improve this issue

What you'll find inside

1. Digital Connectivity Infrastructure Overview

Digital Connectivity Infrastructure

Overview

Given its extensive geography and relatively dispersed population outside major cities, Australia has performed well in connecting our citizens and businesses to telecommunications services. However, as the world becomes more digitised, the need for access to competitively available advanced data and digital services is increasing. With COVID-19, we have seen how much we all depend on connectivity, with data volume demand up 80% or more at some points of the crisis. While both fixed and mobile services are complimentary, fixed line communications has received specific funding focus in recent years. Over 99% of Australian premises now have varying levels of fixed line broadband through NBN's multi-technology mix. Mobile services by contrast are in jeopardy of underinvestment across our regions, threatening a new form of digital divide.

Why are rural and remote regions at risk? The possibilities enabled by 5G and IoT require significantly more capital than was the case for the moves to 4G from 3G, or 2G to 3G, principally because 5G cell density is much greater than previous mobile generations. With declining capital returns, telecommunications carriers in Australia have redoubled their focus on high density areas such as CBDs and inner-city as the target for profitable new network investment. By contrast, many lower density areas such as outer metropolitan Cities and regions still lack basic coverage. Federal policy has not been able to sufficiently drive market behavior to address these challenges, meaning in our view, that intervention is often needed, through advocacy, funding subsidies and streamlined access arrangements by state government and larger local governments.

A "digital divide" in outer-metro and regional Australia is a real risk, and will limit thousands of households, farms, small to medium businesses (SMBs) and communities, dilute new job creation and hamper "regionalisation" at a time when all CBDs face decline post COVID, and public safety and security services have been recently challenged by natural disasters and pandemics.

We are also seeing the **emergence of innovations to connect cities and regions**, such as through network sharing and community-led initiatives, including new communication technologies and energy solutions.

Significant investment is required to provide the required digital connectivity infrastructure in rural and remote regions such as Alpine Shire. Other States have recognised that State Government funding support is required for digital connectivity co-investment, especially in rural and remote areas where government funding intervention is the only method that allows for infrastructure improvements in non-commercial environments.

Undertaking a Current State Assessment

In developing the telecommunication and connectivity study, Gravelroad undertook work to collect relevant data based on the following elements. Please refer to the Glossary provided for simplified explanations of the technologies that are mentioned in this report.

Mobile Network Field Testing

Mobile Network coverage and capacity testing across all agreed major roads, townships and other specified points of interest within Alpine Shire.

By using independent mobile testing technology, Gravelroad Group provides impartial user experience-based reports and recommendations. The methodology used by us to independently test mobile network performance and identify carrier blackspots has been developed over the last 10 years to provide results that describe the 'user experience'.

We used three Google Pixel 4a 5G handsets, as commonly used by members of the public, to capture information about signal strength and network performance for each of the national carriers - Telstra, Optus & Vodafone. This benchmarking process provides a rich methodology that has been acknowledged and respected by all major wireless service providers.

Other local governments have typically used similar reports and specific recommendations to advocate for increased funding by Federal, State governments together with each of the three national carriers – often through the Mobile Black Spot Program.

We tested with an app we have developed specifically for this purpose – GoMobile Network Test (GoMobile) to capture all the information we can about the mobile network and the test device itself. An example of the GoMobile app screen can be seen below.

By providing the GPS location and current results in real time, testers can monitor and authenticate the testing accuracy in real time.

There are six simple principles used to inform our testing methodology:

- User experience based – we use handsets commonly owned by users rather than other more technical and theoretical approaches.
- Same handset, same settings – this provides an equitable basis for bench marking network performance.
- Simultaneous testing – all tests are carried out in the same vehicle – spaced to remove interference and completed at the same time in that location.
- Signal Strength – for 3G and/or 4G
- Network Performance Test – download, upload and latency
- Time Series Testing - Download and upload of data to the internet over a specified time series.

Mobile Network Coverage

Building and maintaining mobile network infrastructure is capital intensive and Mobile Network Operators (MNOs) face an ongoing infrastructure investment challenge. Mobile Networks involve capital investment and fixed operating costs which represent a significant proportion of the total costs to be borne by the industry and its customers.

As referenced by the ACCC, the high costs involved in expanding mobile network coverage and service quality is correlated to Australia's highly urbanised population, where revenues from the provision of mobile services to regional and rural customers diminish as population density decreases. These costs are further exacerbated by the need for MNOs to continually deploy new network technologies to market quickly, such as 5G, while earlier network investments become redundant (e.g. 3G).

The investment decision of expanding mobile network infrastructure is typically a function of –

1. The level of utilisation of mobile network infrastructure which impacts the business case for infrastructure investment and the ongoing cost of mobile service provision to recover such investment,
2. The nature of mobile service provision which requires MNOs to offer services and maintain network infrastructure across a wide coverage area that is inconsistent with customer utilisation of the network. Increasingly, customers expect to be able to access mobile services in rural and regional areas, including where they travel from urban areas to rural and regional areas,
3. Increased consumption of data as newer generations of mobile technology support more data intensive apps and services consume more bandwidth, meaning MNOs face continuing network investment demands after the initial deployment of new generations of mobile technology to address these capacity constraints.

Due to the low returns from building network infrastructure in sparsely populated regional and rural areas, the commercial incentives to roll out network infrastructure in these areas are typically lower than in metropolitan areas. Consequently, co-contribution funding is likely to be a key driver for MNOs when considering expanding mobile coverage. As a result, local, state and federal governments have developed co-contribution programs from time to time to provide subsidies to network operators to roll out infrastructure in these areas.

Co-contribution programs, like the Federal Mobile Black Spot Program (MBSP), provide incentives to invest in areas where there is either inadequate or no mobile coverage. However, the design of these programs often means that governments are generally subsidising the capital component of individual commercial entities without requiring broader benefits to be shared by consumers.

Mobile Network Operators

Telstra

Telstra supplies fixed and mobile voice and broadband services in Australia. Telstra also owns and operates its own mobile network, which covers around 99.5% of the Australian population.

Telstra plans to deliver 95% population coverage for 5G by FY25, which includes a 100,000 km2 increase in its 4G / 5G mobile footprint. This coverage will be supported by Telstra's continued 5G rollout and the doubling of metro cells to increase density for greater capacity and speed. As a result, Telstra expects 80% of all mobile traffic to be on 5G by FY25.

Telstra will extend its 4G coverage to 100% of its mobile network by June 2024, enabling it to lead in composite coverage, speed and performance for 4G and 5G as it closes the 3G network.

Optus

Optus supplies fixed and mobile voice and broadband services over its wholly owned and operated network. Optus has the second largest number of subscribers in mobile services and covers around 98.8% of the Australian population.

Optus planned to commence a network refresh from April 2022, under which it will reallocate its 2100 MHz spectrum assets (currently used to support 3G technology) to provide a better 4G network experience and provide for the growth of 5G.

TPG Telecom (Vodafone)

TPG merged with Vodafone on 13 July 2020 to be the third largest telecommunications provider in Australia, through the provision of fixed and mobile voice and broadband services.

TPG owns and operates its own 3G / 4G network in major metropolitan areas. Its coverage of 3G / 4G in regional and urban fringe Australia comprises approximately 725 sites and a 3G roaming agreement with Optus. TPG has made limited investments in regional Australia in recent years, focusing more on the 5G roll out in the metropolitan areas.

Spectrum Types Deployed

An MNO typically uses a range of radiofrequency spectrum bands for the purpose of providing mobile services. The spectrum an MNO deploys at each of its mobile sites is one of the factors that may impact end-user experience. Radiofrequency spectrum can be used across a variety of technologies including 3G, 4G and 5G and can also be repurposed or re-farmed over time to support a different technology. Generally, spectrum is classified into three categories – low band, mid-band and high band. Each band serves a different purpose in the MNOs' networks and the equipment at a mobile site can support the use of multiple bands at the same time.

Low band

- Radiofrequency bands less than 1 Gigahertz (GHz) or 1,000 Megahertz (MHz).
- Typically used by a mobile network to provide the primary coverage layer and also provides capacity.
- Can transmit information over greater distances and through obstacles such as buildings and trees more easily than higher frequencies. This means it is ideal for providing mobile services in sparsely populated regional and remote areas. It also allows for the deployment of a smaller number of sites, as a given site provides coverage over a greater geographical area.

Mid-band

- Refers to radiofrequency bands between 1 GHz and 6 GHz.
- Typically deployed to supplement low-band spectrum.
- Information sent and received through mid-band spectrum can only occur over shorter distances than that of low band spectrum, meaning an MNO may need to build more sites when using this spectrum compared to low-band, to cover areas of the same size.
- Is likely to have a larger amount of spectrum available than in the low band, and hence a higher capacity, which makes it very useful in more populated and congested areas.

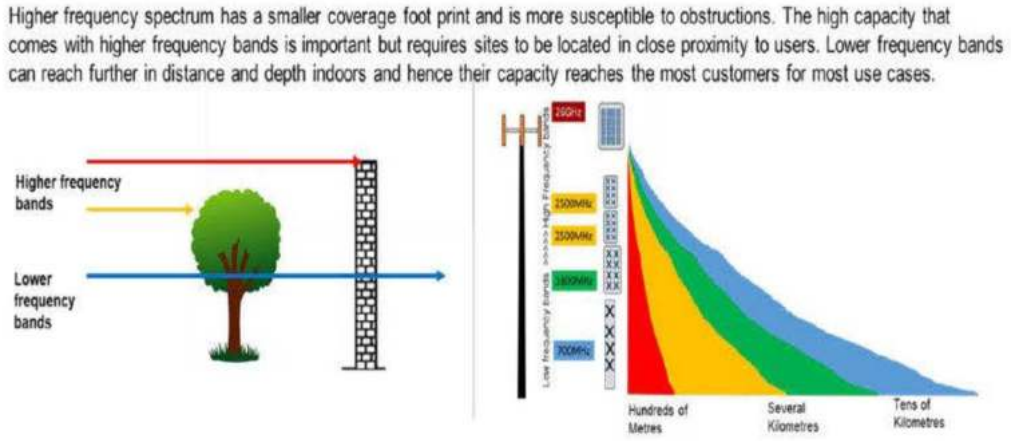
High band

- High band spectrum generally refers to radiofrequency bands greater than 6 GHz.

- The distances information can travel using high band spectrum is less than both low band and mid-band spectrum. The notable characteristic of this frequency band is that it delivers very short range, mainly line of sight coverage. This is combined with significant capacity, due the large amount of spectrum available, for very high-speed data transmission, making it ideal for use in heavy-traffic areas.

The capacity of a network depends on the quantity of spectrum available in a band, not on the frequency of that band. That is, the same quanta of spectrum in the low band can provide the same capacity as the same quanta of spectrum in the mid or high band. However, because larger amounts of spectrum are available in the higher bands those bands are likely to have greater capacity.

As shown in the diagram below, low band spectrum is more important in regional and rural areas because its signal carries further and can penetrate obstacles, such as trees.



Each of the three MNOs have spectrum in the low band and mid band ranges in regional Australia, including the Alpine Shire, shown below

Spectrum Band	Telstra (MHz)	Optus (MHz)	TPG (MHz)
700 MHz	2 x 20	2 x 10	2 x 15
850 MHz	2 x 25	0	2 x 5
900 MHz (from July 2024)	0	2 x 25	0
1800 MHz	2 x 35 to 2 x 40	2 x 20 – 2 x 25	2 x 10 – 2 x 20
2100 MHz	2 x 10	2 x 5	2 x 5
2300 MHz	0	0	0
2600 MHz	2 x 40	2 x 20	0
3600 MHz	50 – 82.5	30 – 67.5	20 – 45
26000 MHz	1000	800	600

Telstra and TPG no longer offer 3G on their 2100 MHZ spectrum, while Optus has announced it will redeploy its 2100 MHz for use with 4G and 5G services in April 2022. Whilst focusing on expanding network and service offerings on the 4G and 5G networks, all three MNOs will continue to offer 3G services using lower frequency spectrum (such as 900 MHz). Telstra has announced that it plans to switch off its 3G services in June 2024. The spectrum that TPG uses for 3G services expires in June 2024.

Telstra TPG Network Sharing Agreement

Telstra and TPG Telecom have announced a ten-year regional Multi-Operator Core Network (MOCN) commercial agreement, which will provide TPG Telecom subscribers with 4G and 5G services within a defined coverage zone across regional and urban fringe areas.

Under the deal TPG Telecom will gain access to around 3,700 of Telstra's mobile network assets, increasing TPG Telecom's current 4G coverage from around 96 per cent to 98.8 per cent of the population.

Telstra will gain access to TPG Telecom's spectrum across 4G and 5G, which will allow it to grow its network, increase capacity and continue to provide the country's largest and fastest network.

Under the MOCN arrangement Telstra will share its Radio Access Network (RAN) for 4G and subsequently 5G services in the defined coverage zone, however both carriers will continue to operate their own core network where key differentiating functionality resides.

Telstra will also obtain access to and deploy infrastructure on up to 169 TPG Telecom existing mobile sites, improving coverage for TPG and Telstra customers in the zone.

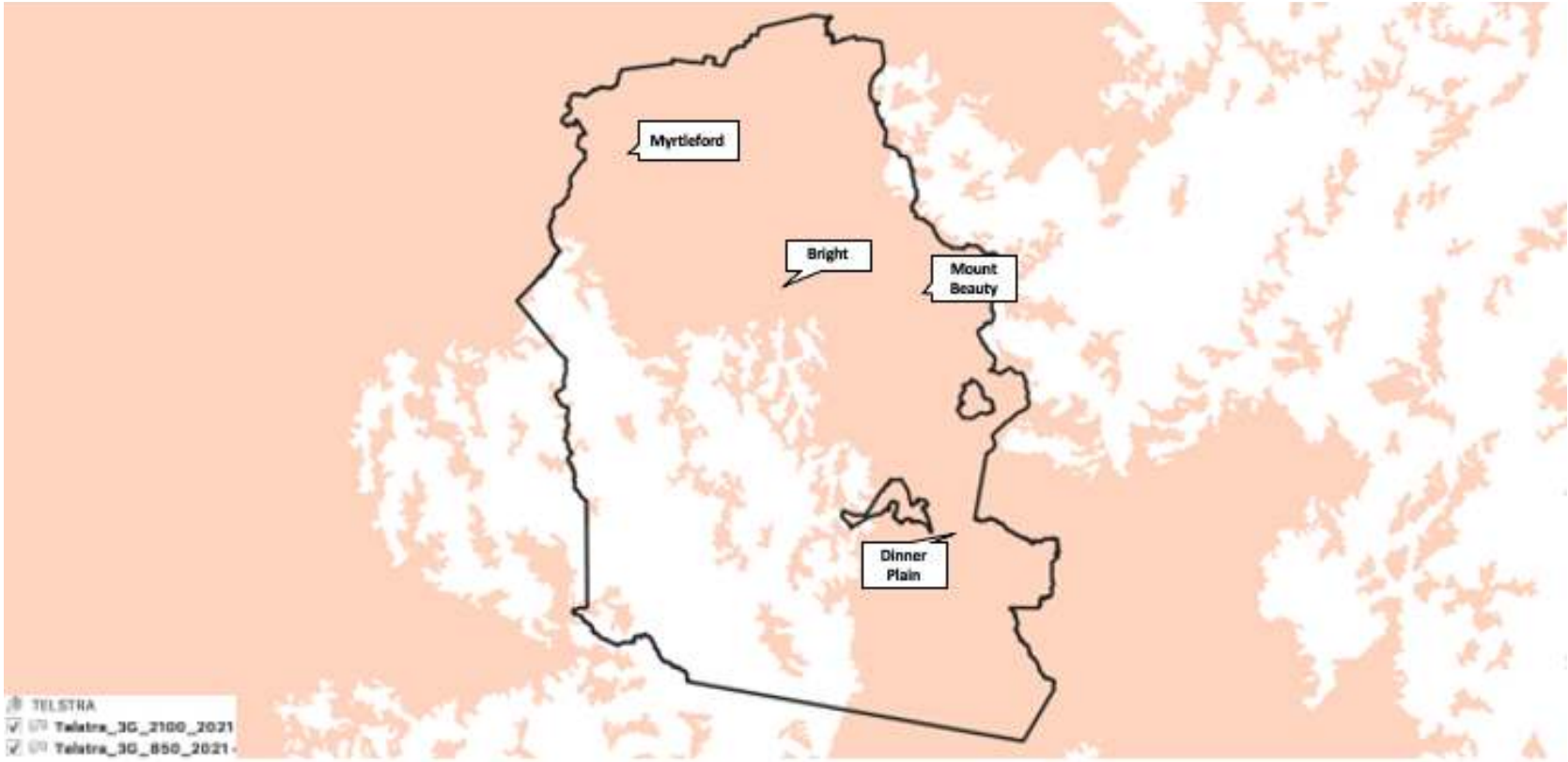
The three mobile providers (Telstra, Optus and TPG Telecom (Vodafone)) are operating in a competitive and profitable part of the telecommunications market and they invest more in their mobile technology than in any other area since the advent of the NBN. This market changes technology platforms increasingly often (3G, 4G and now 5G) to meet market demand for data driven services for smart phones and tablets. The current significant investment in the rollout of 5G technology from 2019 will deliver significantly faster download speeds (greater than 200Mb/s) to mobile devices. Many in the industry consider the advent of 5G services will support many broadband demand requirements and reduce the demand for fixed services such as those delivered by the NBN.

While this potential competition with the NBN is speculative, it will be a potentially valuable alternative to NBN services, especially where they offer limited access technology options.

Telstra 3G coverage

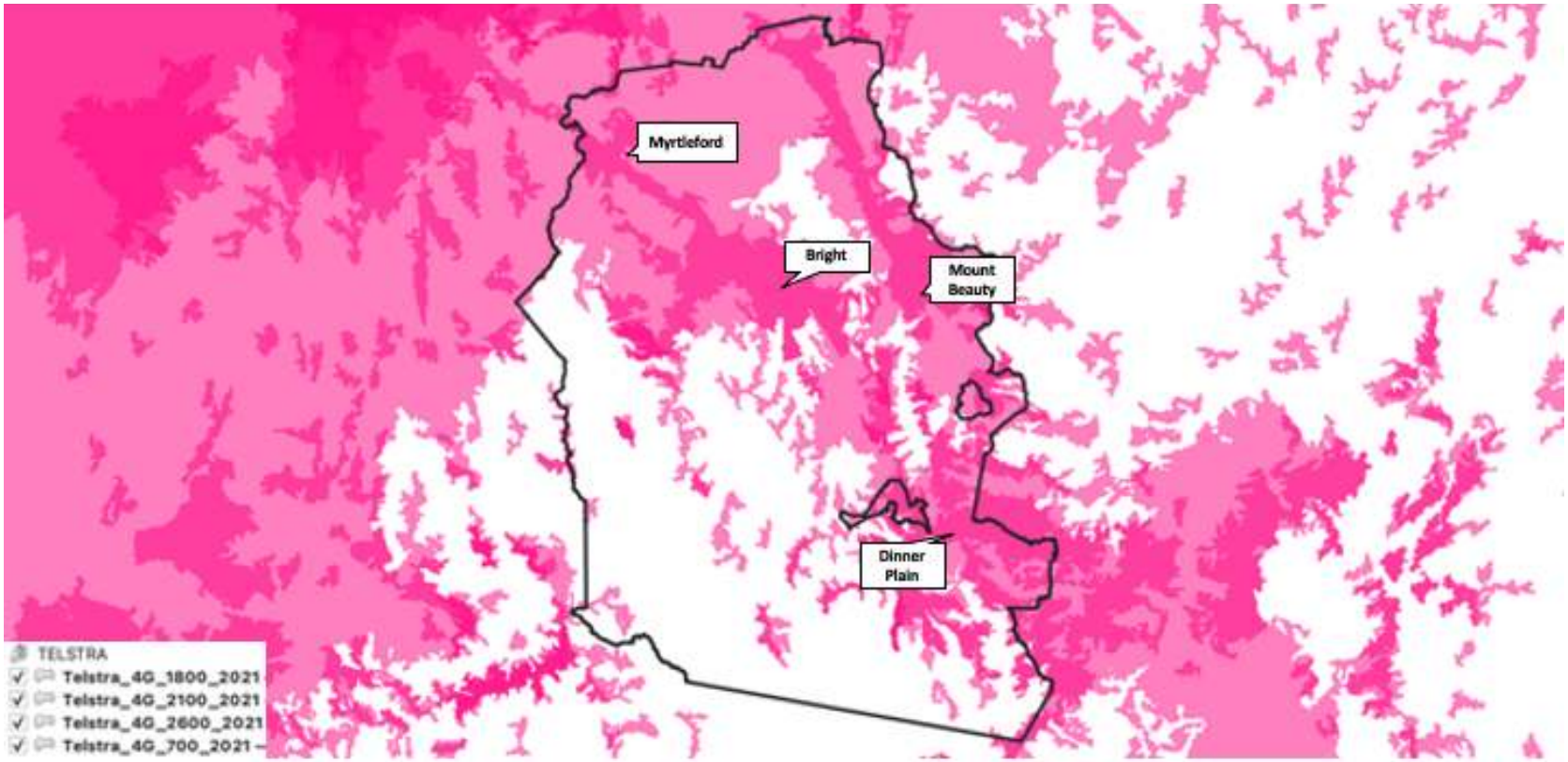
In order to deliver 5G services, many more base stations are needed due to propagation limitations and to conserve radio spectrum and this expensive development of service providers' networks will probably not be economic in some regional areas due to the poor economies of scale.

Please refer to the following pages for mobile network coverage mapping for each Mobile Network Operator (Telstra, Optus and TPG Telecom / Vodafone).



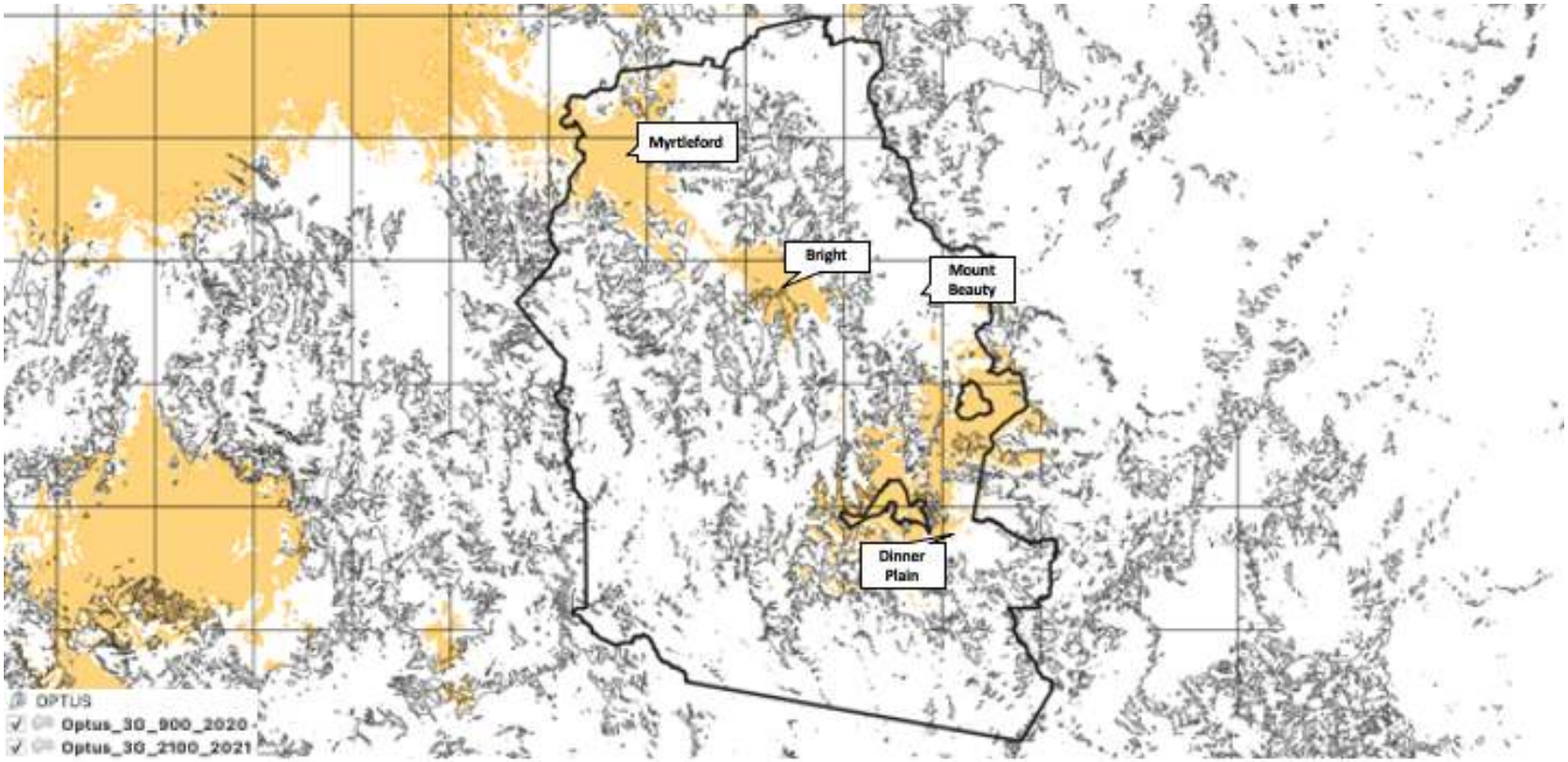
Note – Coloured area indicates 3G coverage

Telstra 4G coverage



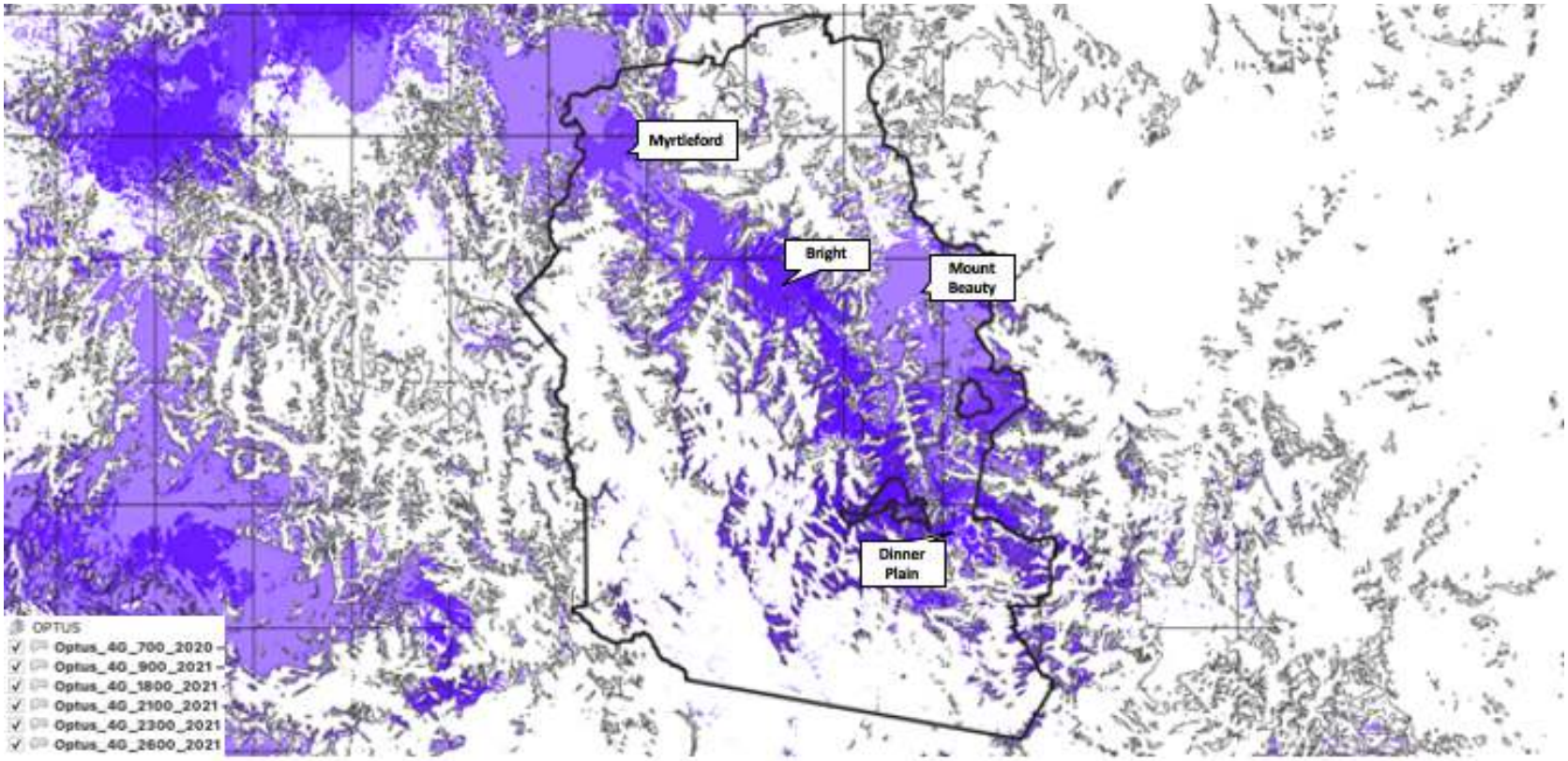
Note – Coloured area indicates 4G coverage

Optus 3G coverage



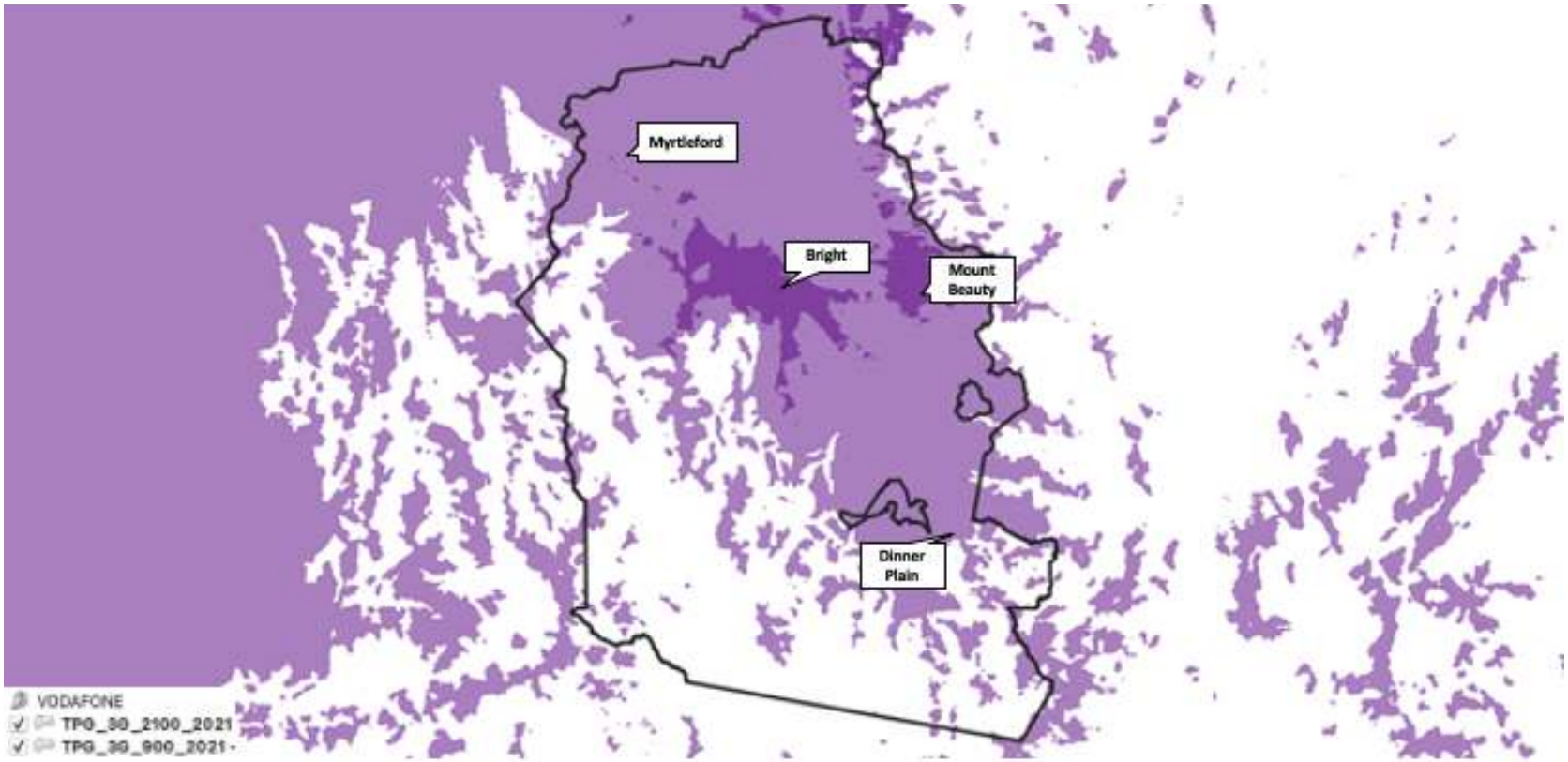
Note – Coloured area indicates 3G coverage

Optus 4G coverage



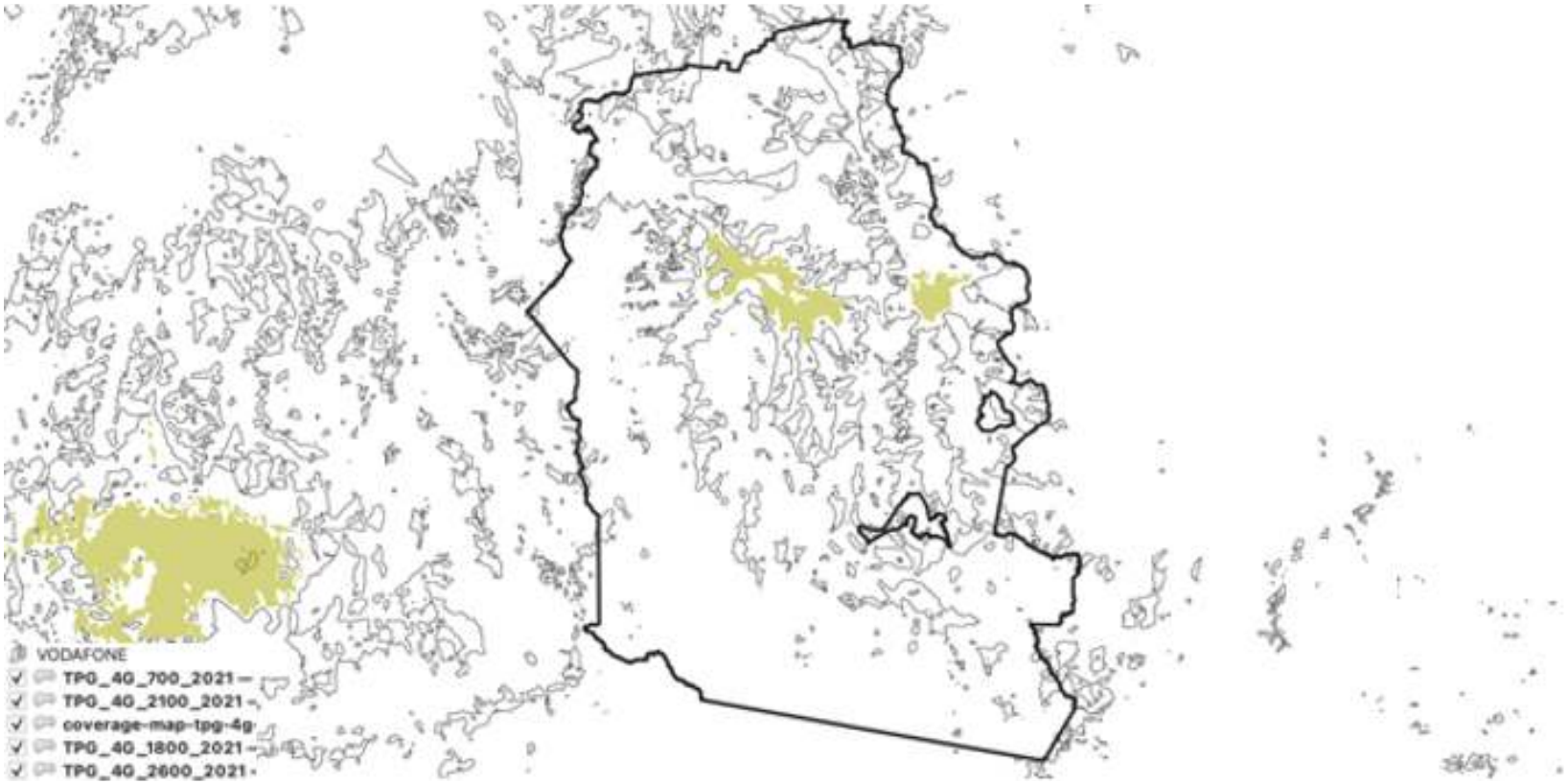
Note – Coloured area indicates 4G coverage

TPG Telecom / Vodafone 3G coverage



Note – Coloured area indicates 3G coverage

TPG Telecom / Vodafone 4G coverage



Note – Coloured area indicates 4G coverage

National Broadband Network

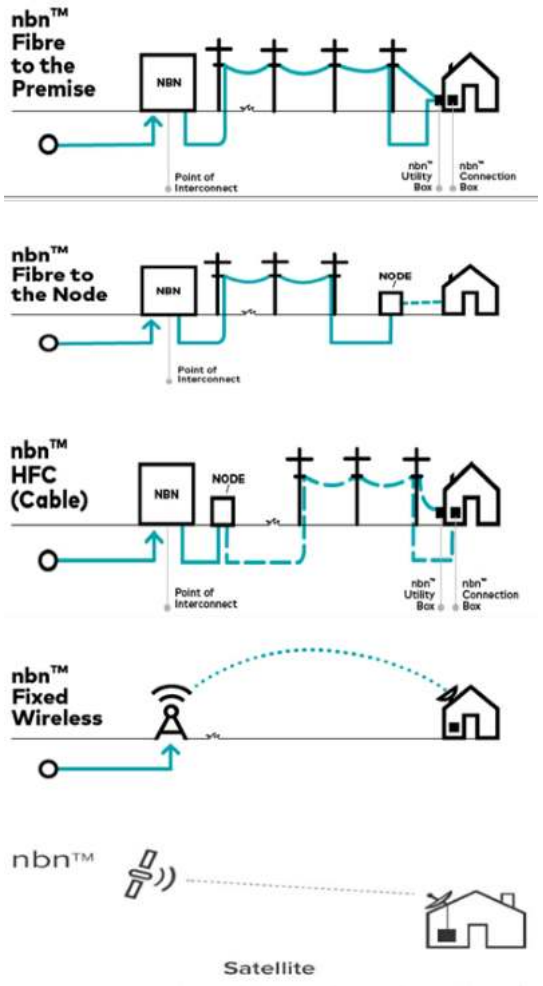
The NBN offers a range of connectivity technology to residential and business premises in Australia. Fibre to the Premise (FttP) offers the highest speed connection and is deployed in several select areas within Alpine Shire. Fibre to the Basement (FttB), Fibre to the Curb (FttC) and Fibre to the Node utilises existing copper cables to connect into the residential and business premises to save the cost of lead-in fibre cabling and as a result have some limitation on connection speed. For broad areas of the ALPINE SHIRE region, fixed wireless connections to premises will be used to avoid cabling costs to or near the premises. For the more remote areas of the region, the NBN satellite service will be the only available connection option.

Fibre Infrastructure (Backhaul)

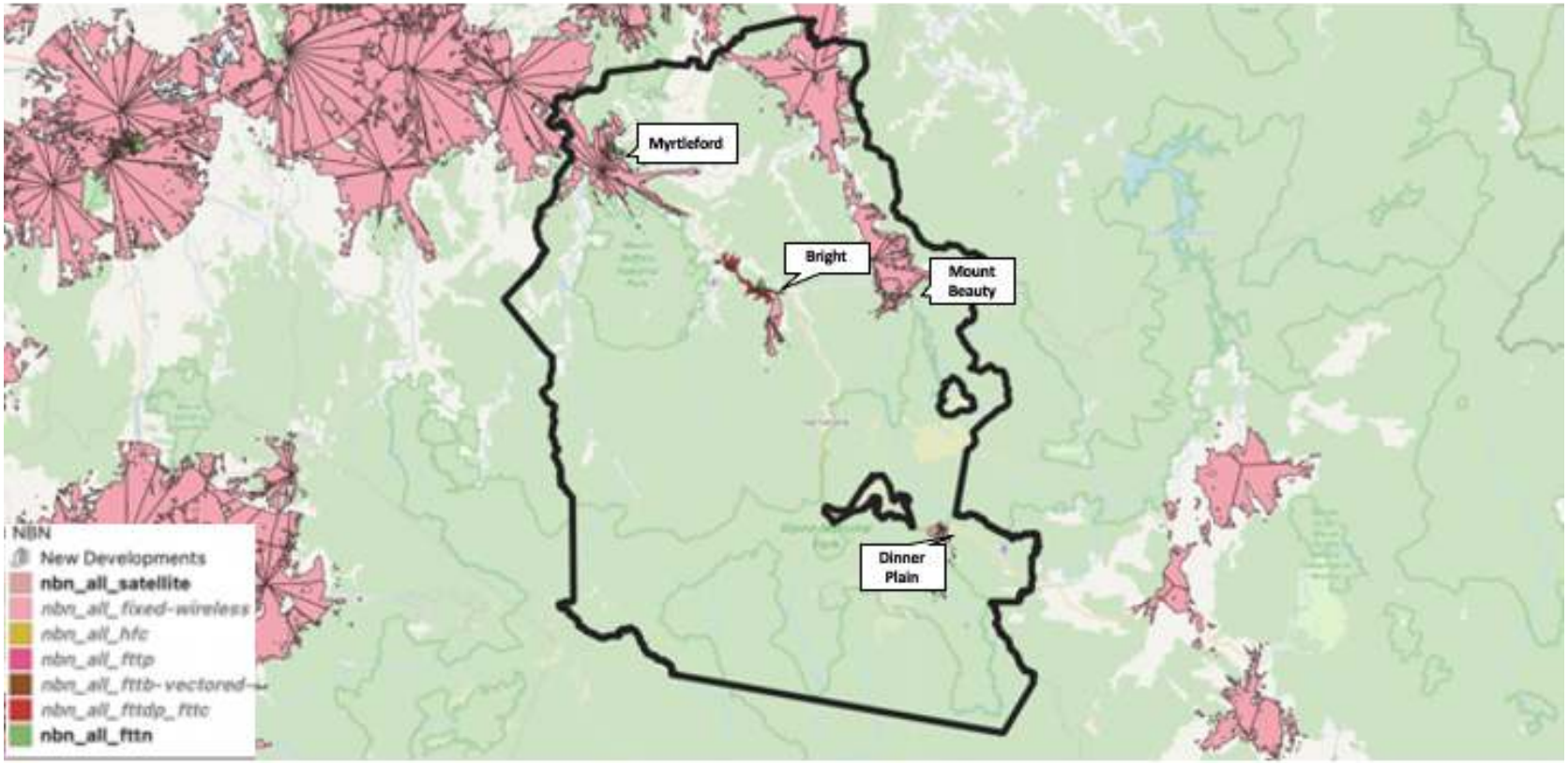
Backhaul refers to the connections from the region to the rest of Australia, and a lack of competition in backhaul choice has in the past been a major contributor to the higher cost of telecommunications services in regional areas in Australia, however this situation has largely been eliminated by the National Broadband Network. However, backhaul is still important for increasing choice and access to non NBN connectivity especially for 'last mile' telecommunications options.

In Alpine Shire there is predominantly only one backhaul provider able to connect the region to Melbourne and Sydney, being Telstra InfraCo.

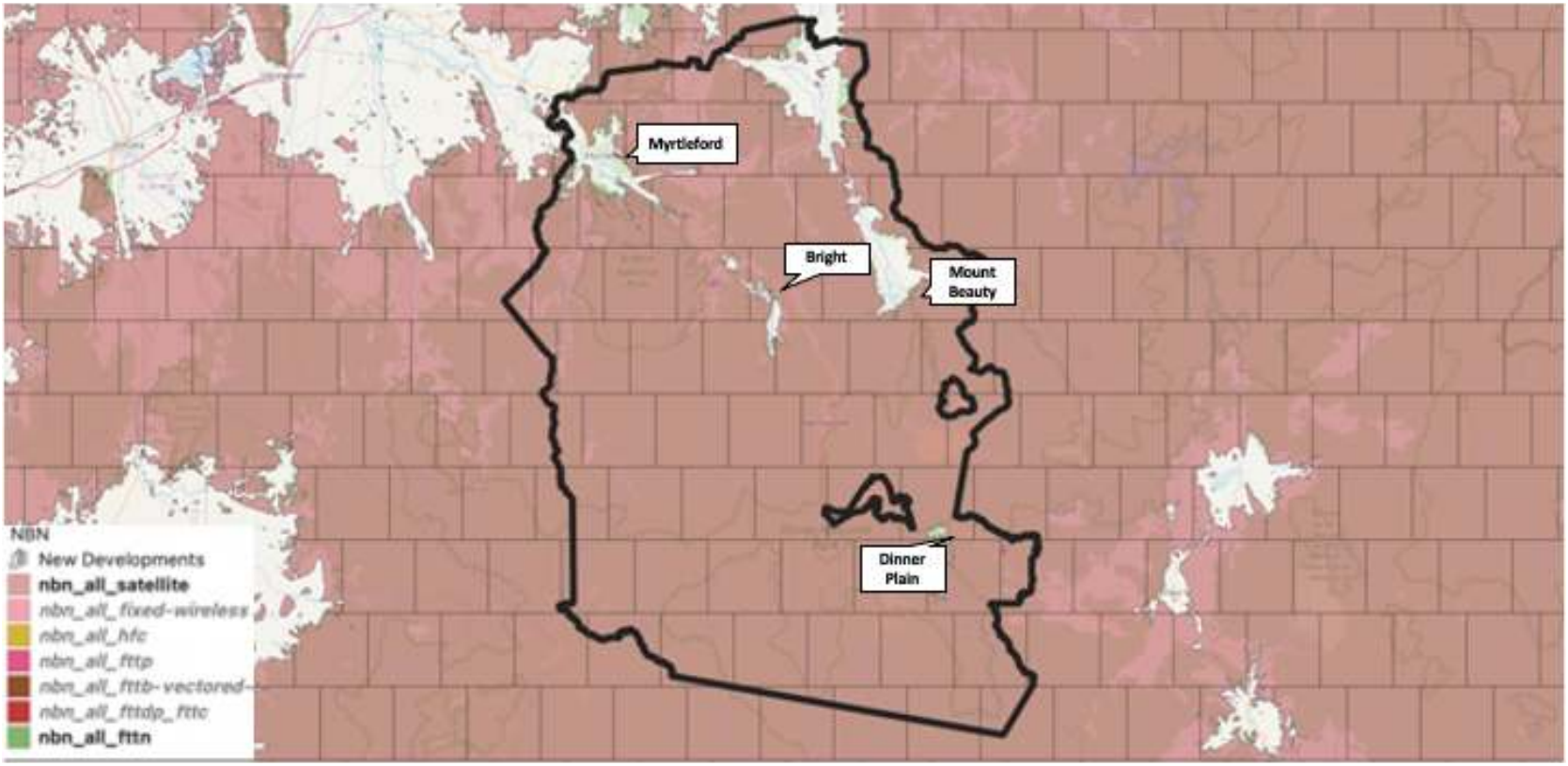
Please refer to the following pages for national broadband network coverage mapping for Alpine Shire.



NBN Coverage (not including Satellite)



NBN Satellite Coverage



Telecommunications Legislation

Alpine Shire Councils regulatory role

The power to regulate and control telecommunications in Australia is vested in the Commonwealth through Section 51 of the Australian Constitution.

With the arrival of the Telecommunications Act 1997, the Commonwealth limited the exemptions and powers available to the carriers and permitted only 'low-impact facilities' to be deployed without scrutiny of State and Territory laws and Council approval.

These exemptions were enshrined in the Telecommunications (Low- Impact Facilities) Determination 1997 (the Determination), which was amended in 1999, 2018 and 2020.

Telecommunications companies deploying infrastructure (known as carriers) are exempt from some state and territory laws, including planning laws, for:

- facilities that are determined to be low-impact facilities,
- temporary facilities for use by a defence organisation, or
- facilities for which the Australian Communications and Media Authority (ACMA) has granted a Facility Installation Permit.

Low-impact facilities include some radiocommunications facilities, underground and above-ground housing, underground and some aerial cables, public payphones, emergency and co-located facilities.

If a facility is not in one of these three groups, then carriers must comply with state and territory laws and planning regulations.

In the case of Alpine Shire Council, the approval pathway for Telecommunications is limited to where Development Approval is required.

Right to install low impact facilities

The Carriers have statutory rights under Schedule 3 of the Act to enter land and install on that land or any buildings on that land, any equipment which falls within the description of a low impact facility.

What are low impact facilities?

The list of the different types of facilities is specified in the Telecommunications (Low-impact Facilities) Determination 2018 - https://www.legislation.gov.au/Details/F2018C00150.

Low-impact facilities can take the form of some radiocommunications facilities, underground and aboveground housing, underground and some aerial cables, public payphones, emergency and collocated facilities. Generally speaking, all 5G Small Cells will be considered to be a low impact facility.

Equipment will not be a low-impact facility if it is installed in areas of environmental significance, which includes places listed on a Commonwealth, State or Territory heritage register. This equipment can only be installed if it meets the requirements of the usual Commonwealth, State or Territory approval processes, such as the Environment Protection and Biodiversity Conservation Act 1999 or the broader telecommunications' regime, including the Radiocommunications Act 1992.

This means that the Carriers do currently have a statutory right to install 5G Equipment on City owned Structures unless the relevant Structure is in an area of environmental significance or listed on a heritage register.

Obligations imposed on carriers installing low impact facilities

If the Carriers wish to install low-impact facilities for mobile phone networks, they must comply with:

(a) Schedule 3 of the Act.

(b) the Telecommunications Code of Practice[1];

(c) the Industry Code for Mobile Phone Base Station Deployment C564:2018[2].

The Act and related regulatory instruments require the Carriers when exercising statutory installation rights to:

(d) do as little damage to the land or building as is practicable.

(e) restore the property as close as possible to its original condition.

(f) restore the property within 10 days after finishing their work.

(g) use good engineering practice.

(h) protect people and property.

(i) protect the environment; and

(j) follow state, territory or local government rules for noise abatement.

Each Carrier must also take reasonable steps to not interfere with:

(a) traffic.

(b) water services.

(c) gas services.

(d) electrical services.

(e) sewerage service.

(f) public roads and paths; and

(g) land use.

[1] https://www.legislation.gov.au/Details/F2018L00171

[2] https://www.commsalliance.com.au/__data/assets/pdf_file/0018/62208/C564_2018-181206.pdf

What Carrier powers and immunities are in place when installing a low impact facility?

Schedule 3 of the Act gives Carriers exercising statutory powers to install low impact facility facilities two important rights/ immunities:

(a) the Carrier does not need to obtain landowner approval to install the low impact facility. However, the Carrier must comply with the notification and appeals process set out in Schedule 3 of the Act; and

(b) the Carrier does not need to comply with local planning laws and approval processes,

Can a landowner (such as Alpine Shire Council) successfully resist a carrier wanting to install low impact facilities?

A Carrier must strictly comply with the landowner notification processes set out in the Act if it wants to exercise its statutory rights to install a low impact facility.

A landowner has very limited grounds upon which it can object to a proposed installation. Whilst the grounds of objection are quite narrow, the objection process can be lengthy and demanding on the Carrier and can significantly delay the Carrier's access to the relevant site.

If a Carrier has statutory rights to install low impact facilities, why would a Carrier want to secure a commercial license to install 4G / 5G Equipment on Council owned Structures?

There are a number of reasons why Carriers choose to first try to negotiate a commercial license to install 5G Equipment on Structures not owned by them. A commercial license:

a) can speed up access to sites (particularly where the parties have agreed on a "Master Agreement" that can apply to multiple sites). The commercial agreement also removes the potential for the landowner to dispute the Carrier's exercise of its statutory rights on a case by case basis.
b) gives the Carrier certainty over its tenure. Under a commercial license the Carrier will be given advance notice if the relevant building or structure will be modified or if a structure such as a pole is replaced or relocated. It also guarantees the term for which the Carrier may occupy the site.
c) is likely to contain provisions that give the Carrier exclusivity or joint exclusivity over the Structure.
d) guarantees the Carrier 24x7 access to the site.
e) normally requires the landowner/building owner to facilitate access by providing information about the site or potential sites that the Carrier may wish to access and use; and
f) eliminates the need for the Carrier to issue statutory notices and wait for notice periods to expire each time it wants to access a site to install, maintain or upgrade its equipment.

In order to preserve statutory immunities in respect of state planning laws, Carriers usually seek to secure a contractual license with the landowner as well as serving the land access notices needed to activate the statutory immunities provided by the Act (which thereby remove the need for the Carrier to comply with local planning laws).

Requirement for multiple parties to make modifications to poles

Carriers often require modification of a utility pole, or the lines or equipment on the utility pole, to accommodate additional small cell facilities on the pole. Under current processes, Carriers are reliant on the pole-owner to arrange and perform the additional work. This can add significant time to the process of installing a new small cell.

In practice, the requirement to rely on the utility or pole owner to undertake the necessary technical work requires the Carrier to reach a commercial agreement with the pole owner – and negates carriers' rights to utilise property.

The timely and efficient deployment of small cells may be enhanced if Carriers could perform the work itself, rather than spreading the work across multiple parties.

2. Community Consultation

Community Survey

Alpine Shire Council conducted a community survey in January 2022 to obtain vital community input to help identify priorities to improve telecommunication issues.

The following high level information was provided to inform the survey responses.

Mobile Network gaps and issues

Telstra, Optus and Vodafone coverage issues

- Great Alpine Road – Myrtleford to Bright to Harrietville to Dinner Plain and beyond
- Kiewa Valley Highway – Dederang to Tawonga to Mt Beauty to Falls Creek and beyond
- Tawonga Gap Road – Bright to Tawonga
- Mt Buffalo Road – Porepunkah to Mt Bright
- Happy Valley Road / Running Creek Road – Myrtleford to Running Creek
- Myrtleford Yackandandah Road – Myrtleford to Mudgegonga
- Buffalo River Road – Myrtleford to Nug to Lake Buffalo and beyond
- Dargo High Plains Road – Hotham Heights to Dargo

NBN Gaps and issues

- Fixed Wireless only townships – Dinner Plain
- Satellite only townships – Harrietville, Falls Creek, Mount Hotham
- Larger towns with Fibre to the Node NBN only – Myrtleford, Bright, Mount Beauty

The Survey was open for three weeks and 146 total responses were obtained.

The key question posed in the community survey was 'Are the mobile and internet gaps identified above correct?'

80 survey participants responded yes, and of these 21 did not make further comment.
63 survey participants responded no.

The key geographic areas that featured heavily in the survey response is outlined below.

Geographic area	Mobile Network issues	NBN issues	Other issues
Harrietville (31 responses)	• Poor mobile network reception, coverage and capacity (17 responses)	• Various NBN and ADSL service issues (8 responses)	• Requirement for capacity in peak times • Requirement for 5G • Requirement for improved NBN
Freeburgh, Smoko, Germantown (8 responses)	• Poor or no mobile network reception, coverage and capacity	• Satellite NBN service issues	• Requirement for 4G & 5G • Requirement for improved NBN
Wandiligong (9 responses)	• Poor or no mobile network reception, coverage and capacity		• Requirement for capacity in peak times • Requirement for 4G & 5G • Requirement for improved NBN
Myrtleford & surrounds (10 responses)	• Poor or no mobile network reception, coverage and capacity	• NBN service issues	

Geographic area	Mobile Network issues	NBN issues	Other issues
Kiewa Valley (7 responses)	• Poor or no mobile network reception, coverage and capacity	• NBN service issues	• Requirement for capacity in peak times • Requirement for 5G • Requirement for improved NBN
Bright (26 responses)	• Lack of capacity for mobile network access in peak times • Poor or no mobile network reception, coverage and capacity	• NBN service issues	• Requirement for capacity in peak times • Requirement for 5G • Requirement for improved NBN
Porepunkah (3 responses)		• Satellite NBN service issues • Fibre to the Node NBN service issues	• Requirement for improved NBN
Eurobin (3 responses)		• Satellite NBN service issues •	• Potential for Starlink LEOSat
Falls Creek	• Poor or no mobile network reception, coverage and capacity	•	• Requirement for improved NBN
Roads			
Great Alpine Road Back Porepunkah Road	• Poor or no mobile network reception, coverage and capacity		
Other			
Non region specific	• Poor or no mobile network reception, coverage and capacity		• Requirement for capacity in peak times • Requirement for 4G & 5G • Requirement for improved NBN

An overview of the community survey results can be provided upon request.

Community Panel

Two workshops were conducted with the Alpine Shire Community Panel on 2 March and 9 March 2022 to obtain further input into the priorities to improve connectivity issues.

The following questions were developed to obtain information from the Community Panel to help validate early findings and guide focus of the Telecommunications Strategy.

Mobile
Q1 Please consider this question as a member of the Alpine Shire community. What are the top 2 priority locations where you think existing mobile communications need to be improved?

Mobile
Q2 Please consider this question in relation to doing business and attracting tourism in the Alpine Shire. What are the top2 priority locations where you think existing mobile communications need to be improved?

Mobile
Q3 Please consider this question in relation to natural disaster response (i.e. bushfire, floods, etc.) in the Alpine Shire. What are the top 2 priority locations where you think existing mobile communications need to be improved?

Internet
Q4 Please consider this question as a member of the Alpine Shire community. What are the top 2 priority locations where you think existing fixed internet (NBN or equivalent) needs to be improved?

Internet
Q5 Please consider this question in relation to doing business and attracting tourism in the Alpine Shire. What are the top 2 priority locations where you think existing fixed internet (NBN or equivalent) communications needs to be improved?

Internet
Q6 Please consider this question in relation to natural disaster response (i.e. bushfire, floods, etc.) in the Alpine Shire. What are the top 2 priority locations where you think existing fixed internet (NBN or equivalent) needs to be improved?

Does the Drive testing data capture your personal experience?

What do you think your community is most concerned about in regards to mobile and internet communications?

Information obtained from the Community Panel in response to these questions has been summarised below

Question	Response
(Community viewpoint) What are the top 2 priority locations where you think existing mobile communications need to be improved?	Coverage • Along Kiewa Valley Highway • Along Great Alpine Road • Mount Beauty to Myrtleford including Happy Valley • Tawonga Gap Capacity • Tawonga / Tawonga South • Bright & Wandiligong • Myrtleford

Question	Response
	• Harrietville / Smoko
(Business & Tourism viewpoint) What are the top 2 priority locations where you think existing mobile communications need to be improved?	Coverage • Bright • Mt Buffalo Capacity • Bright • Myrtleford • Mount Beauty
(Natural Disaster viewpoint) What are the top 2 priority locations where you think existing mobile communications need to be improved?	Coverage • Running Creek / Gundowring / Dederang / Kancoona • Bright & Wandiligong (x2) • Buffalo River Valley • Simmonds Creek Road & Mountain Creek Road • Buckland Valley Capacity • Bright • Mount Beauty & Tawonga South • Remaining major service centres
(Community viewpoint) What are the top 2 priority locations where you think existing fixed internet (NBN or equivalent) needs to be improved?	• Harrietville (x2) • Wandiligong • Kiewa Valley

Question	Response
(Business & Tourism viewpoint) What are the top 2 priority locations where you think existing fixed internet (NBN or equivalent) needs to be improved?	• Bright (x2) • Wandiligong • Mount Beauty
(Natural Disaster viewpoint) What are the top 2 priority locations where you think existing fixed internet (NBN or equivalent) needs to be improved?	• Bright / Wandiligong • Mount Beauty • Harrietville • Dederang
Additional personal experiences relating to Telecommunications	• Numerous coverage issues across Alpine Shire • Capacity issues – especially in Bright • Tawonga South mobile call dropouts • Customer impact for Businesses • In building coverage issues for mobile networks
What do you think your community is most concerned about in regards to mobile and internet communications?	• Lack of reliability • Post storm loss of access • Reliability in emergency situations • Heavy reliance on mobile services • Reliability and speed issues – Whole of Shire • Requirement for High speed internet – for businesses and working from home

Key Community Sentiment Themes

There were a number of key themes that emerged from the community survey and community panel consultation, being:

- **A sharp focus on not just mobile network coverage but also capacity of networks at peak usage times**

Our recommendations for the MNOs to provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain;

For the MNOs to provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain;

and;

High Speed Public WiFi implemented at Bright, Myrtleford, Mount Beauty and Harrietville;

will greatly improve this issue.

- **Requirement for existing NBN infrastructure to be upgraded in various areas but with a particular focus on major service centres**

Our recommendations for NBN to upgrade all service centres (i.e. Bright, Myrtleford, Mount Beauty, Harrietville, Tawonga) to be served by NBN business fibre and NBN fibre to the Premise;

Dinner Plain NBN upgraded from Fixed Wireless to Fibre to the Premise;

and;

Wandiligong NBN upgraded from Fixed Wireless to Fibre to the Premise;

will greatly improve this issue.

- **Numerous coverage issues across Alpine Shire**

Our recommendations for the MNOs to;

Upgrade the regions 3G Footprint to 4G by each of the three MNOs by potentially using Shared Radio Access Network;

New or Improved 4G Mobile Network coverage and capacity for –

- Harrietville (Telstra, Optus and TPG Telecom / Vodafone)
- Wandiligong ((Telstra, Optus and TPG Telecom / Vodafone)
- Happy Valley (Telstra, Optus and TPG Telecom / Vodafone)
- Dederang & Gundowring (Telstra, Optus and TPG Telecom / Vodafone);

High band (mmwave) 5G from each of the three Mobile Network Operators for all service centres (i.e. Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford);

New or Improved 5G Mobile Network coverage and capacity for –

- Buffalo River (Telstra, Optus and TPG Telecom / Vodafone)
- Buckland Valley (Telstra, Optus and TPG Telecom / Vodafone);

will greatly improve this issue.

3. Connectivity Current State

Current State

Current State Analysis

The following tables and maps show the telecommunications infrastructure as currently available for major townships in each of the Council areas within ALPINE SHIRE.

Where any infrastructure is either not available or not fit for purpose, this constitutes the gaps in telecommunications and connectivity that impacts the economic capability and social fabric of that particular area of Alpine Shire Region.

Community	nbn	TELSTRA	OPTUS	tpg TELCO	Telstra InfraCo	VOCUS	VicTrack	LoRaWAN	sigfox
Bright / Porepunkah / Wandiligong	Fibre to the Curb Fibre to the Node	4G 3G	4G 3G	4G 3G	☑	-	-	-	-
Myrtleford	Fibre to the Curb Fibre to the Node Fixed Wireless	4G 3G	4G 3G	4G 3G	☑	-	-	-	-
Mount Beauty	Fibre to the Node Fixed Wireless	4G 3G	4G 3G	4G 3G	☑	-	-	-	-
Harrietville	Satellite	4G 3G	4G 3G	3G	☑	-	-	-	-
Tawonga / Tawonga South	Fibre to the Node Fixed Wireless	4G 3G	4G 3G	4G 3G	☑	-	-	-	-
Dederang	Fixed Wireless	4G 3G	4G 3G	3G	☑	-	-	-	-

Dinner Plain	Fixed Wireless	4G 3G	4G 3G	4G 3G	☑	-	-	-	-

Bright / Porepunkah / Wandiligong

In relation to NBN coverage, the townships are serviced by NBN fibre to the curb and fibre to the node technologies. The level of NBN infrastructure will not be fit for purpose in the coming decade, especially as these townships also have a range of capacity and coverage issues with 4G and 3G networks.

The townships are serviced by Telstra 4G / 3G, Optus 4G / 3G and TPG Telecom (Vodafone) 4G/ 3G. Due to high visitor numbers and potentially other factors, network congestion is experienced resulting in diminished levels of service quality and experience on all mobile networks.

In relation to Fibre Backhaul network access and Low Powered Wireless Access Networks (LPWANs), the townships do not have direct access to alternative choices to Telstra.

Myrtleford

In relation to NBN coverage, the township is serviced by NBN fibre to the curb, fibre to the node and fixed wireless technologies. The level of NBN infrastructure will not be fit for purpose in the coming decade, especially as this township also has a range of capacity and coverage issues with 4G and 3G networks.

The township is serviced by Telstra 4G / 3G, Optus 4G / 3G and TPG Telecom (Vodafone) 4G/ 3G. Due to high visitor numbers and potentially other factors, network congestion is experienced resulting in diminished levels of service quality and experience on all mobile networks.

In relation to Fibre Backhaul network access and Low Powered Wireless Access Networks (LPWANs), the township doesn't have direct access to alternative choices to Telstra.

Mount Beauty

In relation to NBN coverage, the township is serviced by NBN fibre to the node and fixed wireless technologies. The level of NBN infrastructure will not be fit for purpose in the coming decade, especially as this township is a major service centre supporting business and tourism.

The township is serviced by Telstra 4G / 3G, Optus 4G / 3G and TPG Telecom (Vodafone) 4G/ 3G. Telstra and Optus coverage and capacity appears adequate but investment is required for the Vodafone mobile networks.

In relation to Fibre Backhaul network access and Low Powered Wireless Access Networks (LPWANs), the township doesn't have direct access to alternative choices to Telstra.

Harrietville

In relation to NBN coverage, the township is serviced by NBN satellite technologies. The level of NBN infrastructure is not fit for purpose and requires urgent upgrade to Fibre to the Premise technology, especially as this township is a service centre supporting business and tourism.

The township is serviced by Telstra 4G / 3G, Optus 4G / 3G and TPG Telecom (Vodafone) 3G. Telstra coverage and capacity appears adequate but investment is required for the Optus and Vodafone mobile networks.

In relation to Fibre Backhaul network access and Low Powered Wireless Access Networks (LPWANs), the township doesn't have direct access to alternative choices to Telstra.

Tawonga / Tawonga South

In relation to NBN coverage, the township is serviced by NBN fibre to the node and fixed wireless technologies. The level of NBN infrastructure will not be fit for purpose in the coming decade, especially as this township is a major service centre supporting business and tourism.

The township is serviced by Telstra 4G / 3G, Optus 4G / 3G and TPG Telecom (Vodafone) 4G/ 3G. Telstra and Optus coverage and capacity appears adequate but investment is required for the Vodafone mobile networks.

In relation to Fibre Backhaul network access and Low Powered Wireless Access Networks (LPWANs), the township doesn't have direct access to alternative choices to Telstra.

Dederang

In relation to NBN coverage, the township is serviced by NBN fixed wireless technologies. The level of NBN infrastructure is not fit for purpose and requires urgent upgrade to Fibre to the Premise technology, especially as this small township is a service centre supporting business and tourism.

The township is serviced by Telstra 4G / 3G, Optus 4G / 3G and TPG Telecom (Vodafone) 3G. Telstra coverage and capacity appears adequate but investment is required for the Optus and Vodafone mobile networks.

In relation to Fibre Backhaul network access and Low Powered Wireless Access Networks (LPWANs), the township doesn't have direct access to alternative choices to Telstra.

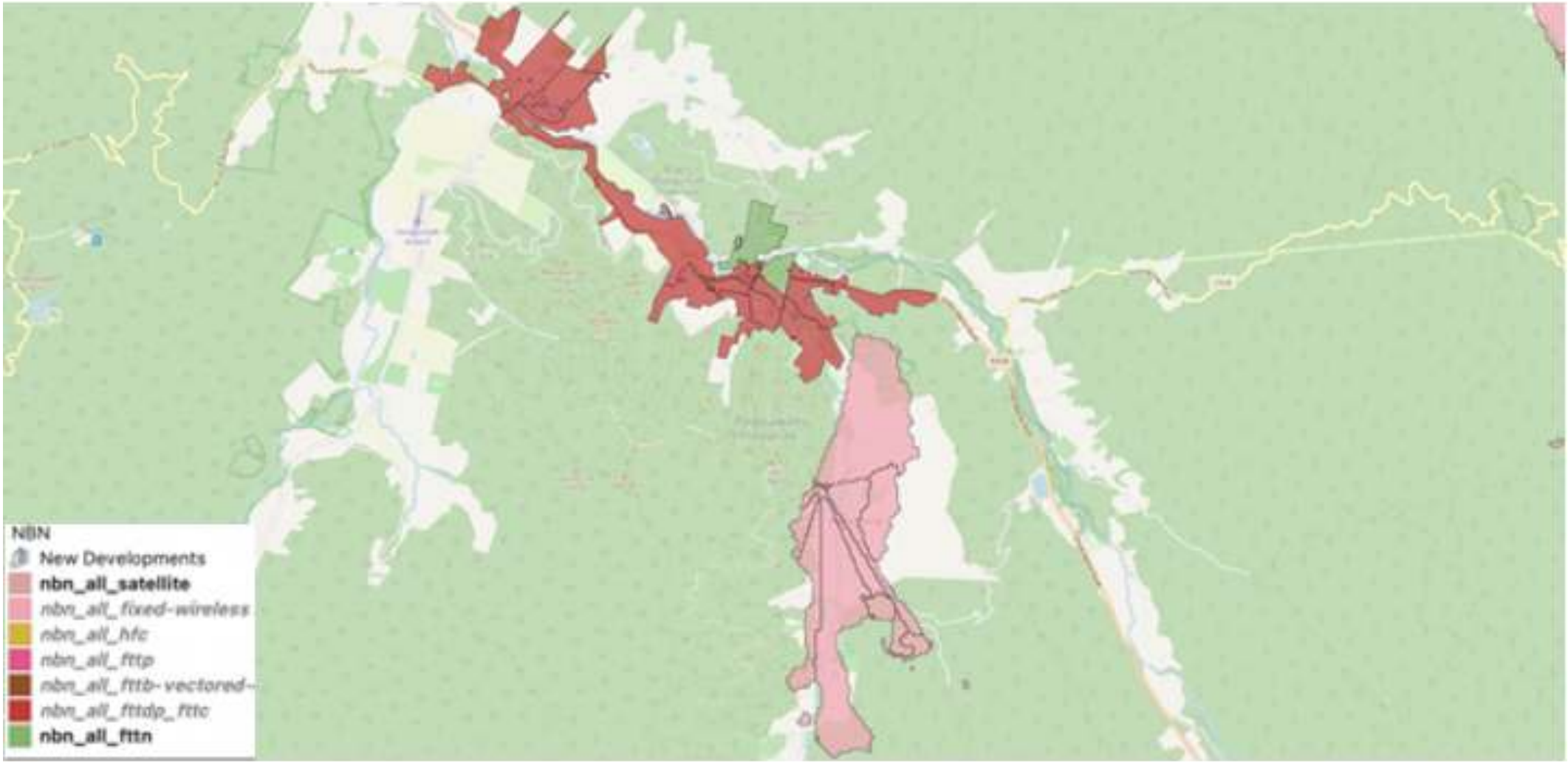
Dinner Plain

In relation to NBN coverage, the township is serviced by NBN fixed wireless technologies. The level of NBN infrastructure is not fit for purpose and requires urgent upgrade to Fibre to the Premise technology, especially as this small township is a service centre supporting business and tourism.

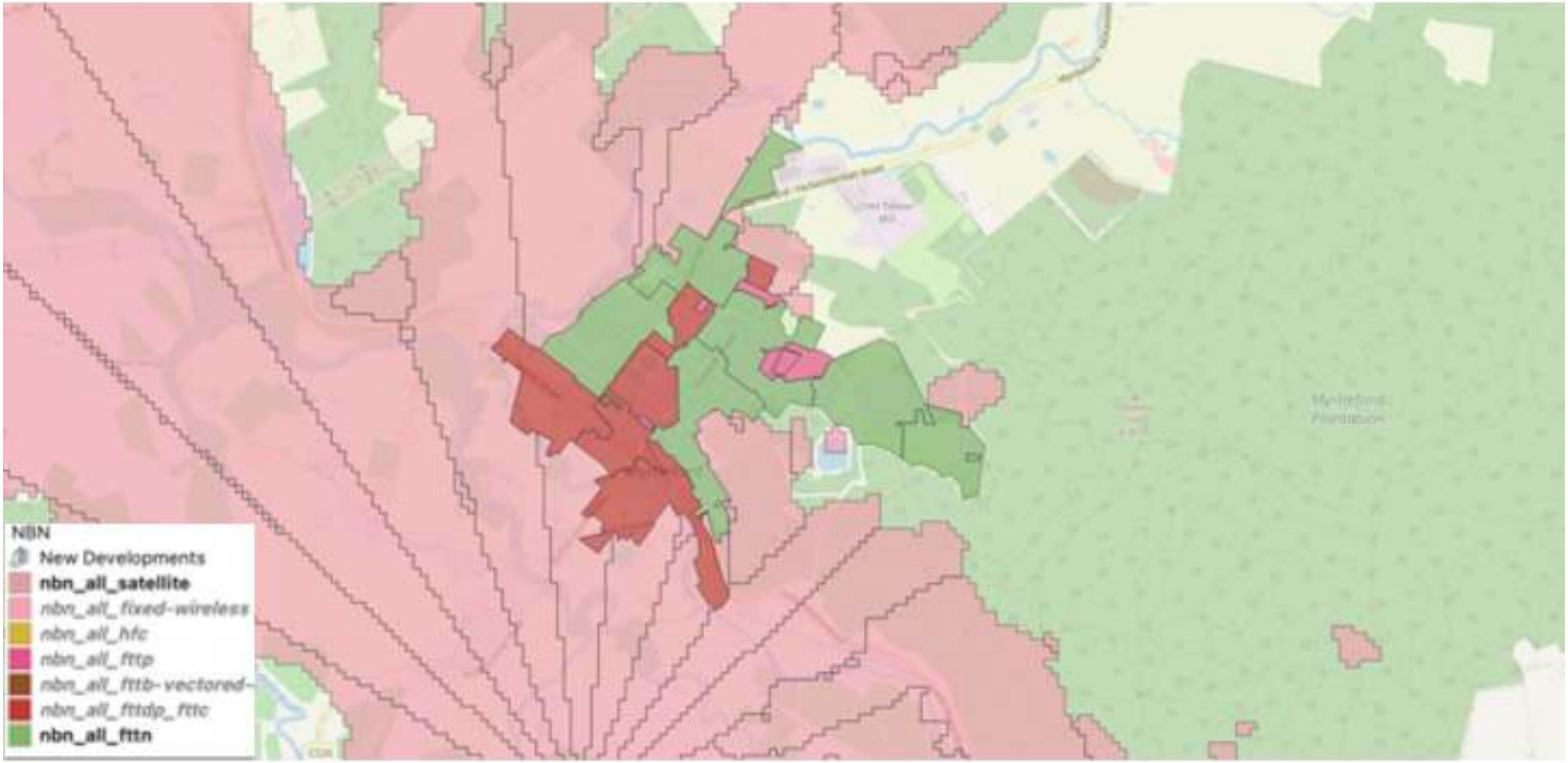
The township is serviced by Telstra 4G / 3G, Optus 4G / 3G and TPG Telecom (Vodafone) 3G. Telstra and Optus coverage and capacity appears adequate but investment is required for the Vodafone mobile networks.

In relation to Fibre Backhaul network access and Low Powered Wireless Access Networks (LPWANs), the township doesn't have direct access to alternative choices to Telstra.

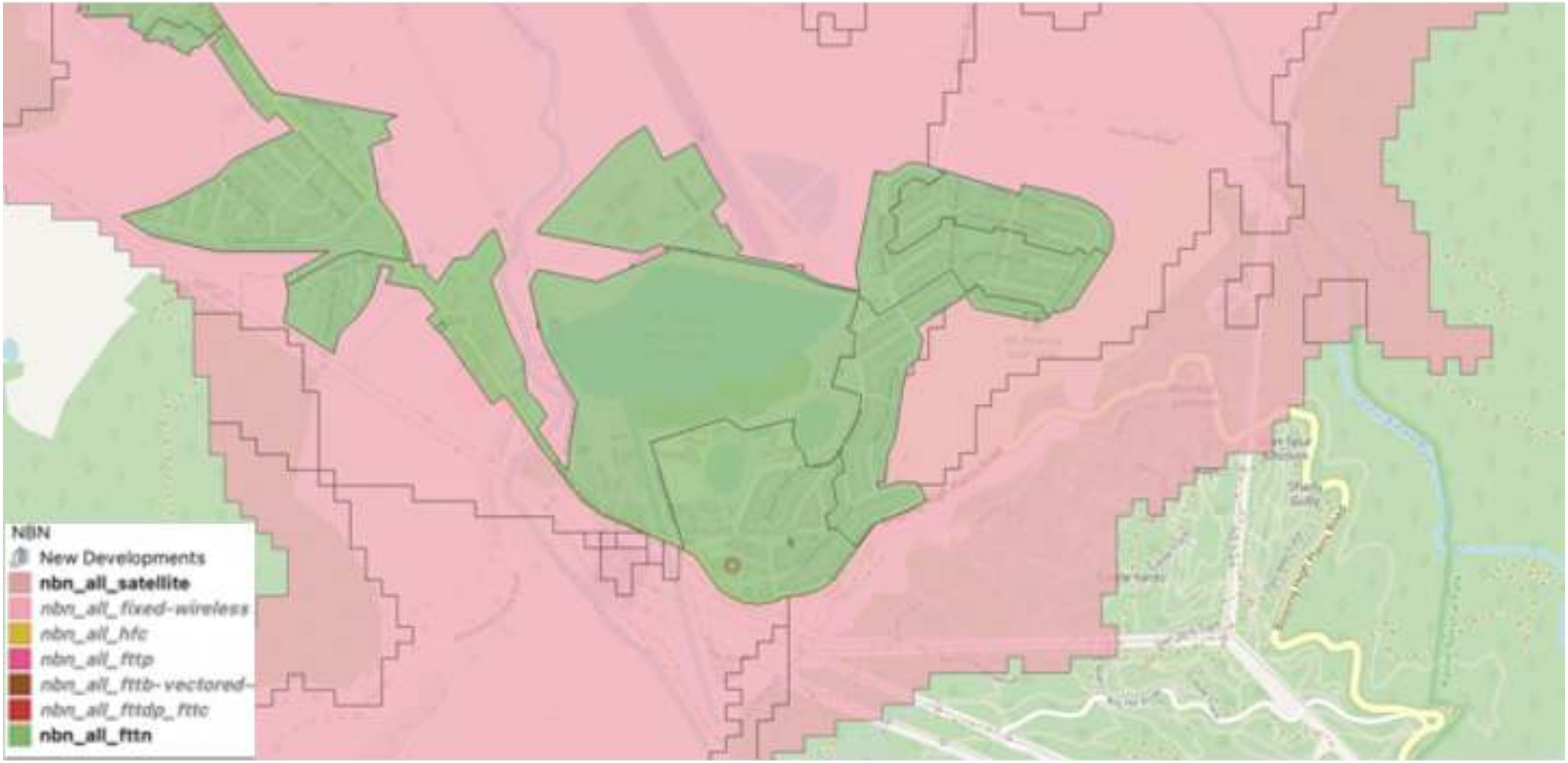
Bright / Porepunkah / Wandiligong NBN coverage



Myrtleford NBN Coverage

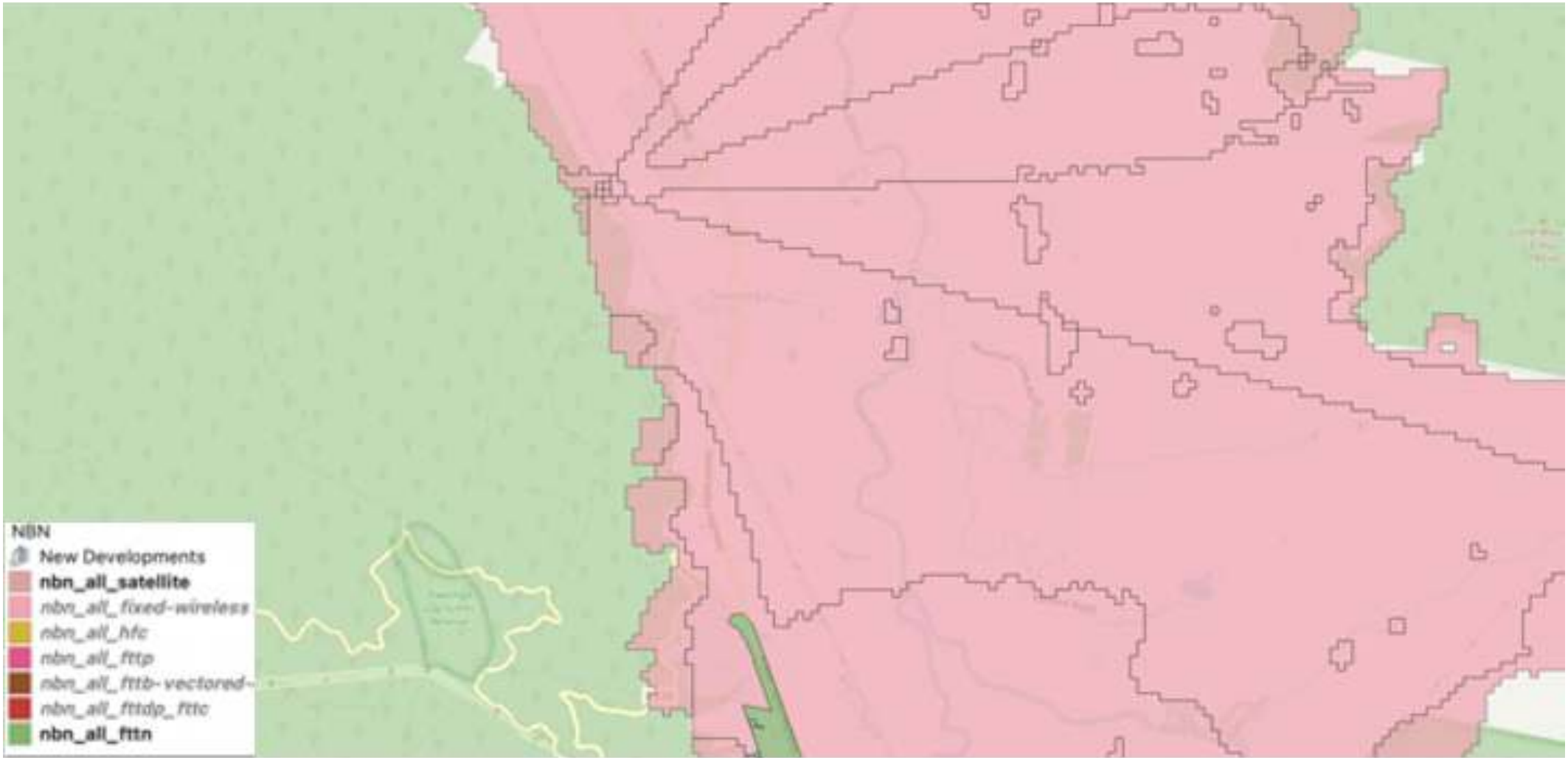


Mount Beauty / Tawonga South NBN coverage

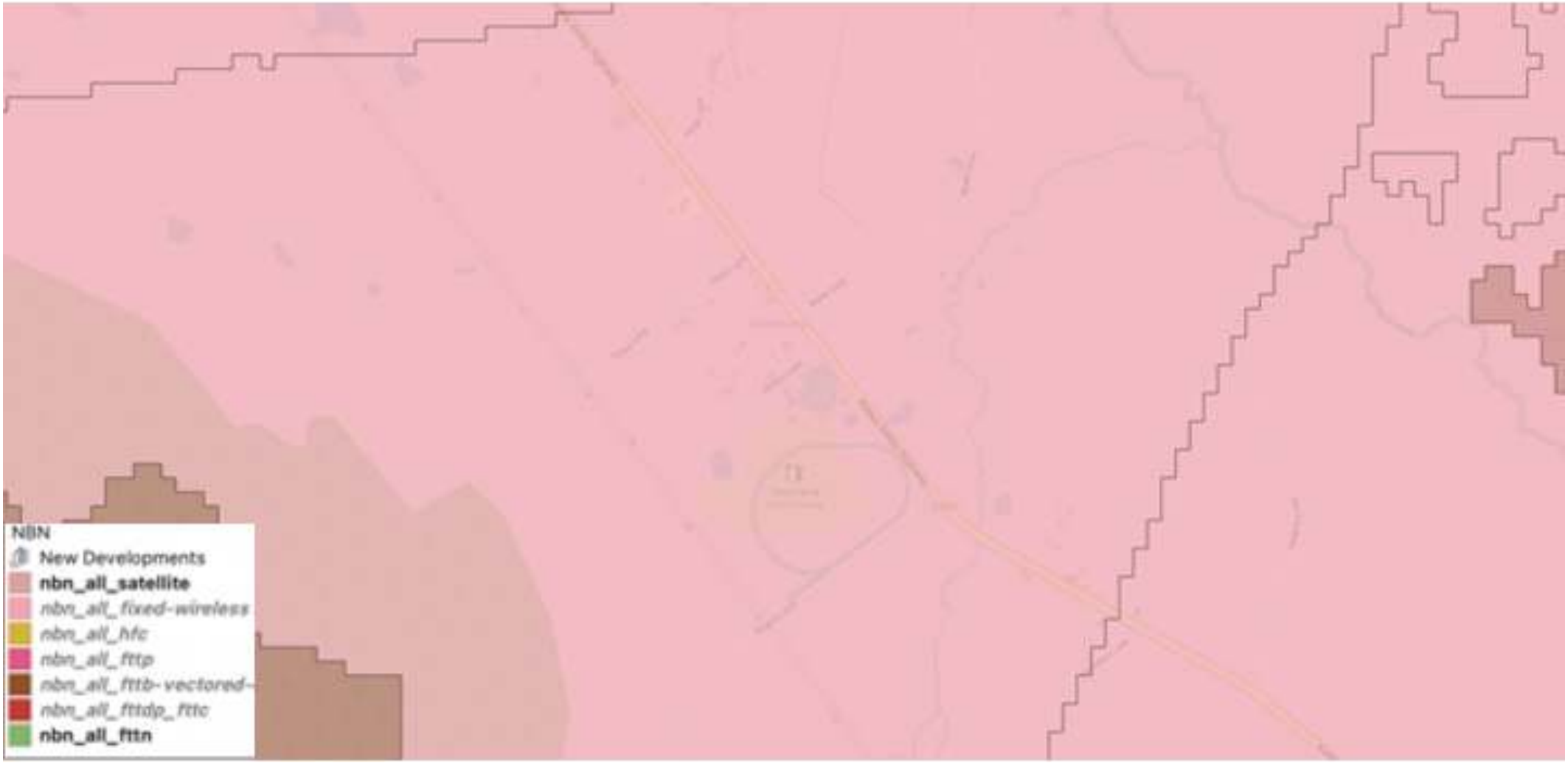


Harrietville NBN coverage

Tawonga / Tawonga South NBN coverage



Dederang NBN coverage



Dinner Plain NBN coverage

4. Mobile Network Testing

Mobile Network Testing

By using independent mobile testing technology, Gravelroad Group provides impartial user experience-based reports and recommendations. The methodology used by us to independently test mobile network performance and identify carrier blackspots has been developed over the last 10 years to provide results that describe the 'user experience'.

We used three Google Pixel 4a 5G handsets, as commonly used by members of the public, to capture information about signal strength and network performance for each of the national carriers - Telstra, Optus & Vodafone. This benchmarking process provides a rich methodology that has been acknowledged and respected by all major wireless service providers.

Other local governments have typically used the report and specific recommendations to advocate for increased funding by Federal, State governments together with each of the three national carriers – often through the Mobile Black Spot Program.

We tested with an app we have developed specifically for this purpose – GoMobile Network Test (GoMobile) to capture all the information we can about the mobile network and the test device itself. An example of the GoMobile app screen can be seen below.

By providing the GPS location and current results in real time, testers can monitor and authenticate the testing accuracy in real time.

Our testing is now completed using Android handsets with the results available in near real-time from an online portal.

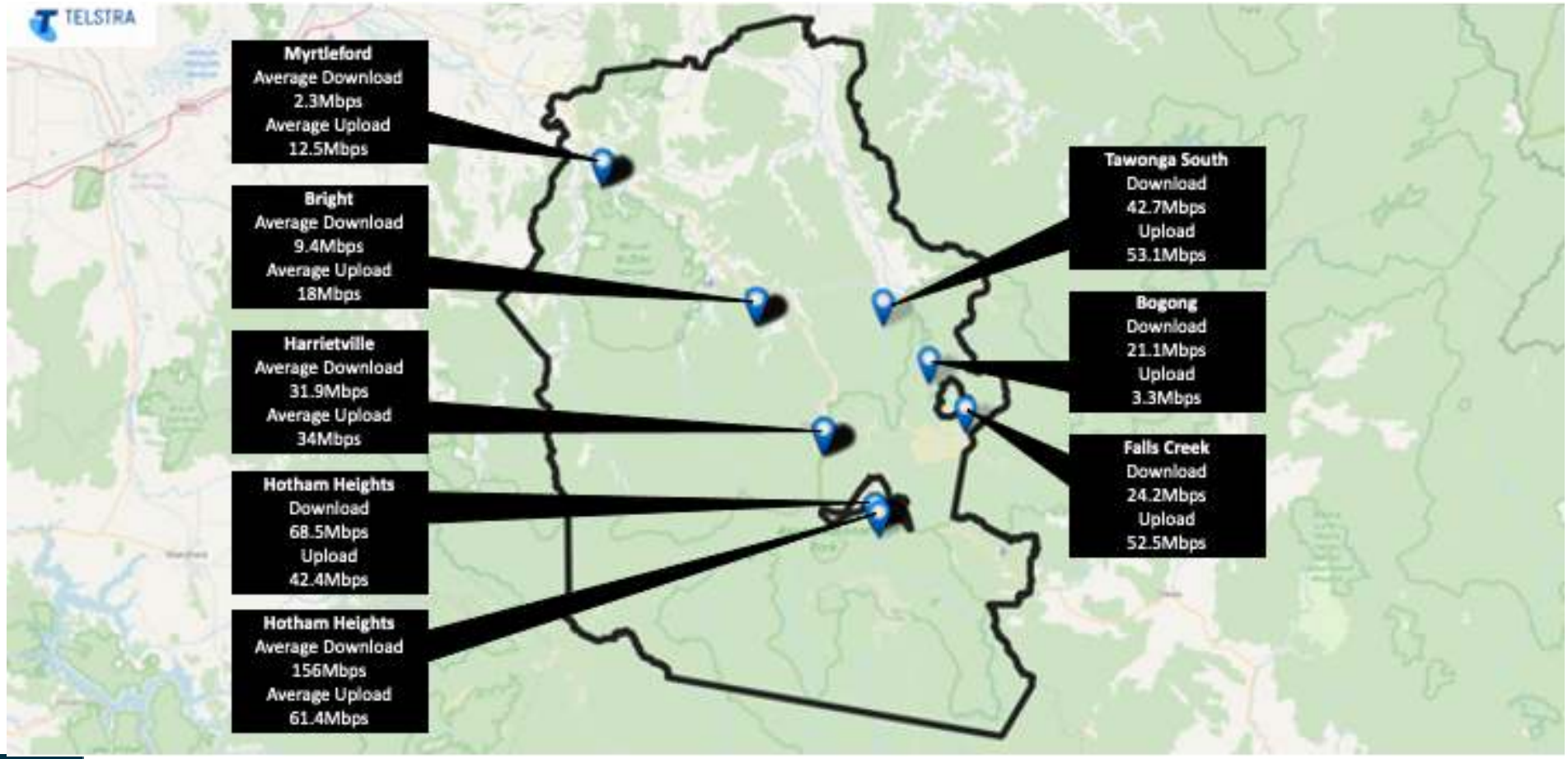
There are six simple principles used to inform our testing methodology:

- User experience based – we use handsets commonly owned by users rather than other more technical and theoretical approaches.
- Same handset, same settings – this provides an equitable basis for bench marking network performance.
- Simultaneous testing – all tests are carried out in the same vehicle – spaced to remove interference and completed at the same time in that location.
- Signal Strength – for 3G, 4G & 5G
- Network Performance Test – download, upload and latency
- Time Series Testing - Download and upload of data to the internet over a specified time series.

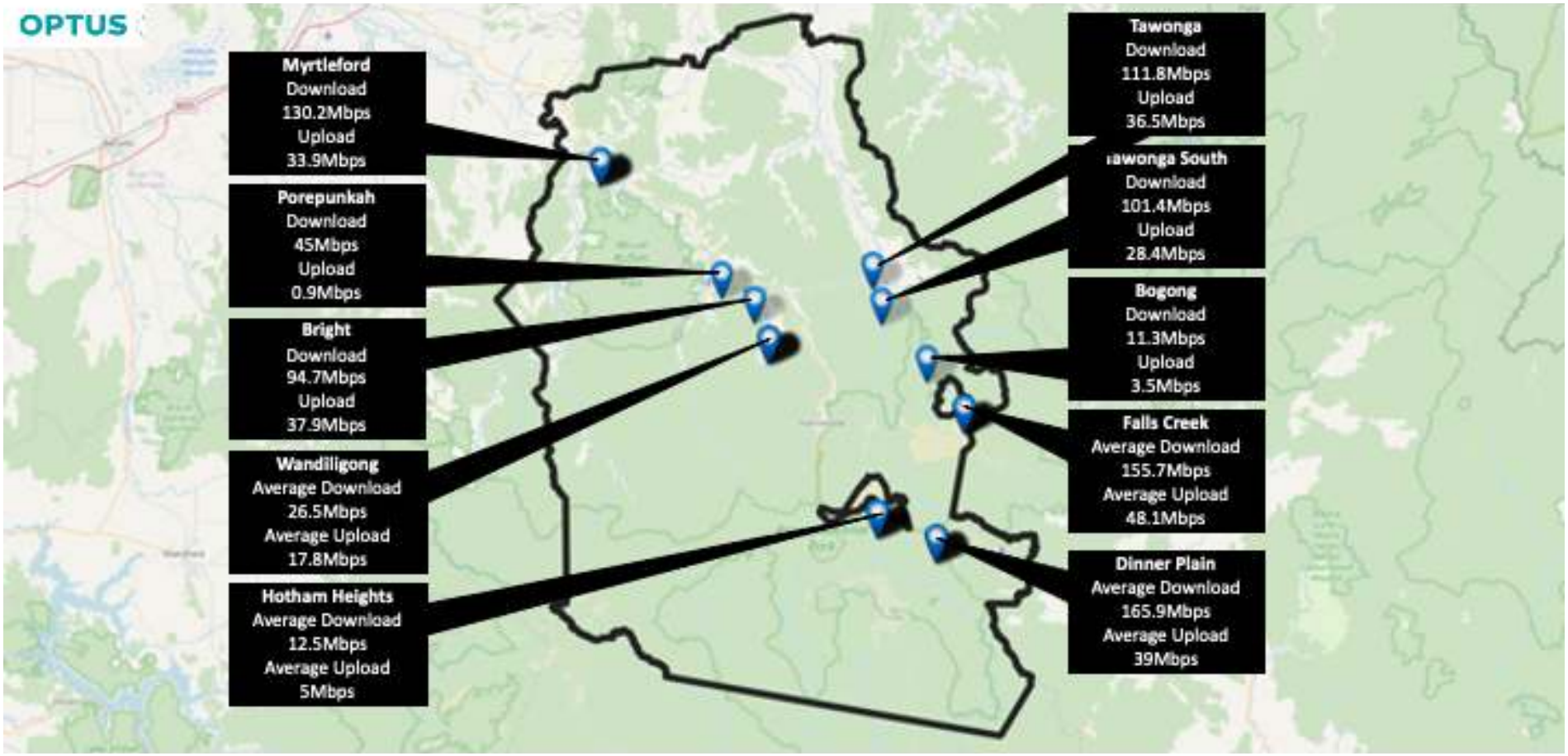
Network Bandwidth Tests

In January 2022, we completed a number of point in time and time series network bandwidth tests for each of the three mobile network operators (Telstra, Optus and TPG Telecom / Vodafone) with the results shown in the maps below.

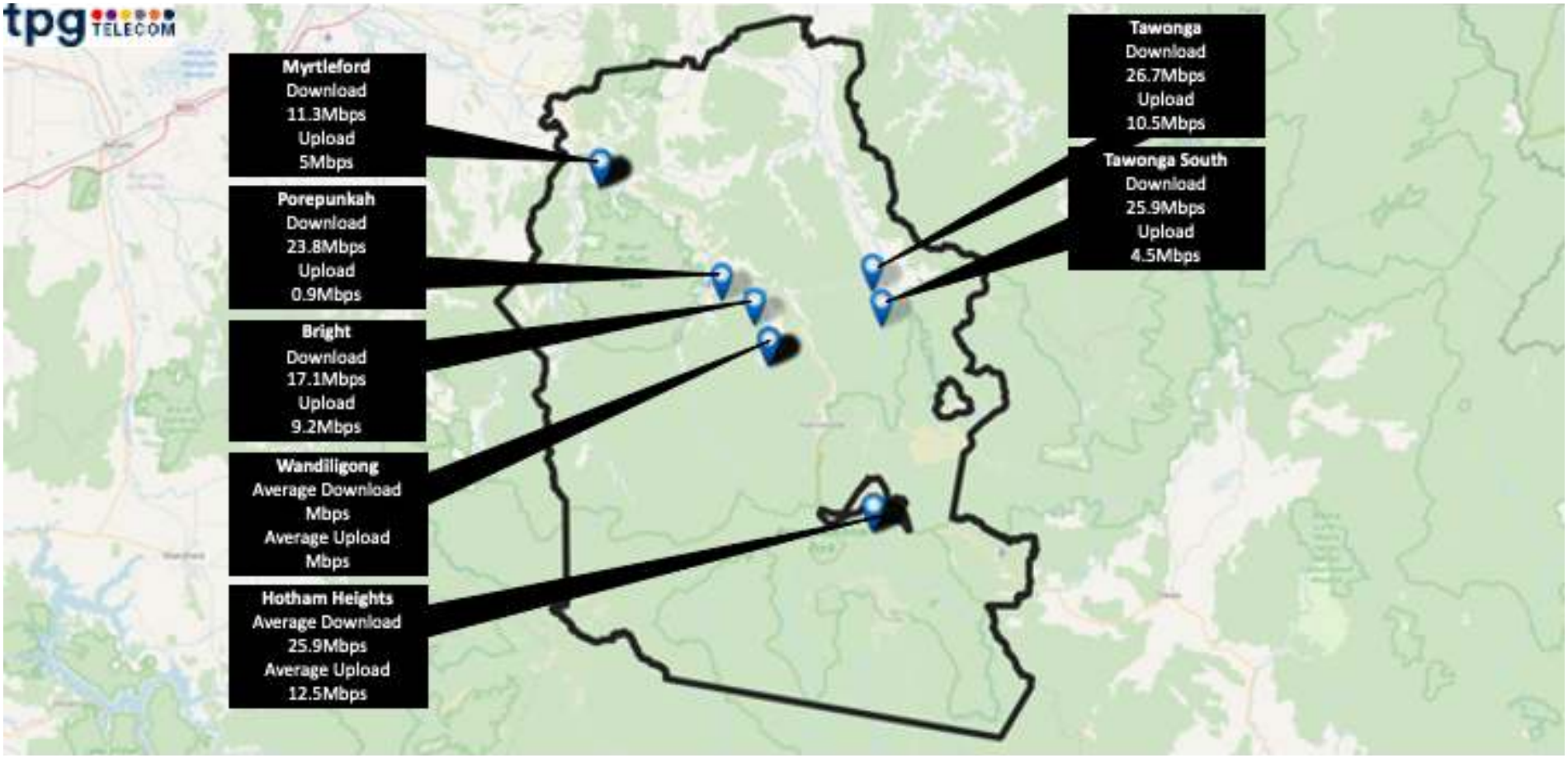
Telstra



Optus

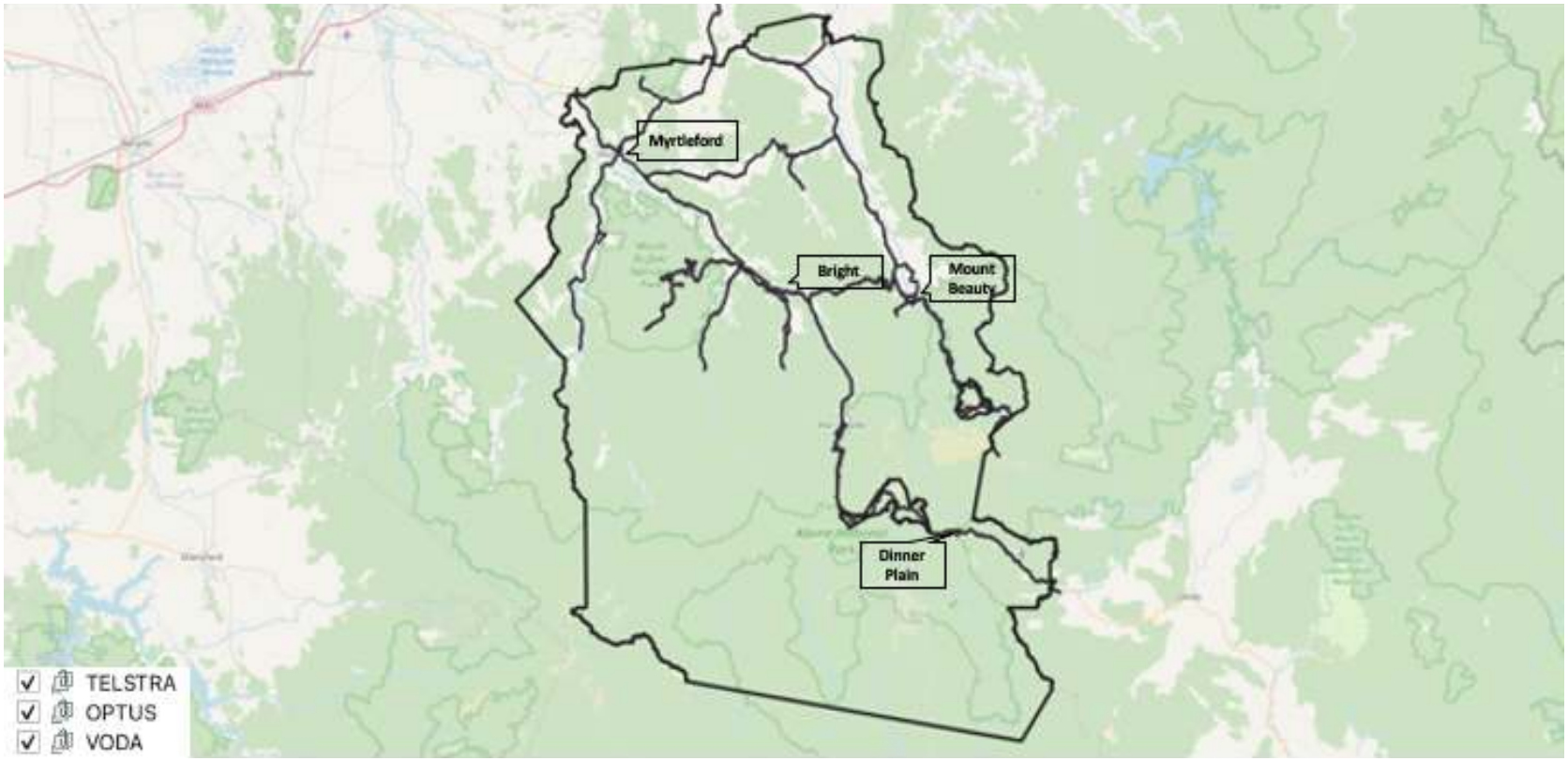

OPTUS
Myrtleford
Download
130.2Mbps
Upload
33.9Mbps
Porepunkah
Download
45Mbps
Upload
0.9Mbps
Bright
Download
94.7Mbps
Upload
37.9Mbps
Wandiligong
Average Download
26.5Mbps
Average Upload
17.8Mbps
Hotham Heights
Average Download
12.5Mbps
Average Upload
5Mbps
Tawonga
Download
111.8Mbps
Upload
36.5Mbps
awonga South
Download
101.4Mbps
Upload
28.4Mbps
Bogong
Download
11.3Mbps
Upload
3.5Mbps
Falls Creek
Average Download
155.7Mbps
Average Upload
48.1Mbps
Dinner Plain
Average Download
165.9Mbps
Average Upload
39Mbps

Vodafone


tpg TELECOM
Myrtleford
Download
11.3Mbps
Upload
5Mbps
Porepunkah
Download
23.8Mbps
Upload
0.9Mbps
Bright
Download
17.1Mbps
Upload
9.2Mbps
Wandiligong
Average Download
Mbps
Average Upload
Mbps
Hotham Heights
Average Download
25.9Mbps
Average Upload
12.5Mbps
Tawonga
Download
26.7Mbps
Upload
10.5Mbps
Tawonga South
Download
25.9Mbps
Upload
4.5Mbps

Signal Strength

We have tested mobile signal strength for each of the three mobile network operators (Telstra, Optus and TPG Telecom / Vodafone) in both 3G, 4G and 5G modes at approx. every 100m as per the map below. This methodology will comprehensively demonstrate the quality of coverage by carriers in each area tested.



The contrast between Black Spots and hotspots of coverage is clearly shown in both the 3G, 4G and 5G tables and maps below.

Signal strength by itself is not the best indicator of a network performance as it only shows where local access is possible. The signal strength information combined with the network performance testing provides a clear assessment on the networks in the region of study.

3G Signal Strength explained

The following indicators are used to determine the quality of a 3G signal. The table below indicate guidelines as to what constitutes a particular level of quality, ranging from excellent to unusable (poor or no usable signal)

Signal	Quality	Description
>= -75dbm	Excellent	Strong signal enabling maximum data capacity
>= -80dbm	Good	Good signal and speeds with no dropouts expected
>= -90dbm	Fair	Fair/usable signal with possibility of dropouts and slowdowns
>= -112dbm	No / Poor / Unusable	No usable signal - expect frequent disconnections and sluggish performance

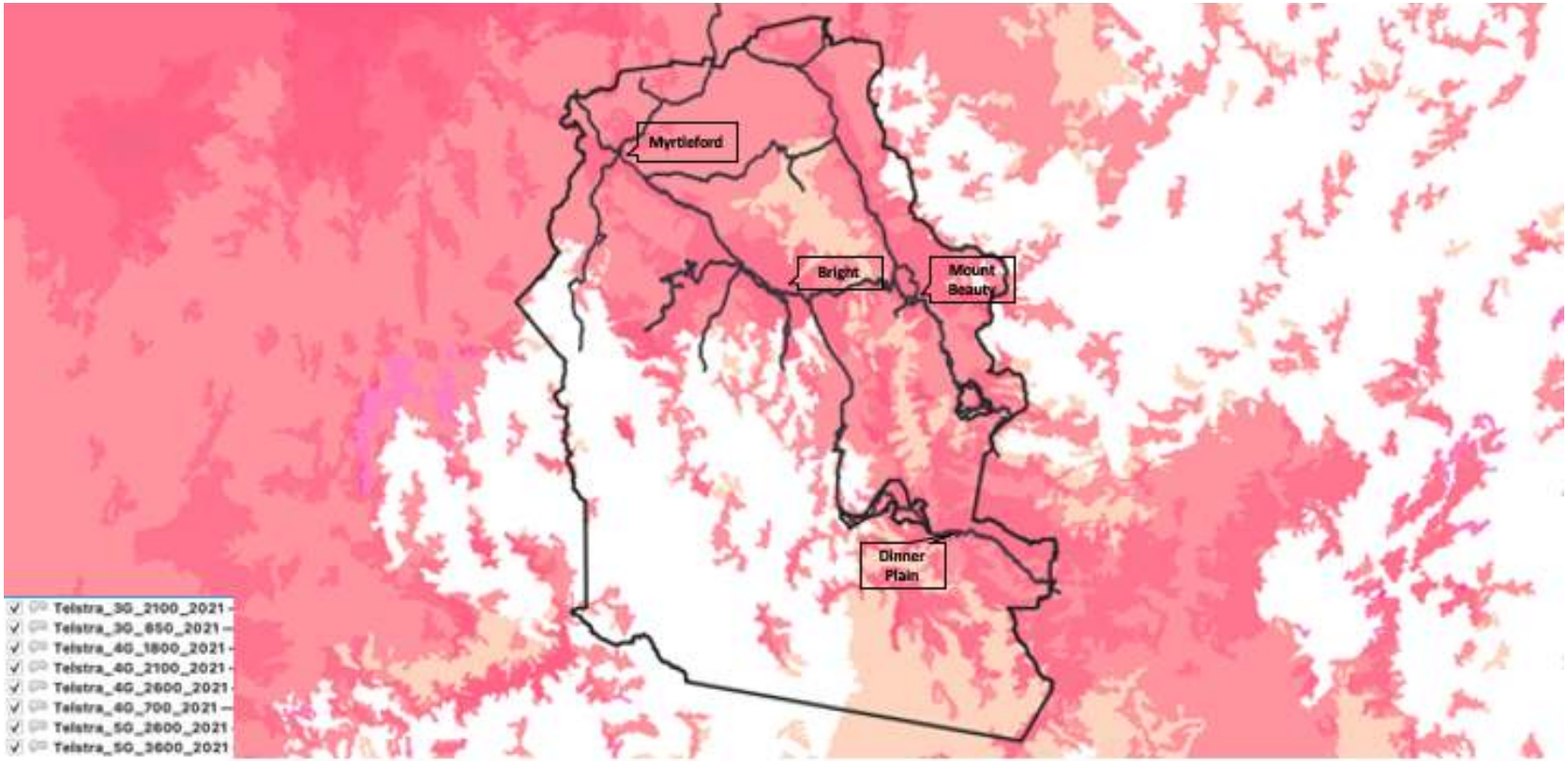
4G Signal Strength explained

The following indicators are used to determine the quality of a 4G signal. The table below indicate guidelines as to what constitutes a particular level of quality, ranging from excellent to unusable (poor or no usable signal)

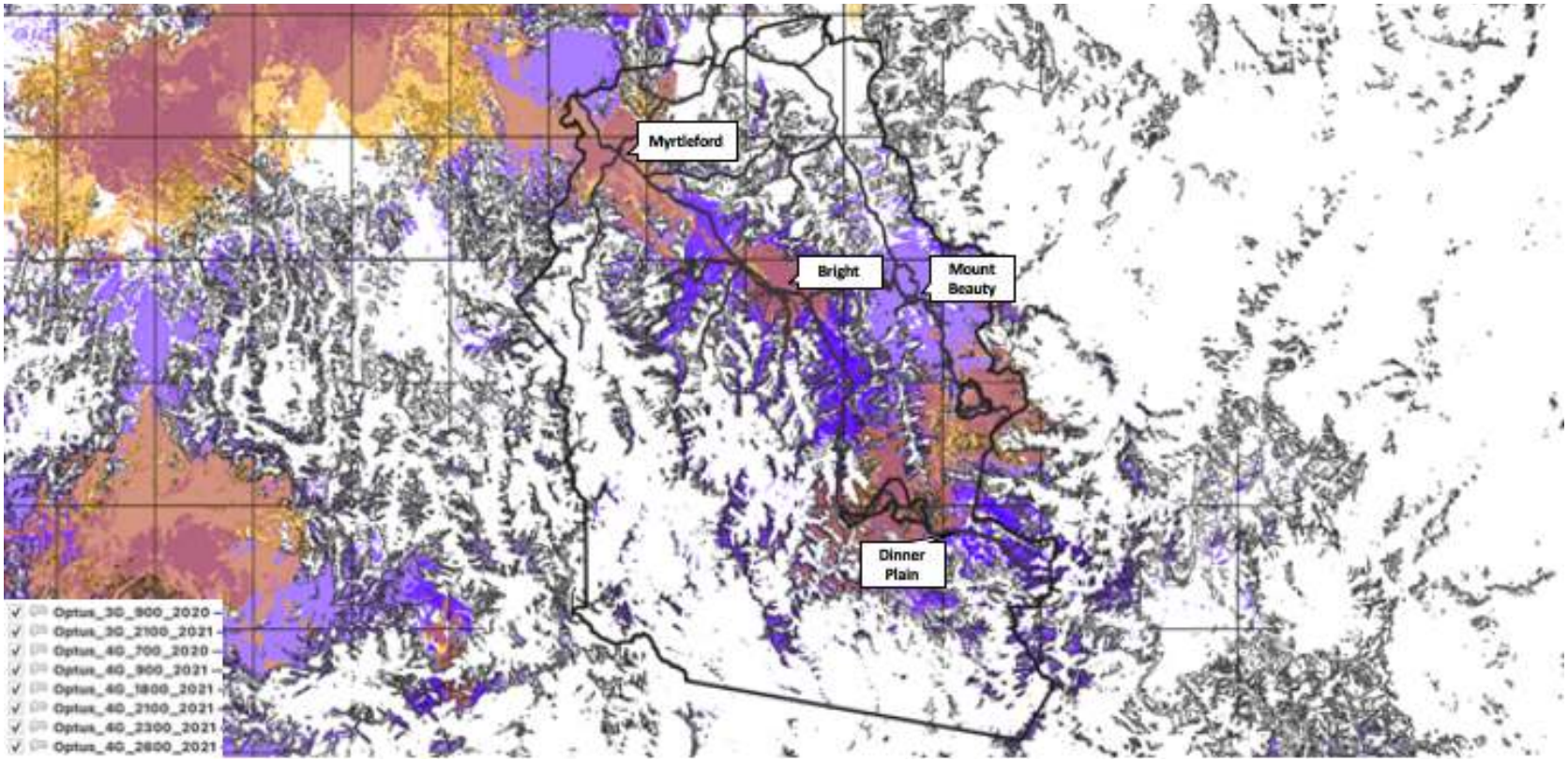
Signal	Quality	Description
>= -80dbm	Excellent	Strong signal enabling maximum data capacity
>= -90dbm	Good	Good signal and speeds with no dropouts expected
>= -110dbm	Fair	Fair/usable signal with possibility of dropouts and slowdowns
>= -120dbm	No / Poor / Unusable	No usable signal - expect frequent disconnections and sluggish performance

Summary of total mobile testing vs published 4G and 3G coverage

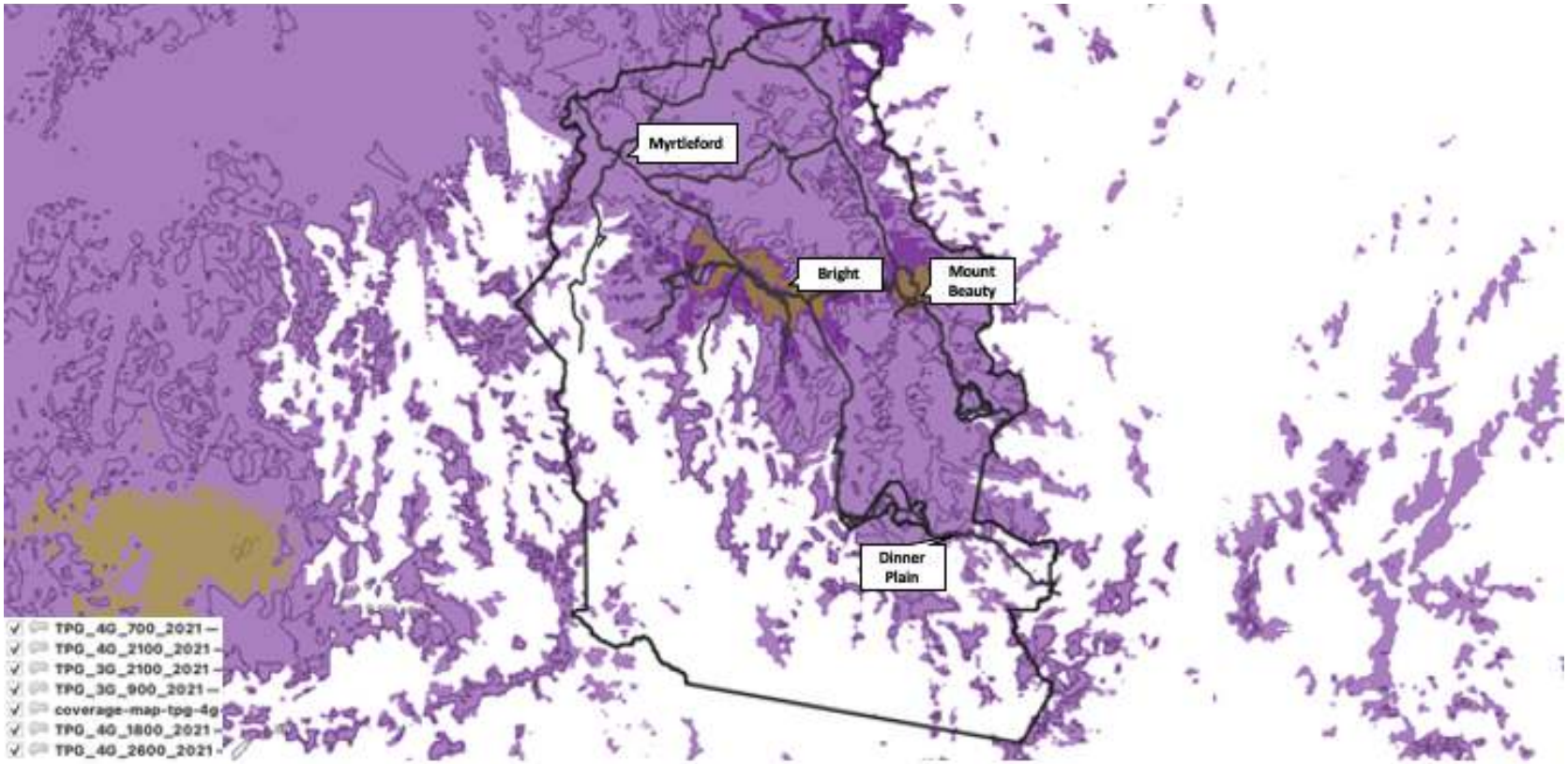
Telstra (with white areas representing no coverage)



Optus (with white areas representing no coverage)

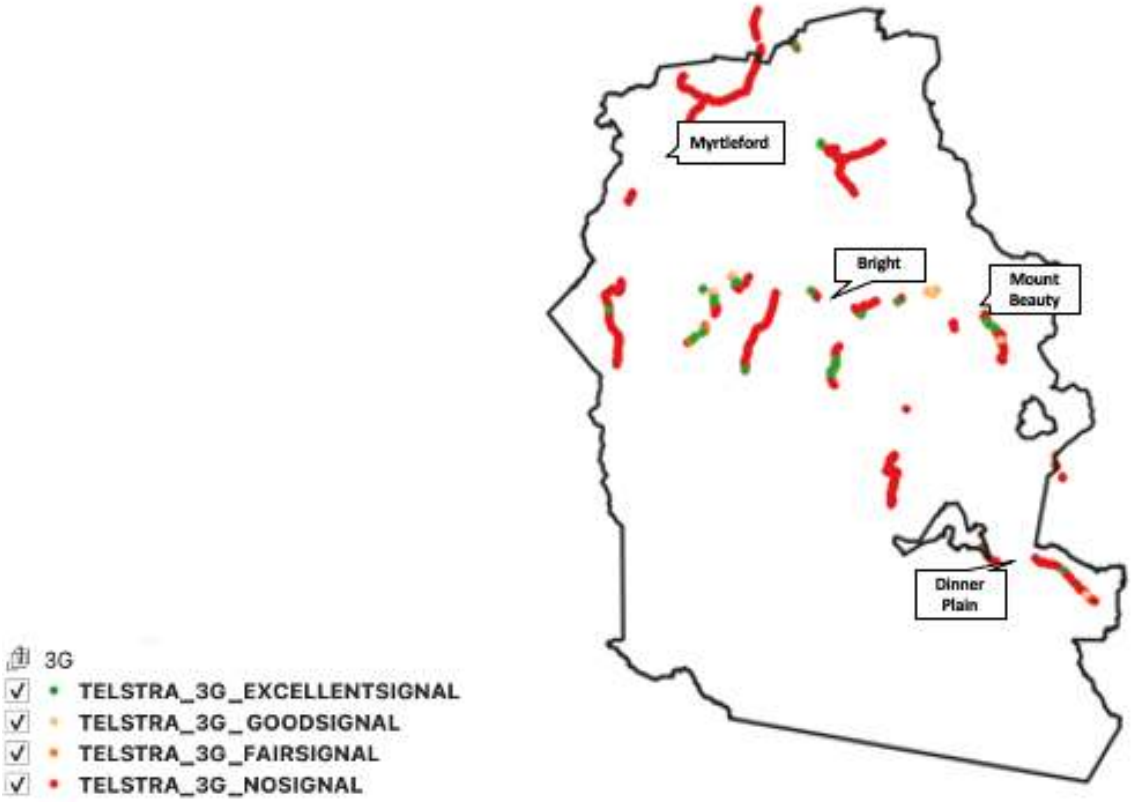


Vodafone / TPG Telecom (with white areas representing no coverage)

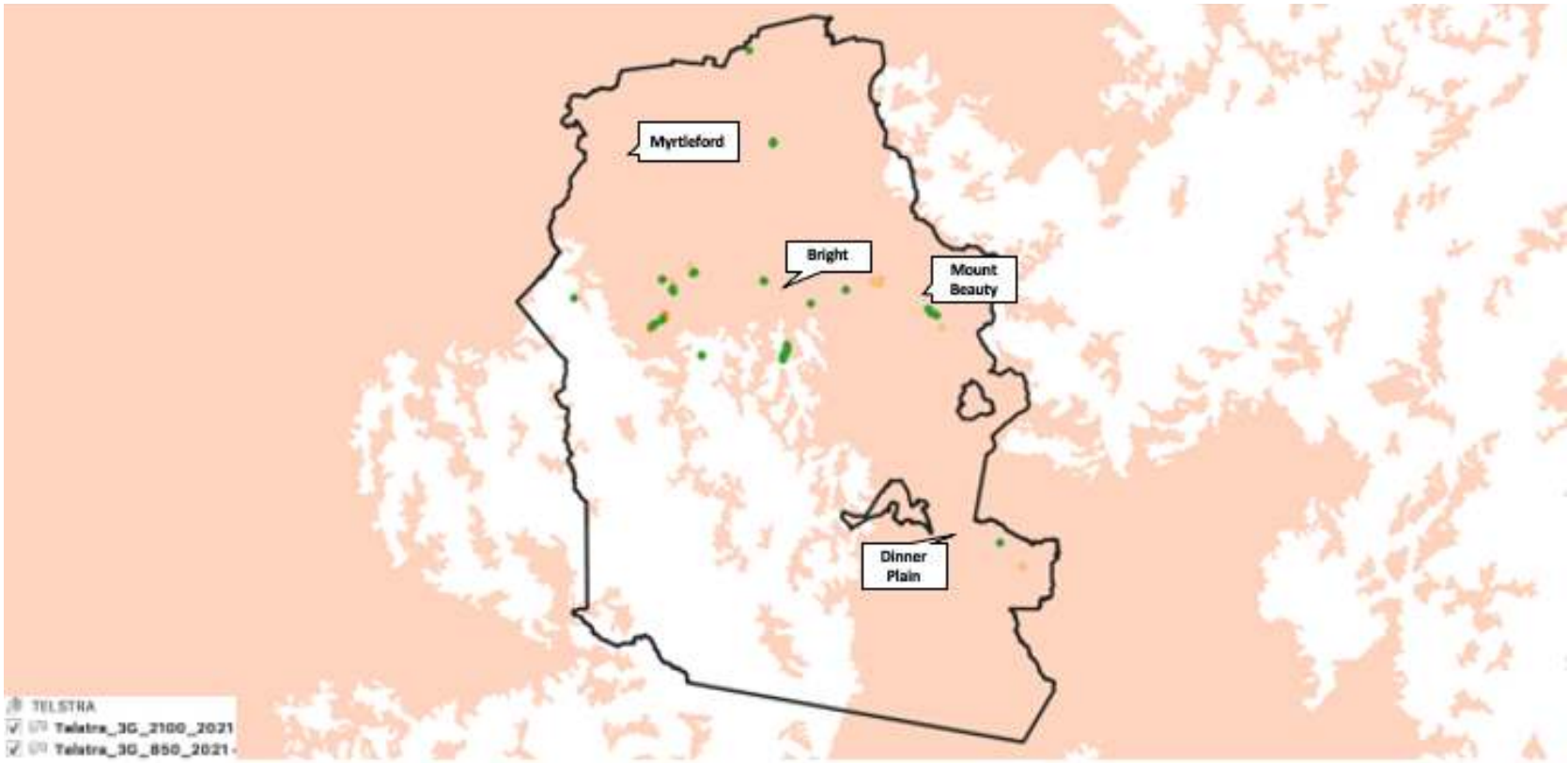


Summary of 3G mobile coverage

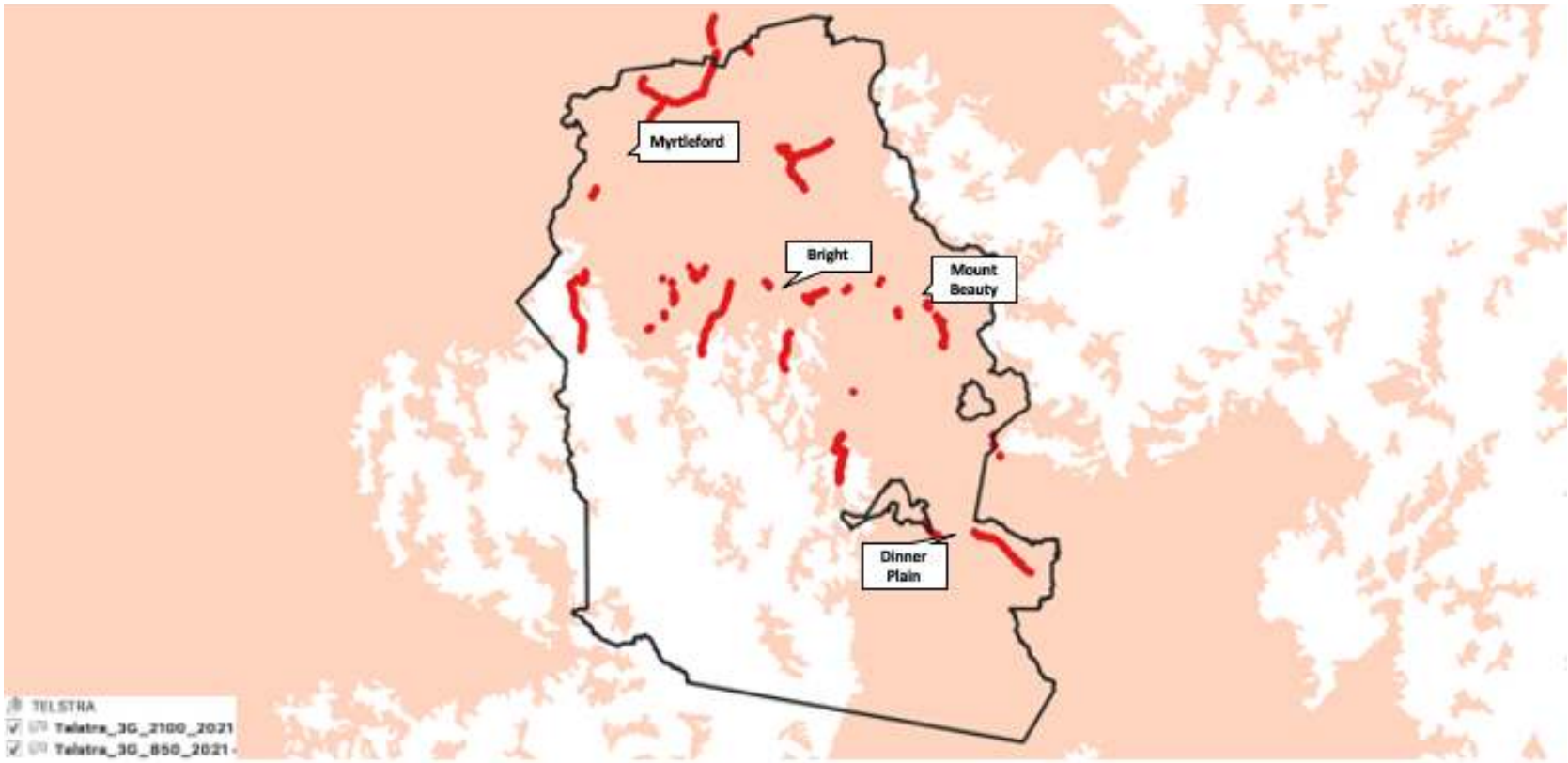
Telstra 3G Signal collected



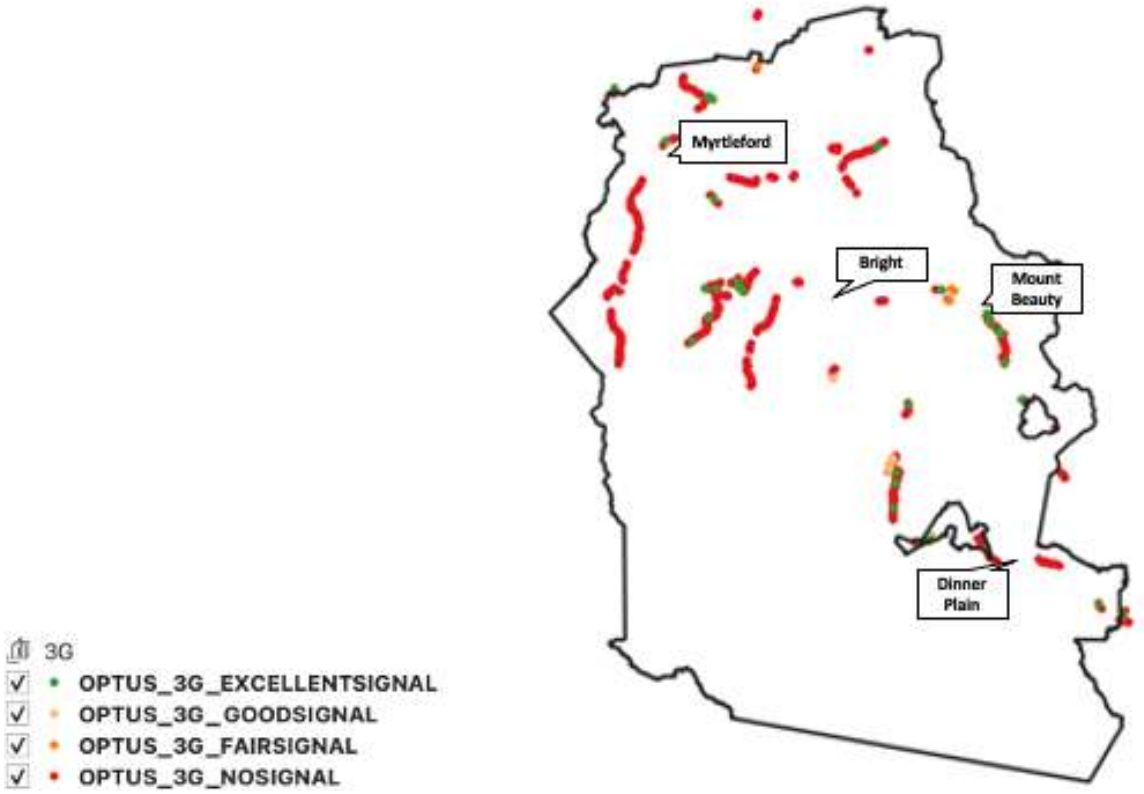
Telstra 3G Excellent, Good & Fair Signal vs 3G coverage map



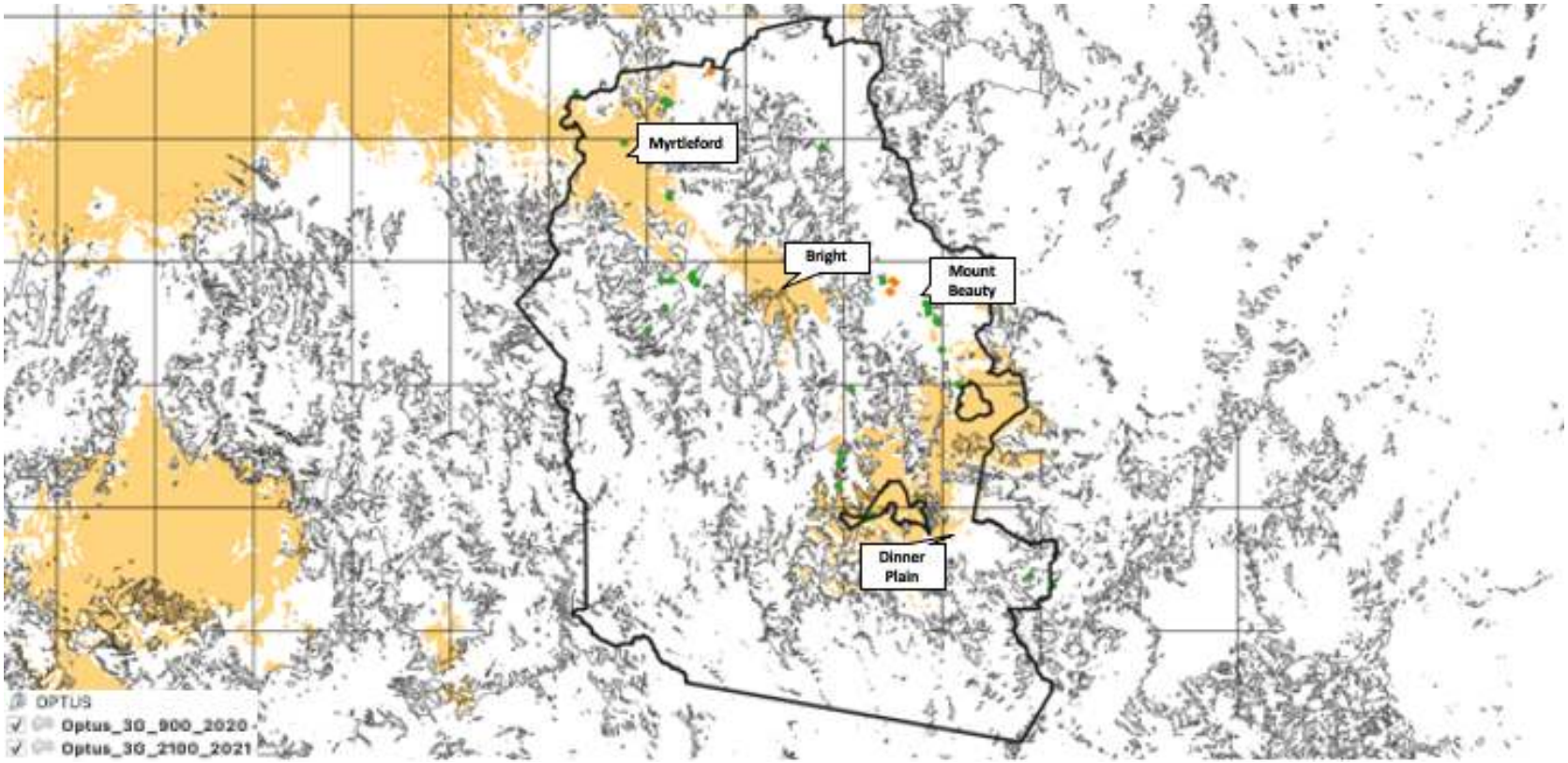
Telstra 3G Poor & No Signal vs 3G coverage map



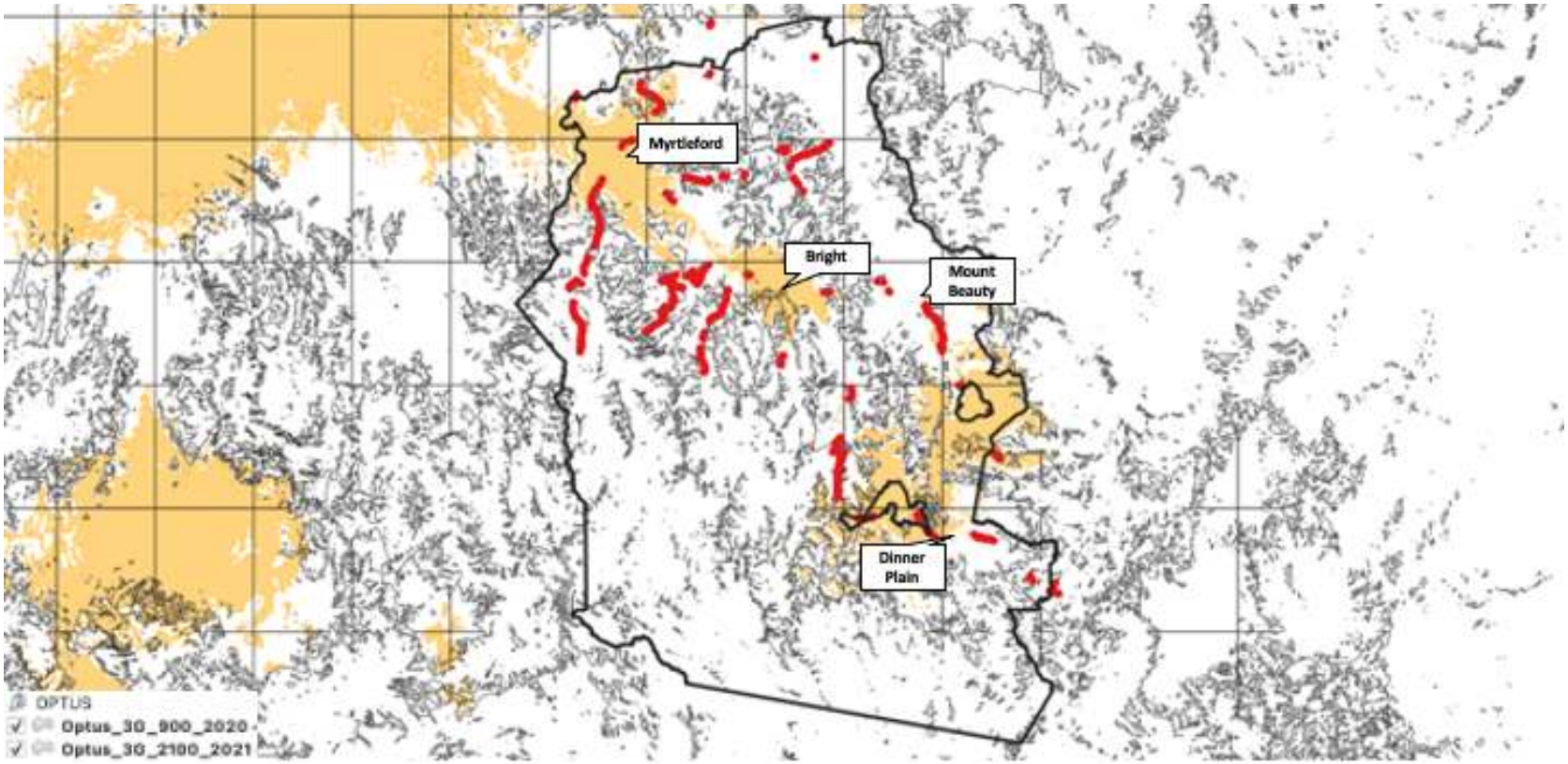
Optus 3G Signal collected



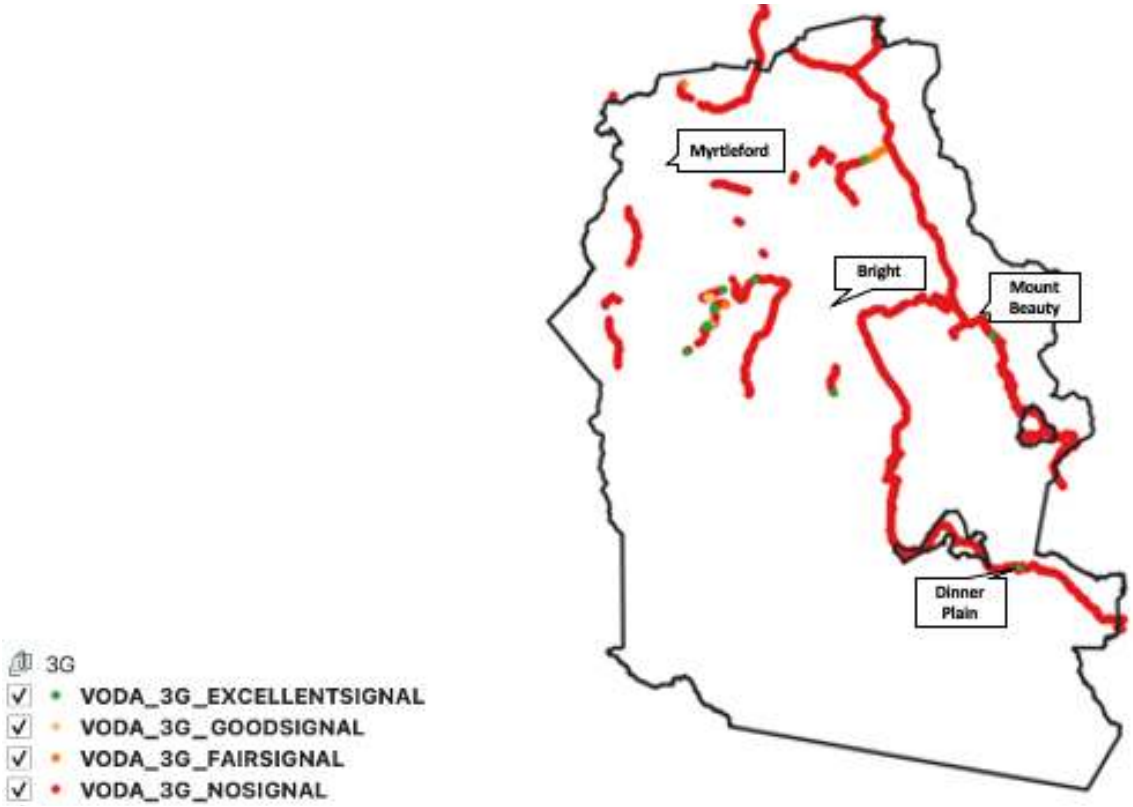
Optus 3G Excellent, Good & Fair Signal vs 3G coverage map



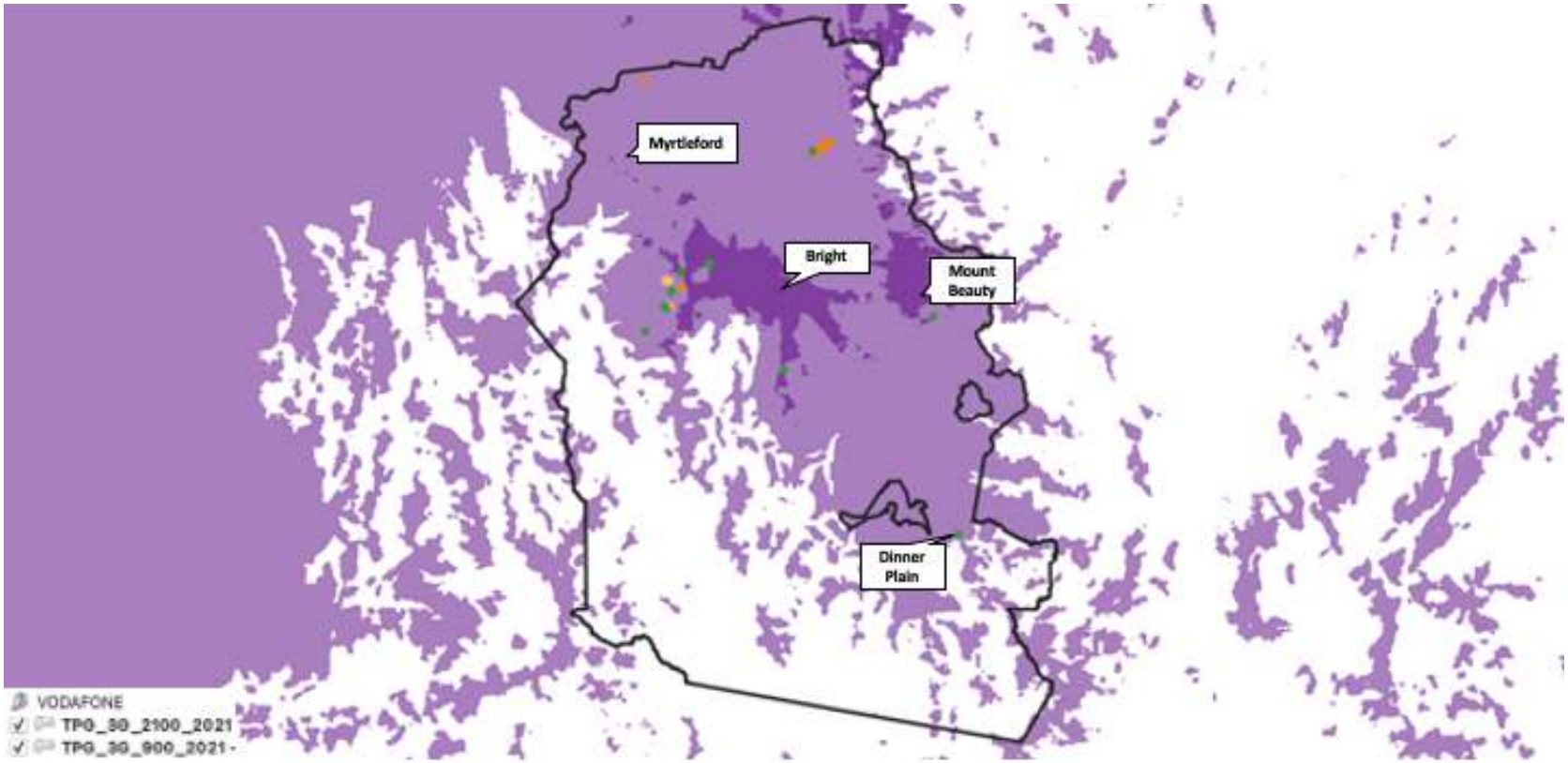
Optus 3G Poor & No Signal vs 3G coverage map



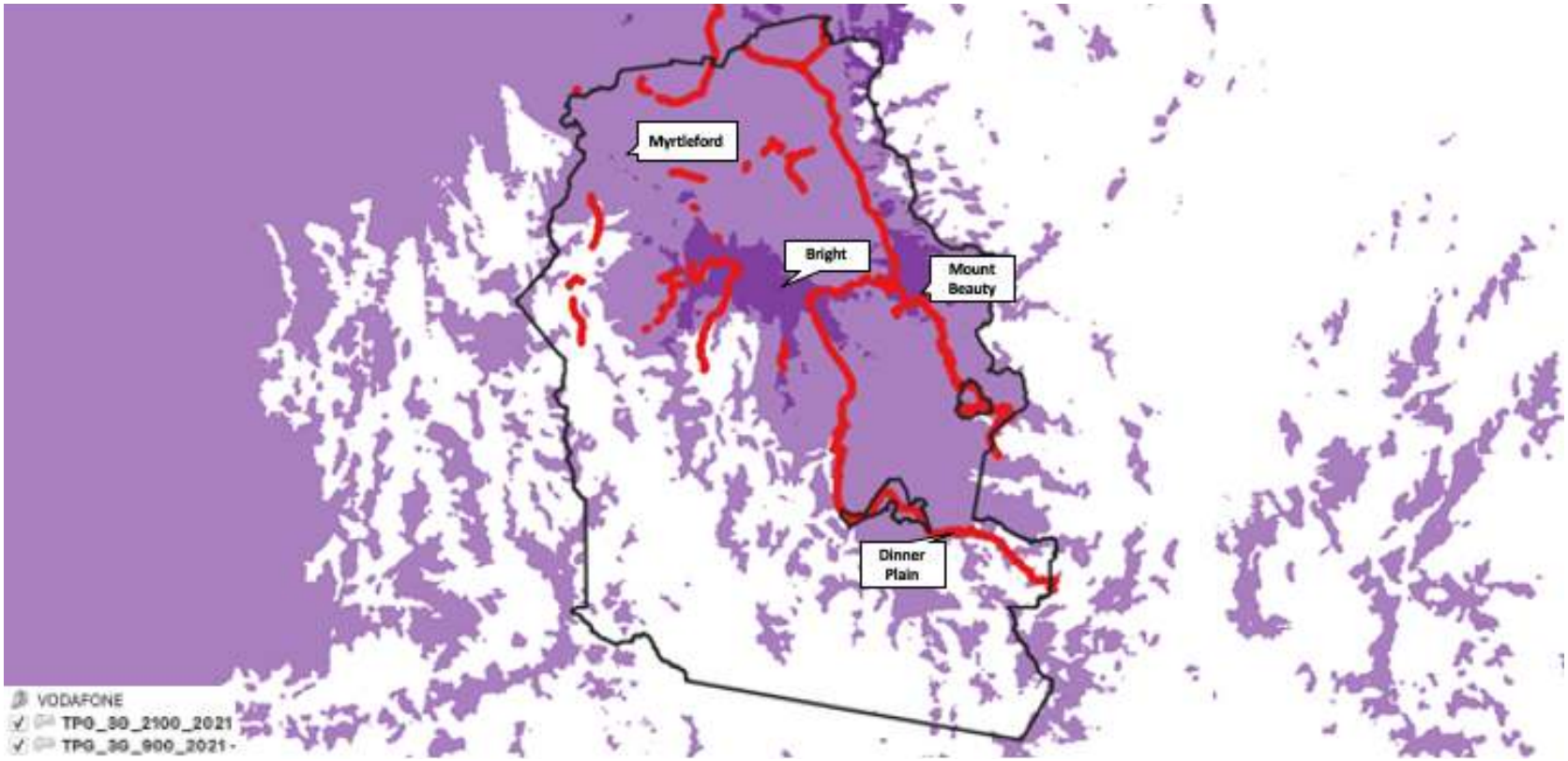
Vodafone / TPG Telecom 3G Signal collected



Vodafone / TPG Telecom 3G Excellent, Good & Fair Signal vs 3G coverage map

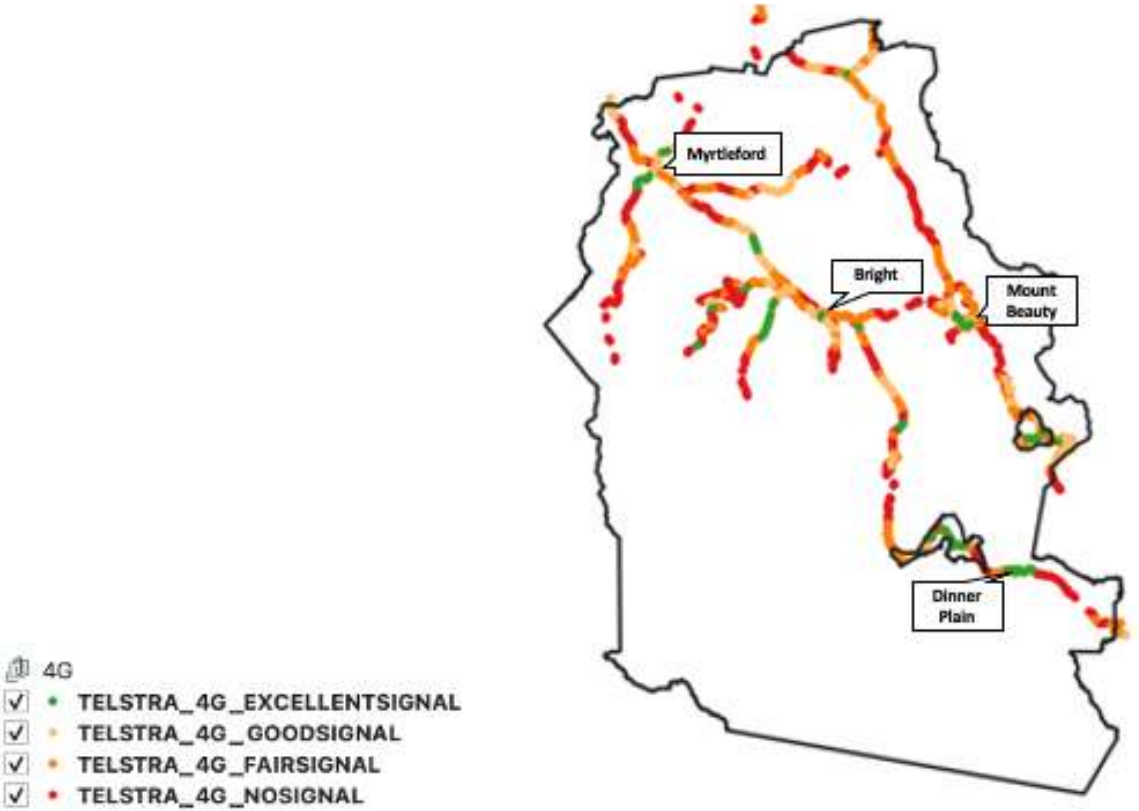


Vodafone / TPG Telecom 3G Poor & No Signal vs 3G coverage map

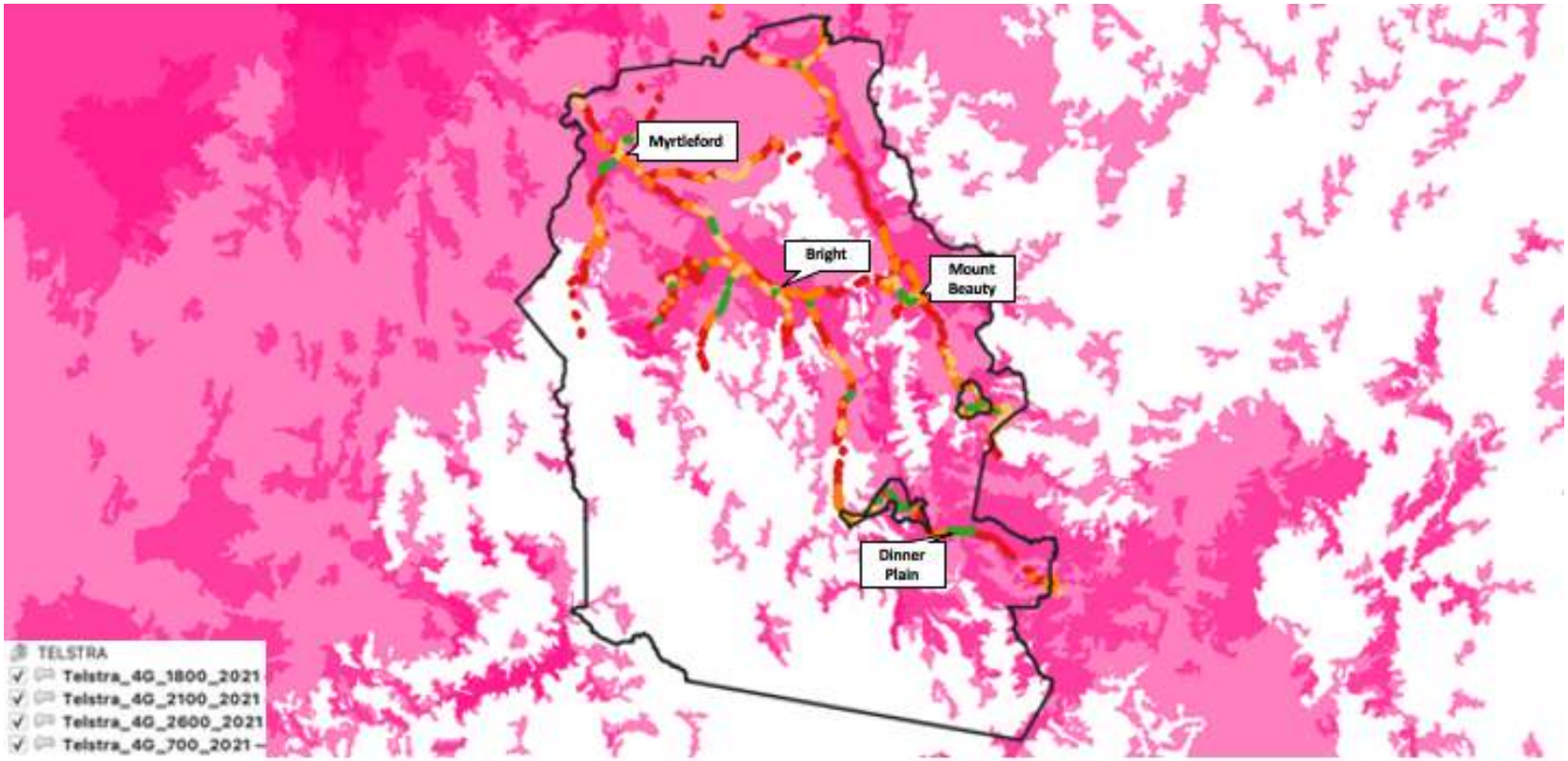


Summary of 4G mobile coverage

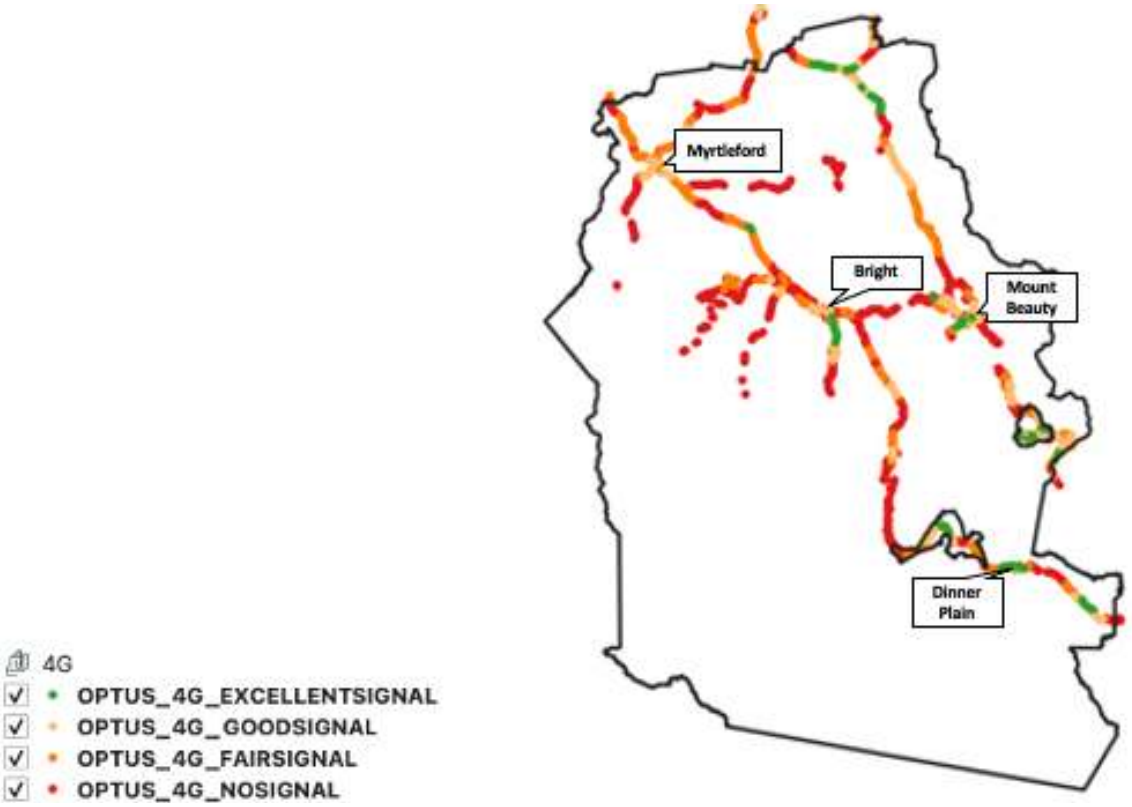
Telstra 4G Signal collected



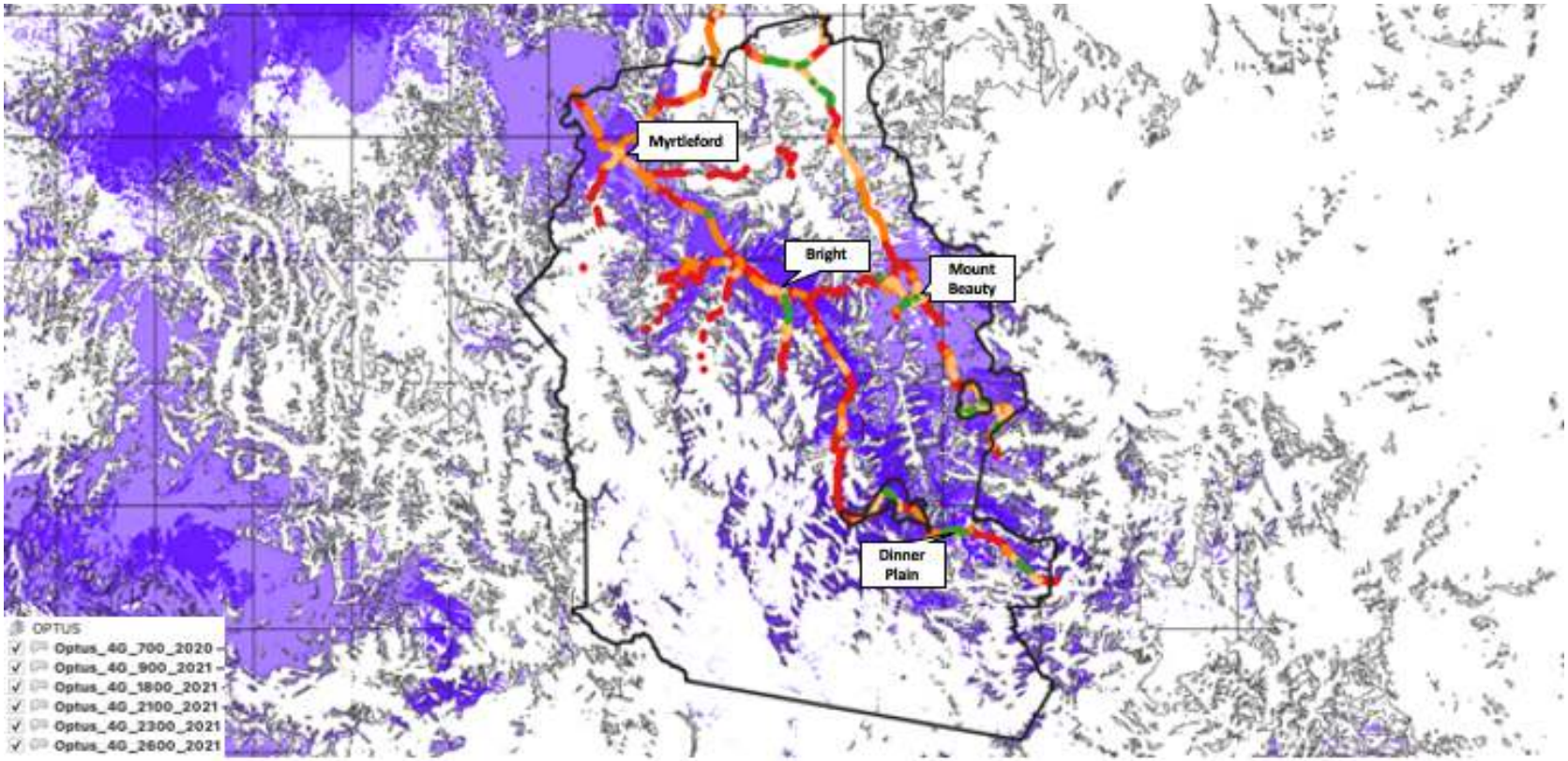
Telstra 4G Excellent, Good, Fair & Poor / No Signal vs 4G coverage map



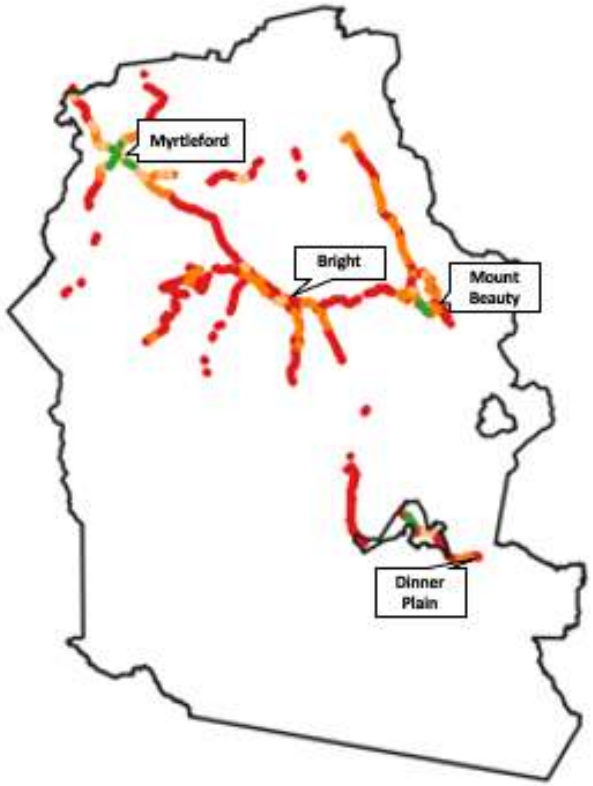
Optus 4G Signal collected



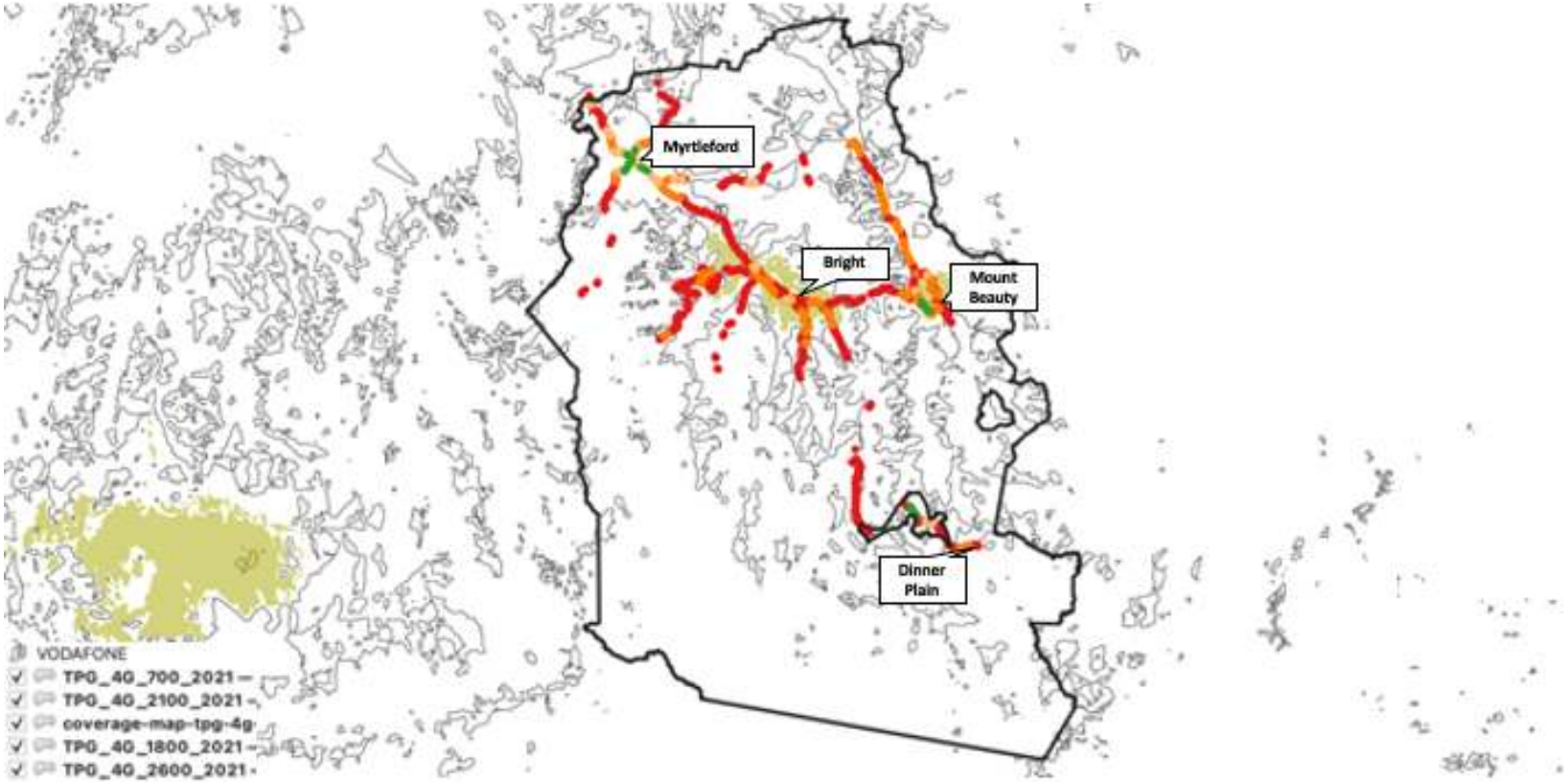
Optus 4G Excellent, Good, Fair & Poor / No Signal vs 4G coverage map



Vodafone / TPG Telecom 4G Signal collected



Vodafone / TPG Telecom 4G Excellent, Good, Fair & Poor / No Signal vs 4G coverage map



5. Mobile Network Technical Analysis

Overview

Telecommunications services are vital during emergencies to keep communities safe, connected and informed. They are also crucial in coordinating response efforts to get timely information to emergency personnel during natural disasters. However, no communications network is 100 per cent resilient to natural disasters.

The ability of agencies and citizens to respond to, and recover from, extreme weather events and other disasters is particularly reliant on the telecommunication and communications networks

For example, Mobile telecommunications services are used to provide early warning information to communities at risk of natural disasters and are essential in relief operations, for members of the community to communicate with each other and for Emergency Service Organisations to perform their duties effectively.

Assets across the sector are susceptible to physical damage from natural disasters as well as inoperability through power loss.

Physical damage

Mobile Network Operator's (MNO) physical assets such as exchange buildings, cables, towers, microwave dishes and mobile sites are all susceptible to physical damage from natural disasters, especially in the more remote regions of Australia.

Generally, underground cables are more resilient in the face of natural disasters. By way of example, despite the severe heat experienced in the Victorian Black Saturday bushfires the vast majority of the network withstood the intensity of the fires. There was some, limited damage to a number of optical fibre pits.

Aerial cabling is also particularly vulnerable in cyclones and high winds and in flood situations poles may be washed away, leading to aerial cabling across creeks and rivers being severed.

Power loss

Key elements of each MNO's networks rely on a continuous supply of power. These include exchanges and mobile base stations. If the power supply is disrupted, functionality may be lost to that equipment, and to the services supported by that equipment.

Fibre optic networks are no exception and require power to be available at both the switch and the customer ends of the network to remain operative. Each customer premises will require as a minimum the restoration of their domestic power for their service to be restored.

This is different to the previous Telstra copper network design where a loss of power at the customer's premises will not ordinarily impact services at the premise (unless a cordless phone is used).

Network hardening

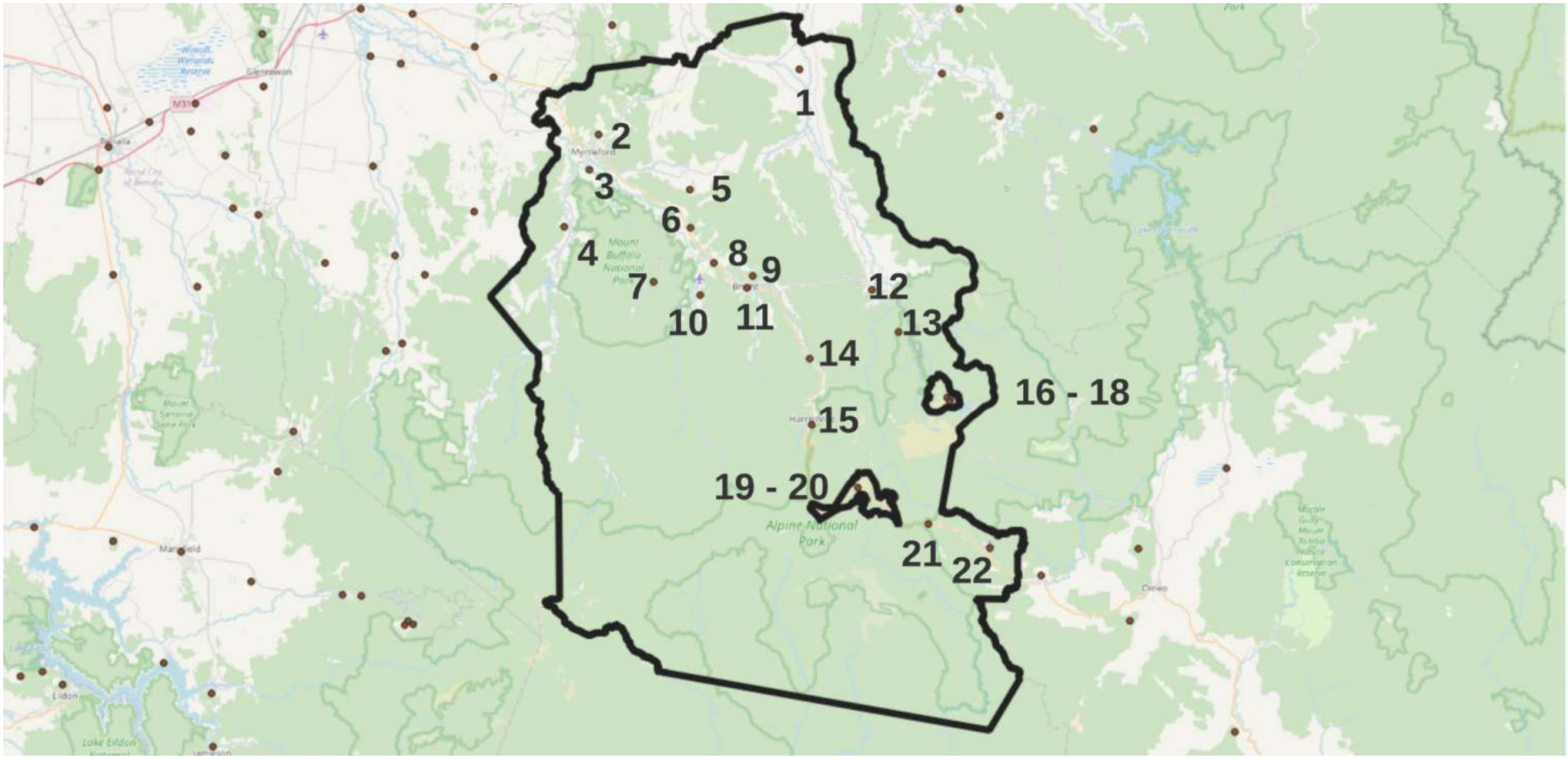
Network hardening measures at high priority locations can prevent telecommunications outages during disaster events, including:

- Improved backup power and other infrastructure hardening measures, such as improved facility design at key telecommunications facilities (such as mobile base station feeder sites and exchanges)
- Backhaul transmission redundancy.

We have presented our technical assessment of the Telstra, Optus and TPG Telecom mobile networks in Alpine Shire over the following pages.

Telstra – Mobile Tower Site Locations

The map below shows the current Telstra Mobile Network Site locations in the Alpine Shire Council area and are described in further detail below.



Telstra – Mobile Tower Site Details

Site Number		IoT 700 MHz	3G WCDMA 850 MHz	3G WCDMA 2100 MHz	4G LTE 700 MHz	4G LTE 1800 MHz	4G LTE 2100 MHz	4G LTE 2600 MHz	5G NR 2600 MHz	5G NR 3600 MHz
1	Telstra Site off Crosthwaite Lane DEDERANG https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=300473	☑	☑		☑					
2	Telstra RBS Site Adj 39 Briggs L https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9011065	☑	☑		☑	☑				
3	CMTS Site off Clemans Lane MYRTLEFORD https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=301318	☑			☑					
4	Telstra Site 109 McLees Road Buffalo River https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=10007418	☑	☑		☑					
5	Telstra Site 182 Havilah Road Rosewhite https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=10005017	☑	☑		☑					
6	Telstra RBS Site 6261 Great Alpine Rd Eurobin https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9010785	☑	☑		☑					
7	Telstra Radio Terminal Mt Buffalo Chalet MT BUFFALO https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=36659	☑	☑		☑					
8	Telstra Exchange 2A Seamer St Porepunkah https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=10012578	☑			☑					
9	Telstra Site Apex Lookout Off Mount Porepunkah Road 1.5 km NE of BRIGHT https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11994	☑	☑		☑	☑				
10	Telstra Site, 457 Buckland Valley Road Buckland https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=10017940	☑	☑		☑					
11	Telstra Exchange Cobden Street BRIGHT https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=304422	☑			☑					

Site Number		IoT 700 MHz	3G WCDMA 850 MHz	3G WCDMA 2100 MHz	4G LTE 700 MHz	4G LTE 1800 MHz	4G LTE 2100 MHz	4G LTE 2600 MHz	5G NR 2600 MHz	5G NR 3600 MHz
12	Telstra Tower MOUNT BEAUTY Tawonga South https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11958		☑			☑				
13	Telstra CMTS Site BIG HILL https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11959	☑	☑		☑					
14	Telstra Site Lot 77 Brookes Lane (Smoko Creek Rd) SMOKO https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=304268	☑	☑		☑					
15	Telstra Site Alpine Rd Ovens Water Tank HARRIETVILLE https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=301322	☑	☑		☑					
16	Telstra Exchange Mount Beauty to Falls Creek Road FALLS CREEK https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=37445		☑							
17	Telstra Site Nissen Hut 1 Village Bowl Falls Creek https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9001889	☑	☑		☑	☑				
18	Ski Patrol Buildings Falls Creek https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=55649	☑	☑		☑					
19	Telstra Site off Alpine Road MT HOTHAM https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11997	☑	☑		☑	☑				
20	Big D Chr Alpine Rd Hotham Heights https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=43361	☑	☑		☑	☑				
21	Telstra Site Dinner Plain https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=36359	☑	☑		☑					
22	Telstra Site Great Alpine Rd Dinner Plain https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9001993		☑							
New Site	Telstra Site, 10 Stony Creek Road Harrietville https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=10025578	☑			☑					

Site Number		IoT 700 MHz	3G WCDMA 850 MHz	3G WCDMA 2100 MHz	4G LTE 700 MHz	4G LTE 1800 MHz	4G LTE 2100 MHz	4G LTE 2600 MHz	5G NR 2600 MHz	5G NR 3600 MHz
New Site	Telstra Radio Terminal Bright-Tawonga Rd GERMANTOWN https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11995	☑			☑					

Telstra uses a range of radiofrequency spectrum bands for the purpose of providing mobile services. We have provided a detailed Spectrum overview earlier in this Strategy.

In relation to 3G network provision, most Telstra Network Tower sites provide 850MHz 3G spectrum. From our analysis there is no mid band spectrum 3G provision (i.e. 2100MHz) in Alpine Shire.

In relation to 4G network provision, most Telstra Network Tower sites provide 700MHz 4G spectrum. There is provision of some mid band 4G spectrum through 1800MHz.

In relation to 5G network provision, there are no current Telstra Network Tower sites providing 5G connectivity

Based on this assessment, it is recommended that Council advocate for Telstra to

- **provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**
- **provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**

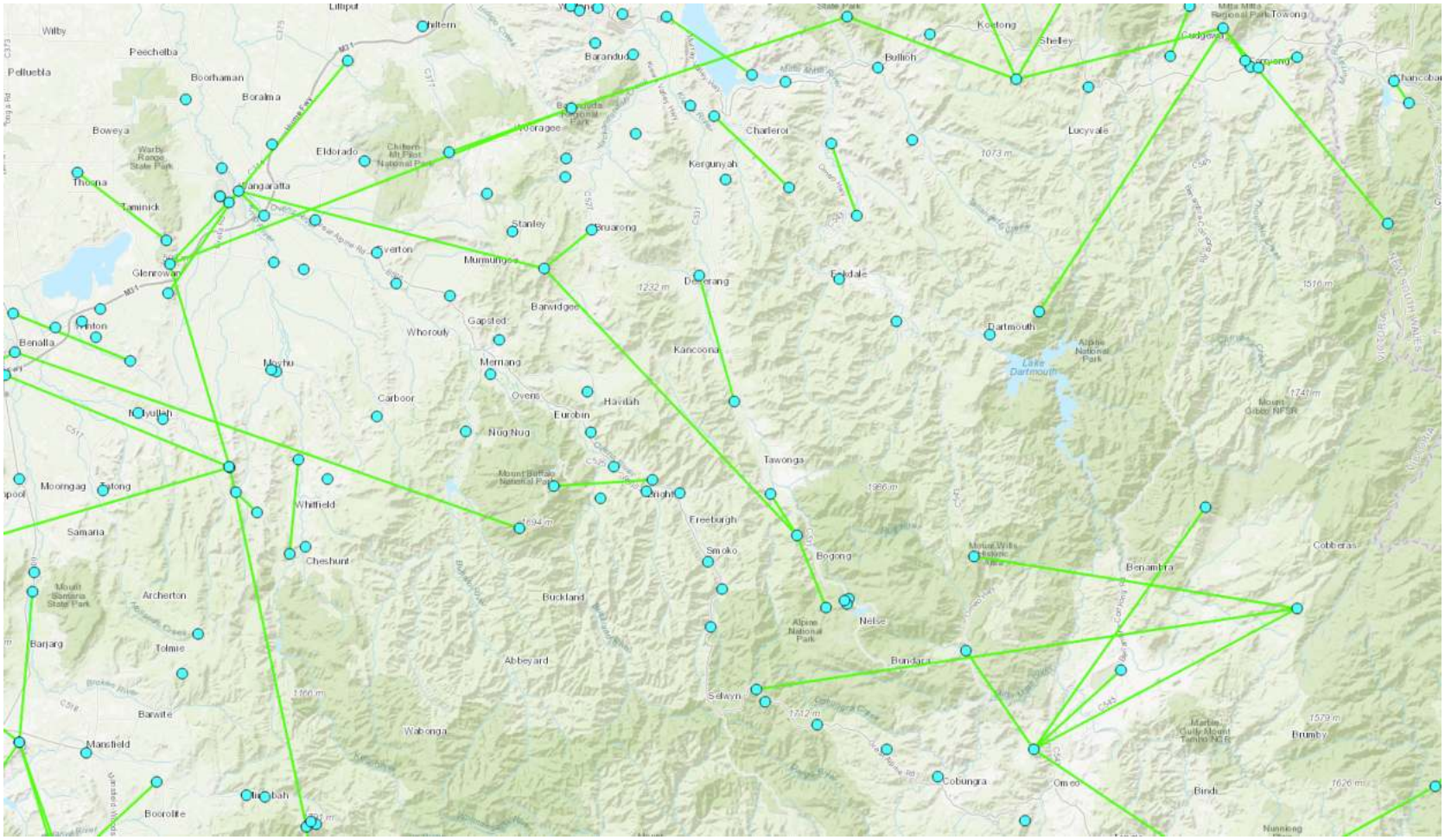
Telstra – Interconnected Mobile Tower Sites

A number of Telstra Mobile Network sites are provided high bandwidth microwave transmission (or backhaul) from another Telstra Mobile Network sites in place of fibre optic transmission. Based on our analysis of ACMA data these sites are listed below –

Site	Parent Site	Grandparent Site
Telstra CMTS Site BIG HILL https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11959	Comms Tower SP Ausnet Site Mt Stanley off Mt Stanley Rd STANLEY VIC 3737 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=12003	Telstra Exchange WANGARATTA VIC 3677 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11934
Southern Hydro site MT MCKAY VIC 3699 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11961	Telstra CMTS Site BIG HILL https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11959	
Telstra Tower TAWONGA SOUTH VIC 3699 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11958	Telstra CMTS Site BIG HILL https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11959	
Telstra Site off Crosthwaite Lane DEDERANG VIC 3691 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=300473	Telstra Exchange CORAL BANK VIC 3691 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=37446	
Telstra Radio Terminal Mt Buffalo Chalet MT BUFFALO VIC 3740 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=36659	Telstra Site Apex Lookout Off Mount Porepunkah Road 1.5 km NE of BRIGHT VIC 3741 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11994	
Mount Buffalo Road THE HORN VIC 3740 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=302549	Telstra Exchange 72-78 Arundel Street BENALLA VIC 3672 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11923	

Based on this assessment, it is recommended that Council advocate for Telstra to

- **prioritise resiliency upgrades to each of these sites including Improved backup power and other infrastructure hardening measures, such as improved facility design at key telecommunications facilities (such as mobile base station feeder sites and exchanges) and backhaul transmission redundancy.**



Map showing wirelessly interconnected Telstra Tower sites.

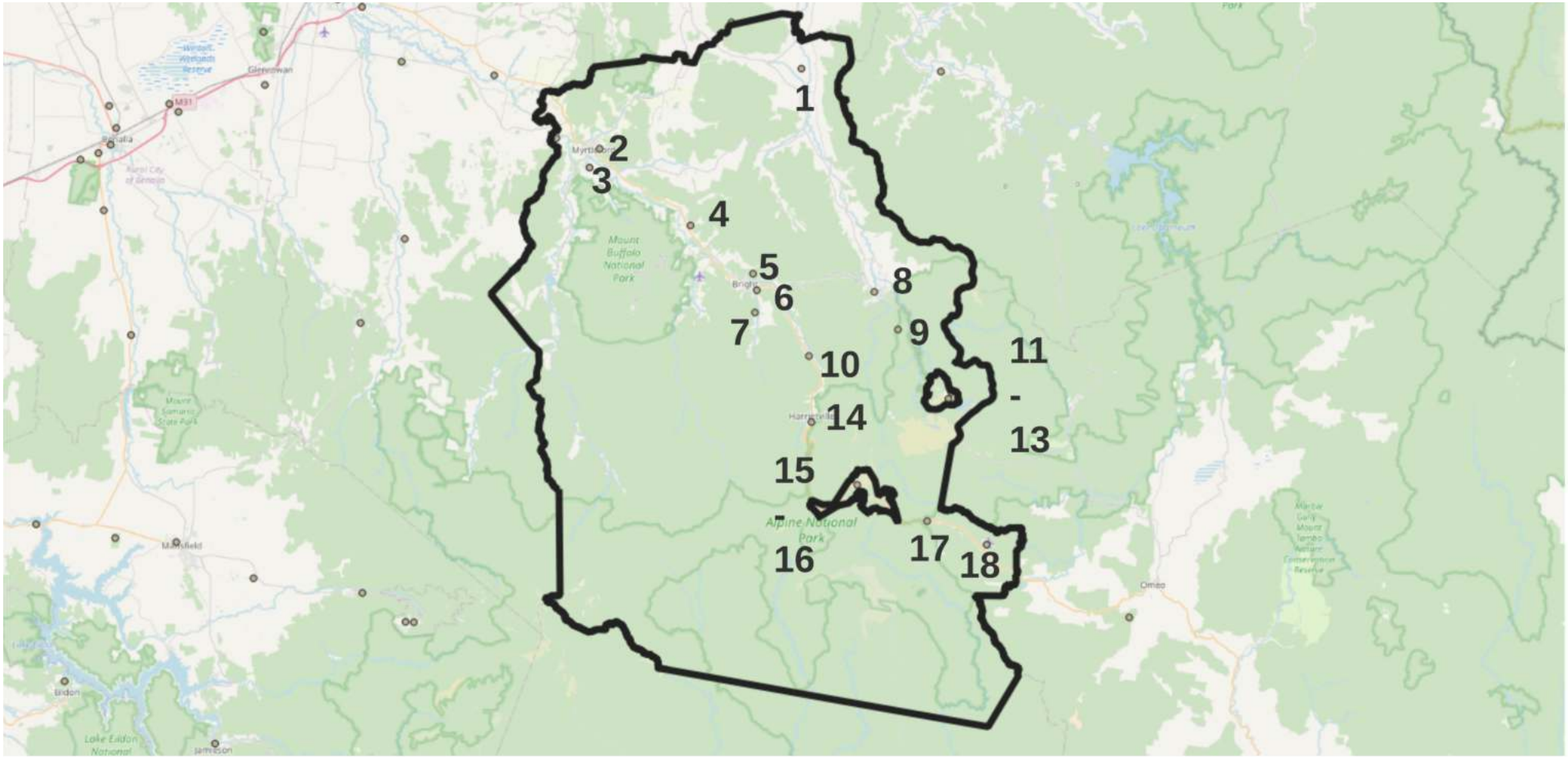
Telstra Mobile Tower Sites – High level Resiliency Assessment for Priority Sites

We have assessed the likely resiliency remedies for the highest and medium priority mobile tower sites in Alpine Shire, presented below.

Site Number		12 hour Backup Power upgrade	Provide redundant backhaul	Flood elevation	Emergency Power solution	Protection Zone from Natural Disaster	Priority
1	Telstra Site off Crosthwaite Lane DEDERANG https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=300473	☑	☑		☑	☑	**High**
2	Telstra RBS Site Adj 39 Briggs L https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9011065	☑	☑		☑	☑	**Medium**
7	Telstra Radio Terminal Mt Buffalo Chalet MT BUFFALO https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=36659	☑	☑		☑	☑	**High**
9	Telstra Site Apex Lookout Off Mount Porepunkah Road 1.5 km NE of BRIGHT https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11994	☑	☑		☑	☑	**High**
12	Telstra Tower MOUNT BEAUTY Tawonga South https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11958	☑	☑		☑	☑	**Medium**
13	Telstra CMTS Site BIG HILL https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11959	☑	☑		☑	☑	**High**
15	Telstra Site Alpine Rd Ovens Water Tank HARRIETVILLE https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=301322	☑	☑		☑	☑	**Medium**

Optus– Mobile Tower Site Locations

The map below shows the current Optus Mobile Network Site locations in the Alpine Shire Council area and are described in further detail below.



Optus – Mobile Tower Sites Details

Site Number		IoT 700 MHz	3G WCDMA 850 MHz	3G WCDMA 2100 MHz	4G LTE 700 MHz	4G LTE 1800 MHz	4G LTE 2100 MHz	4G LTE 2600 MHz	5G NR 2600 MHz	5G NR 3600 MHz
1	Optus Monopole Crosthwaite La https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9001511	☑	☑		☑					
2	SPI Tower 159 Merriang Gap Road GAPSTED https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=305388	☑	☑	☑	☑	☑		☑		
3	Lookout Hill Lookout Road Myrtleford https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=41099	☑	☑		☑	☑				
4	CMTS Site off Clemans Lane MYRTLEFORD https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=301318	☑	☑		☑					
5	Optus Site Eurobin Westons Lane EUROBIN https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135803	☑	☑	☑	☑	☑		☑		
6	Optus Site Bright Apex Lookout BRIGHT https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135501	☑	☑		☑	☑				
7	Bright West 63B CHURCHILL AVENUE Bright https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=10014067	☑	☑		☑					
8	NBN Co Site 42 White Star Road Wandiligong https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9022814	☑	☑		☑					
9	Optus Site 233 Kiewa Valley Hwy MOUNT BEAUTY https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=303507	☑	☑		☑					

10	Optus Site Bogong Mt Big Hill off Mt Bogong Tourist Rd BOGONG https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=134551	☑	☑		☑	☑				
11	Telstra Site Lot 77 Brookes Lane (Smoko Creek Rd) SMOKO https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=304268	☑	☑		☑	☑	☑	☑		
12	Optus Site Falls Creek Bogong High Plains Rd FALLS CREEK https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135571	☑	☑	☑	☑	☑		☑		
13	Optus Monopole Adj Ski Patrol Building https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9012710	☑	☑	☑	☑	☑		☑		
14	Telstra Exchange Mount Beauty to Falls Creek Road FALLS CREEK https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=37445				☑					
15	Optus Site Fire Watch Tower Mount Hotham https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=47525				☑					
16	Optus Site Mt Hotham Mt Hotham Summit HOTHAM HEIGHTS https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135125	☑	☑	☑	☑	☑	☑	☑		
17	Fire Station Big Muster Drv DINNER PLAIN https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=302658	☑	☑		☑			☑		
18	Mt Hotham Airport Cobungra https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=10010177	☑	☑		☑	☑	☑			

Optus uses a range of radiofrequency spectrum bands for the purpose of providing mobile services. We have provided a detailed Spectrum overview earlier in this Strategy.

In relation to 3G network provision, most Optus Network Tower sites provide 850MHz 3G spectrum with some also providing mid band 3G spectrum through the 2100MHz spectrum.

In relation to 4G network provision, all Optus Network Tower sites provide 700MHz 4G spectrum. There is provision of some mid band 4G spectrum through 1800MHz, 2100MHz and 2600MHz.

In relation to 5G network provision, there are no current Optus Network Tower sites providing 5G connectivity

Based on this assessment, it is recommended that Council advocate for Optus to

- **provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**
- **provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**

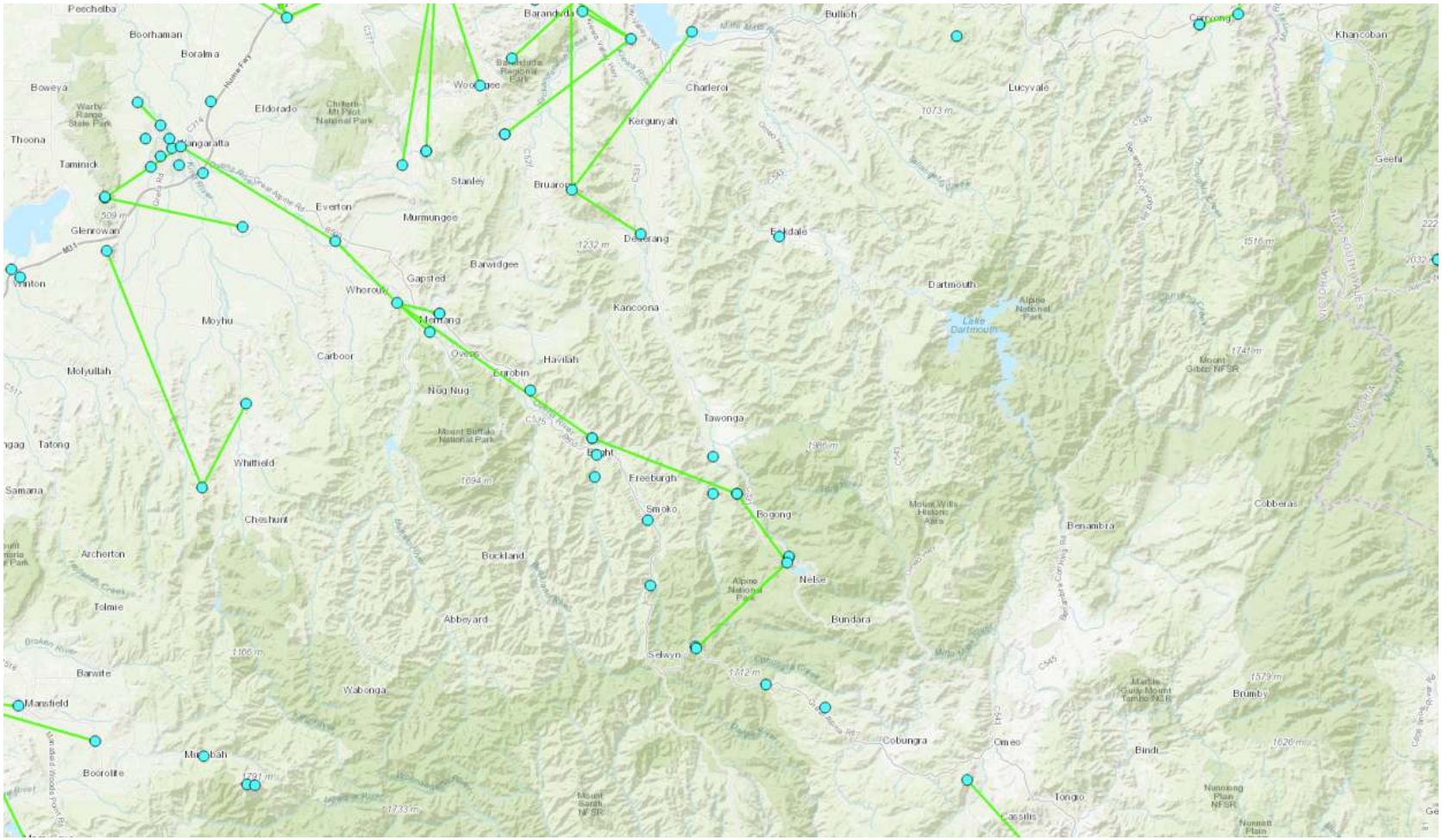
Optus – Interconnected Mobile Tower Sites

A number of Optus Mobile Network sites are provided high bandwidth microwave transmission (or backhaul) from another Optus Mobile Network sites in place of fibre optic transmission. Based on our analysis of ACMA data these sites are listed below –

Site	Parent Site	Grandparent Site
Optus Site Bogong Mt Big Hill off Mt Bogong Tourist Rd BOGONG VIC 3699 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=134551	Optus Site Bright Apex Lookout BRIGHT VIC 3741 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135501	SPI Tower 159 Merriang Gap Road GAPSTED VIC 3737 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=305388
SPI Tower 159 Merriang Gap Road GAPSTED VIC 3737 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=305388	Telstra Radio Terminal EVERTON VIC 3735 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=131761	Optus Site 11 Parfitt Rd WANGARATTA VIC 3677 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=54739
CMTS Site off Clemans Lane MYRTLEFORD VIC 3737 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=301318	SPI Tower 159 Merriang Gap Road GAPSTED VIC 3737 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=305388	
Lookout Hill Lookout Road MYRTLEFORD VIC 3737 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=41099	SPI Tower 159 Merriang Gap Road GAPSTED VIC 3737 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=305388	

Based on this assessment, it is recommended that Council advocate for Optus to

- **prioritise resiliency upgrades to each of these sites including Improved backup power and other infrastructure hardening measures, such as improved facility design at key telecommunications facilities (such as mobile base station feeder sites and exchanges) and backhaul transmission redundancy.**



Map showing wirelessly interconnected Optus Tower sites.

Optus Mobile Tower Sites – High level Resiliency Assessment for Priority Sites

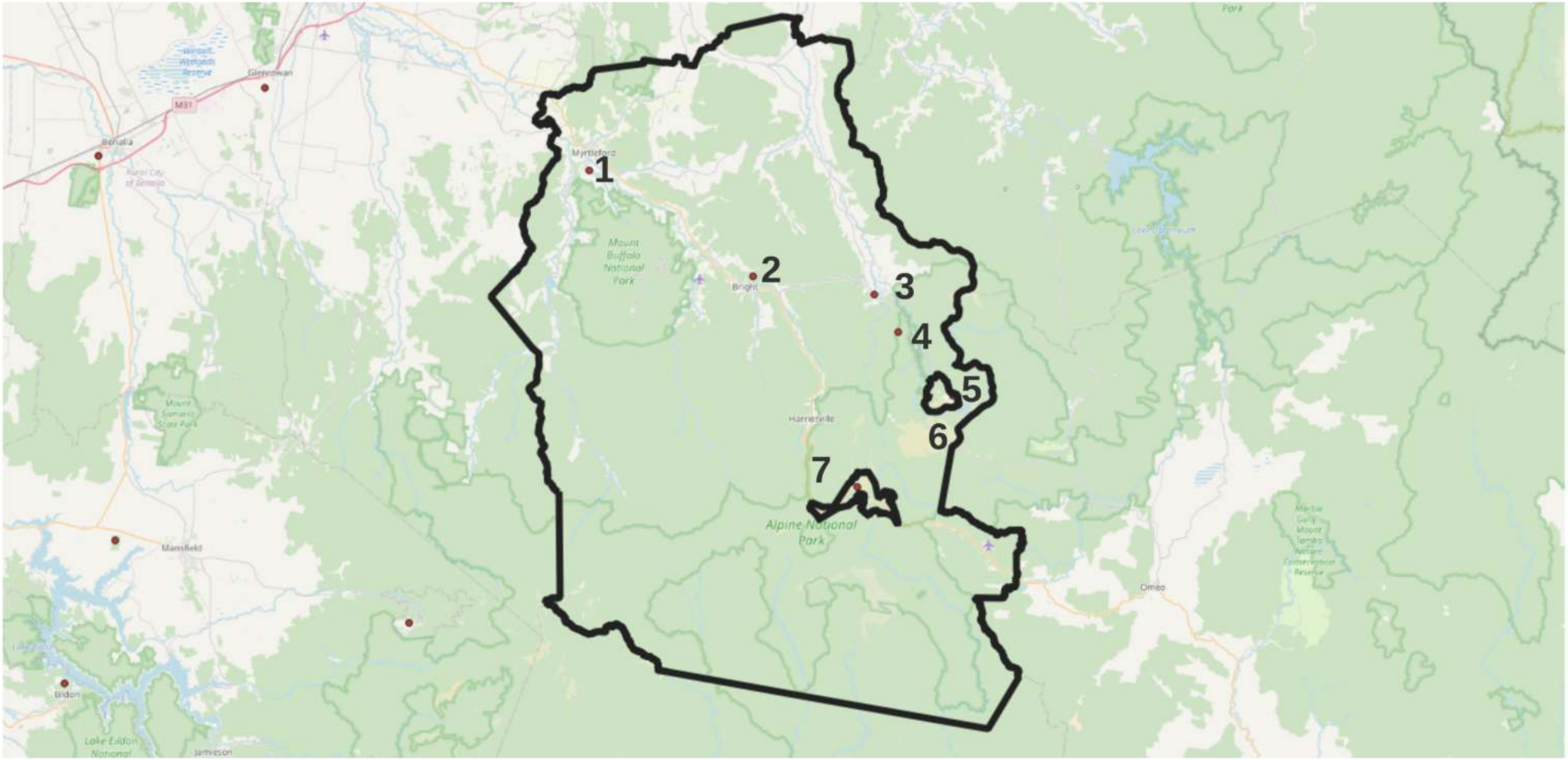
We have assessed the likely resiliency remedies for the highest and medium priority mobile tower sites in Alpine Shire, presented below.

Site Number		12 hour Backup Power upgrade	Provide redundant backhaul	Flood elevation	Emergency Power solution	Protection Zone from Natural Disaster	Priority
1	Optus Monopole Crosthwaite La https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9001511	☑	☑		☑	☑	Medium
2	SPI Tower 159 Merriang Gap Road GAPSTED https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=305388	☑	☑		☑	☑	High
3	Lookout Hill Lookout Road Myrtleford https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=41099	☑	☑		☑	☑	Medium
4	CMTS Site off Clemans Lane MYRTLEFORD https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=301318	☑	☑		☑	☑	High
5	Optus Site Eurobin Westons Lane EUROBIN https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135803	☑	☑		☑	☑	High
6	Optus Site Bright Apex Lookout BRIGHT https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135501	☑	☑		☑	☑	High
10	Optus Site Bogong Mt Big Hill off Mt Bogong Tourist Rd BOGONG https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=134551	☑	☑		☑	☑	**High**
11	Telstra Site Lot 77 Brookes Lane (Smoko Creek Rd) SMOKO https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=304268	☑	☑		☑	☑	**Medium**
12	Optus Site Falls Creek Bogong High Plains Rd FALLS CREEK https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135571	☑	☑		☑	☑	**Medium**

13	Optus Monopole Adj Ski Patrol Building https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9012710	☑	☑		☑	☑	**High**
16	Optus Site Mt Hotham Mt Hotham Summit HOTHAM HEIGHTS https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135125	☑	☑		☑	☑	**Medium**

TPG Telecom / Vodafone – Mobile Tower Site Locations

The map below shows the current TPG Telecom / Vodafone Mobile Network Site locations in the Alpine Shire Council area and are described in further detail below.



TPG Telecom / Vodafone– Mobile Tower Site Details

Site Number		IoT 900 MHz	3G WCDMA 900 MHz	3G WCDMA 2100 MHz	4G LTE 850MHz	4G LTE 1800 MHz	4G LTE 2100 MHz	4G LTE 2600 MHz	5G NR 2600 MHz	5G NR 3600 MHz
1	CMTS Site off Clemans Lane MYRTLEFORD https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=301318		☑		☑					
2	Telstra Site Apex Lookout Off Mount Porepunkah Road 1.5 km NE of BRIGHT https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11994	☑	☑	☑	☑					
3	Optus Site 233 Kiewa Valley Hwy MOUNT BEAUTY https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=303507	☑	☑	☑	☑		☑			
4	Telstra CMTS Site BIG HILL https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11959		☑		☑					
5	Vodafone Site Control Centre FALLS CREEK https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=48095		☑		☑					
6	Optus Monopole Adj Ski Patrol Building Falls Creek https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9012710		☑		☑					
7	Telstra Site off Alpine Road MT HOTHAM https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11997 n		☑		☑					

TPG Telecom / Vodafone uses a range of radiofrequency spectrum bands for the purpose of providing mobile services. We have provided a detailed Spectrum overview earlier in this Strategy.

In relation to 3G network provision, most TPG Telecom / Vodafone Network Tower sites provide 900MHz 3G spectrum with some also providing mid band 3G spectrum through the 2100MHz spectrum.

In relation to 4G network provision, all TPG Telecom / Vodafone Network Tower sites provide 850MHz 4G spectrum with little to no provision of mid band 4G spectrum through 1800MHz, 2100MHz and 2600MHz.

In relation to 5G network provision, there are no current TPG Telecom / Vodafone Network Tower sites providing 5G connectivity

Based on this assessment, it is recommended that Council advocate for TPG Telecom / Vodafone to

- **provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**
- **provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 1800MHz, 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**

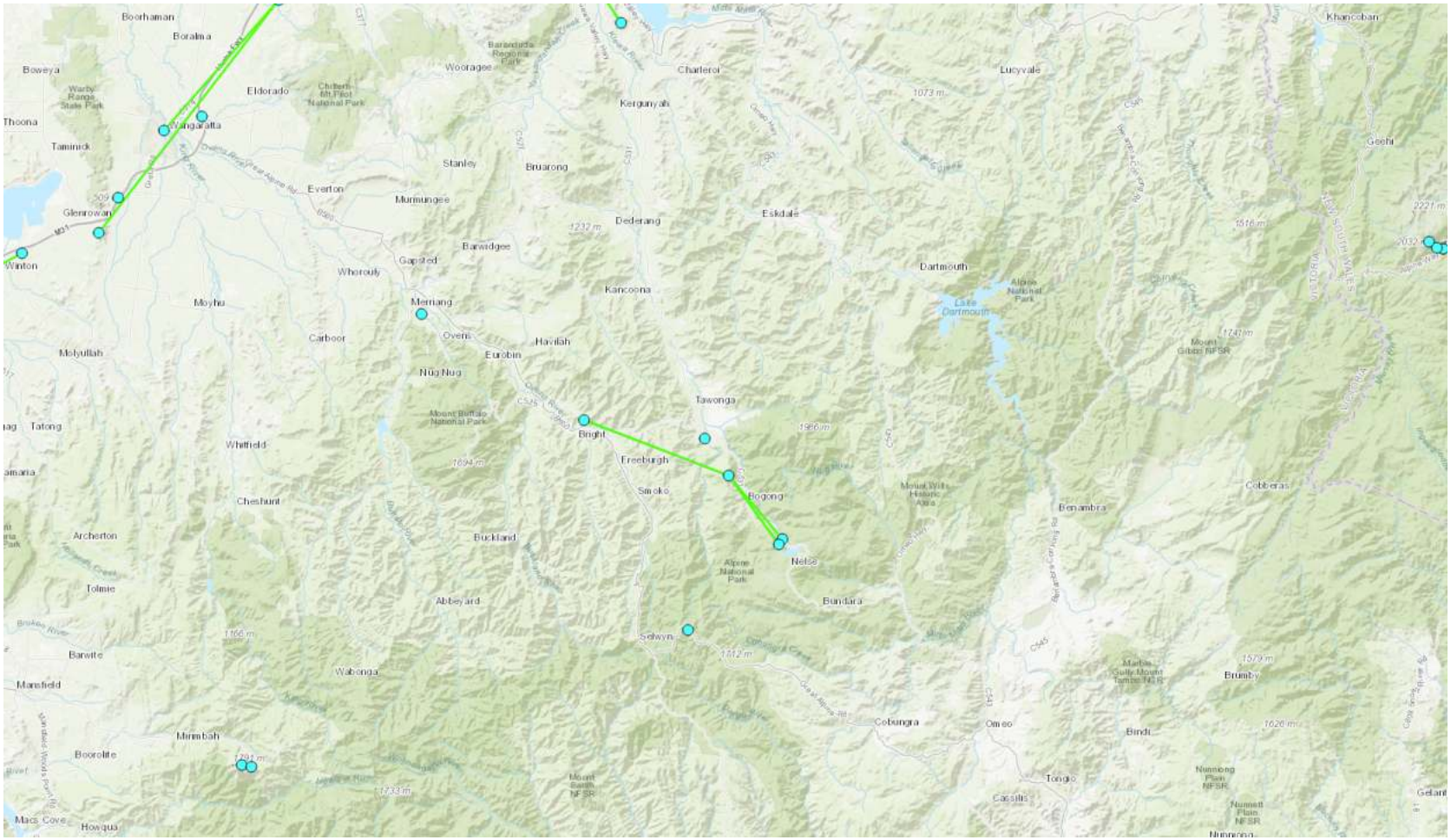
TPG Telecom / Vodafone– Interconnected Mobile Tower Sites

A number of TPG Telecom / Vodafone Mobile Network sites are provided high bandwidth microwave transmission (or backhaul) from another TPG Telecom / Vodafone Mobile Network sites in place of fibre optic transmission. Based on our analysis of ACMA data these sites are listed below –

Site	Parent Site	Grandparent Site
Telstra CMTS Site BIG HILL https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11959	Telstra Site Apex Lookout Off Mount Porepunkah Road 1.5 km NE of BRIGHT VIC 3741 https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11994	

Based on this assessment, it is recommended that Council advocate for TPG Telecom / Vodafone to

- **prioritise resiliency upgrades to each of these sites including Improved backup power and other infrastructure hardening measures, such as improved facility design at key telecommunications facilities (such as mobile base station feeder sites and exchanges) and backhaul transmission redundancy.**



Map showing wirelessly interconnected TPG Telecom / Vodafone Tower sites.

TPG Telecom Mobile Tower Sites – High level Resiliency Assessment for Priority Sites

We have assessed the likely resiliency remedies for the highest and medium priority mobile tower sites in Alpine Shire, presented below.

Site Number		12 hour Backup Power upgrade	Provide redundant backhaul	Flood elevation	Emergency Power solution	Protection Zone from Natural Disaster	Priority
1	CMTS Site off Clemans Lane MYRTLEFORD https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=301318	☑	☑		☑	☑	Medium
2	Telstra Site Apex Lookout Off Mount Porepunkah Road 1.5 km NE of BRIGHT https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11994	☑	☑		☑	☑	High
3	Optus Site 233 Kiewa Valley Hwy MOUNT BEAUTY https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=303507	☑	☑		☑	☑	Medium
4	Telstra CMTS Site BIG HILL https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11959	☑	☑		☑	☑	High

6. Issues, Challenges & Advocacy

Key Issues

Current Challenges

The following challenges have been identified:

The importance of highly connected service centres

In the Alpine Shire region, there are several very important 'service centre' townships (Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford) with a growing resident population that provide the local areas with essential services. It is essential that advocacy and prioritisation efforts are concentrated on the provision of better connectivity to these centre's than towns with higher populations that are easier to reach due to their geographic proximity and more attractive for investment by telecommunication providers.

Mobile Network Coverage, Capacity and Choice

Due to the nature of the Mobile Network Operator market, it is not commercially feasible for these operators to build ubiquitous mobile networks across any region in Australia including Alpine Shire. Whilst some lower populated areas are not expected to have access to 4G networks for the foreseeable future, several higher population growth locations have been recommended for prioritisation to improve mobile network coverage, capacity and choice.

NBN Infrastructure access & suitability

Several key townships in Alpine Shire are currently only served by NBN Fixed Wireless and Satellite. Additionally, other key centres are currently served by Fibre to the Node (FttN) infrastructure. Whilst these technologies are essentially fit for purpose for 2022, it is arguable that by 2030 and the subsequent decade that Fixed Wireless, Satellite and Fibre to the Node technologies will not serve the capacity demands of households, businesses and other connectivity requirements such as growing Internet of Things connections.

Solving 'Last Mile' connectivity alternatives

The NBN enjoys a near monopoly position as the last mile fixed line network provider in Australia. However, in many areas there is evidence of frustration with service delivery and connection issues that result in either a diminished outcome or the inability to access an NBN service outright. More populated areas are seeing the introduction of alternatives to NBN such as high-speed wireless services and 5G Fixed Wireless.

Improvements to Satellite access

For rural and remote Australia, satellite networks have the attraction of offering additional bandwidth to connect these regions to international destinations. Satellite broadband services provide 100 per cent coverage of Australia's land area. However, the high costs and low speeds of satellite technologies have relegated them to be truly a last-option broadband technology. New low-earth orbit (LEO) satellites could potentially offer significant speed, performance and latency improvements towards the middle of the coming decade. Early LEOSat services such as Starlink are becoming available now as a high cost 'beta' service but will need to be accessible at lower pricing in the future.

Lack of access to LPWAN networks

Low-power wide area networks (LPWAN) is a wireless wide area network technology that interconnects low-bandwidth, battery-powered devices with low data rates over long ranges. Created for internet of things (IoT) networks, LPWANs operate at a lower cost with greater power efficiency than traditional mobile networks. They are also able to support a greater number of connected devices over a larger area.

Ensuring future connectivity is fit for purpose

As digital connectivity continues to embed itself as an essential 21st century utility, the importance of ensuring connectivity infrastructure is fit for purpose for not just now but for coming decades in the most efficient way possible is paramount. Policies such as 'Dig Once' can ensure that the required passive infrastructure such as Ducts and Pits are installed in new development areas and construction projects enabling easier and cheaper installation of effective and competitive telecommunication infrastructure.

Advocacy Priorities

In the area of Telecommunications and Digital Connectivity, there are several key Federal and State Government Departments, Telecommunications Carriers and Service Providers and Industry Organisations that all regional stakeholders should maintain regular contact with to advocate for improvements and funding opportunities.

It is recommended that regional stakeholders should prioritise their finite resources for advocacy in accordance with the following section:

National Broadband Network

Areas for Alpine Shire advocacy include specific items outlined in the Action Plans later in this strategy and generally the following:

- **NBN infrastructure improvements and extensions**
- **Business grade NBN access**
- **Satellite technology improvements**

Stakeholder	Frequency
NBN (Vic Stakeholder Relations representative)	Bi-annually
Federal Local Members	Annually
Department of Infrastructure, Transports, Regional Development and Communications	Annually
DJPR (Victorian State Government)	Annually

In relation to advocacy for improvements to NBN Satellite capacity and service levels, we recommend that Alpine Shire Council concentrates on advocating for longer term improvements by NBN and the Federal Government in the potential use of LEO Sat technologies as any immediate improvements by NBN in this area would be of incremental benefit at best.

Mobile Network coverage, capacity and choice

Areas for Alpine Shire advocacy include specific items outlined in the Action Plans later in this strategy and generally the following:

- **Mobile network blackspots and Commonwealth Mobile Coverage Blackspot program funding**
- **Uplift of Mobile network capacity in key centres**
- **Shared infrastructure opportunities**
- **Low Power Wireless Networks for Sensors delivered by mobile networks**

Stakeholder	Frequency
Mobile Carriers Forum	Annually
Telstra	Annually
Optus	Annually
TPG Telecom	Annually

Federal Local Members	Annually
Department of Infrastructure, Transports, Regional Development and Communications	Annually
DJPR (Victorian State Government)	Annually

Last mile connectivity alternatives and Fibre Backhaul

Areas for Alpine Shire advocacy include specific items outlined in the Action Plans later in this strategy and generally the following:

- **High speed Network alternatives to NBN (Fixed Wireless, Microwave etc.)**
- **Low Power Wireless Networks for Sensors delivered by non-mobile networks**
- **Increased opportunities for Fibre Backhaul connectivity**

Stakeholder	Frequency
QCN	Annually
LPWAN vendor(s)	Annually
Federal Local Members	Annually
Department of Infrastructure, Transports, Regional Development and Communications	Annually
DJPR (Victorian State Government)	Annually

In relation to advocacy with Fibre Backhaul providers such as Telstra and others, we recommend that Alpine Shire focuses its finite advocacy efforts on “Last Mile Connectivity” like NBN uplift and Mobile Network coverage, capacity and choice improvements, which will provide the most benefit for the region.

7. Future State Connectivity

Connectivity technologies are improving rapidly

The days of dial-up, when the internet moved at a glacial pace, are now a distant memory. Today technology heeds our commands at the touch of a button. But even in urban areas, the digital world is not as fast and responsive as it could be. Calls still drop, connections go down, large files fail to download, and videos freeze for buffering.

All that is about to change, and quickly, thanks to the next generations of fixed and mobile connectivity as well as the proliferation of some existing technologies. More than any single advance on its own, it is the convergence of these developments that could enable new capabilities and create a more connected world.

In the coming years, connections could be 10 times faster, with a new level of reliability and stability. As latency improves by up to 50 times, applications will respond seamlessly to commands. Consumers could enjoy instant high-definition video streaming and even new types of immersive experiences with augmented and virtual reality.

Connectivity Technologies towards 2030

Connectivity Technology	Description	Applicability & timeline for ALPINE SHIRE
 Low to mid band 5G	High-speed, low-latency cellular connectivity overlay on existing 4G infrastructure	• Highly applicable upgrade to all current 4G and 3G networks • By 2025 for all Towns in ALPINE SHIRE
 Fibre to the Premise	High-speed, low-latency fixed networks that support other connectivity	• Highly applicable upgrade to all current NBN in township areas • By 2030 for all Towns in ALPINE SHIRE
 LPWAN	Low-power and low-maintenance networks that support high densities of connected devices	• Highly applicable to Agricultural areas
 LEO Satellite	Global coverage with significantly reduced latency vs. existing satellite offerings	• Highly applicable upgrade to NBN Satellite • Dependent on NBN upgrading to LEO Satellite technology or alternative provider (i.e., Starlink)
 High band 5G	Highest speed, low latency, and highly secure cellular connectivity	• Highly applicable enhancement to 5G networks • By 2030 for all Towns in ALPINE SHIRE

Mobile (Cellular)

5G

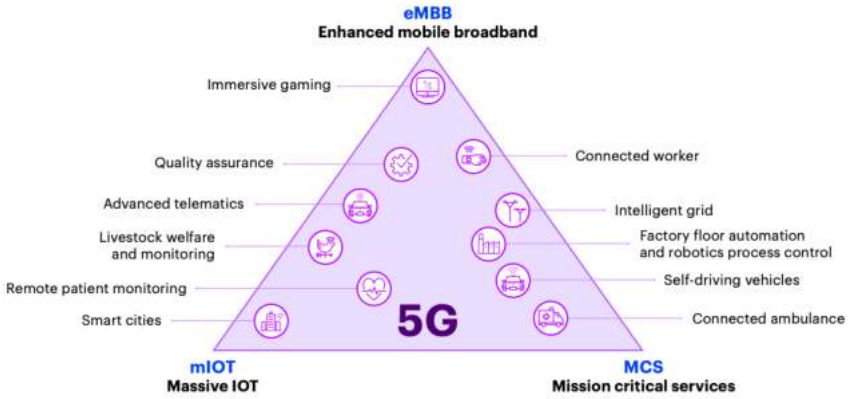
In terms of mobile coverage, providers are upgrading existing 4G infrastructure with low- to mid-band 5G network overlay. The end results of these upgrades will vary depending on the spectrum used and tower density. But in general, these low- to mid-frequency 5G networks can offer significant improvements in speed and latency, all while supporting a greater density of connected devices.

High-band (also known as millimetre-wave or standalone) 5G networks represent a step change in performance. Designed to be the most ultra-fast mobile option, high-band 5G promises to put the speed, latency, reliability, and security of fibre in the air, expanding what mobile devices can do. Because this requires a highly densified radio access network, an upgraded 5G core network, and upgraded network support systems, these networks are highly capital-intensive to build. Users will also need to upgrade to 5G-capable devices in order to experience the full benefits. Some companies will connect to commercially available services, while others may opt to build their own private 5G networks.

5G will lay the platform for the anticipated surge in connected devices and sensors by making more efficient use of spectrum and core networks than 3G and 4G technologies.

The improved connectivity offered by 5G will enable the potential of emerging technologies including augmented and virtual reality, autonomous vehicles, machine learning and robotics to be explored.

5G can better handle the increasing number of wireless devices being used simultaneously, so it will also facilitate greater use of Internet of Things (IoT).



IoT is currently enabled by 4G and other networks and in 2017 its adoption in the Australian consumer market rose by 55 per cent. In addition, government investment in and use of sensor technologies is becoming more compelling as they are capable of gathering more information and data, become self-powering and cheaper.

Business and industry use of IoT solutions is driving exponential growth and it is predicted that the existing 4G network will be unable to cope with the projected growth in data and devices - driving the need for 5G.

Comparing 5G to other Technologies

	Wi-Fi 6	4G	5G
Latency	Several seconds	~55 milliseconds	<10 milliseconds
Mobility	Low	High	High
Coverage	10m (30 feet)	100m to km[1]*	100m to km[1]*
Bandwidth	High bandwidth[2]	Up to 20MHz band[3]	Up to 400 MHz[3]
Security	Reasonably secured[4]	Very secure[5]	Very secure[6]

With 4G, consumers can already stream media with fast download rates, but 5G takes this a step further. 5G has faster bi-directional connectivity and enhanced latency that can unlock many use cases across industries that 4G could not, such as augmented or virtual reality. 5G also offers several important benefits compared to WiFi-6. While WiFi-6 offers low cost and high speed, it lacks wireless mobility, reliability over wide-area coverage and the low latency benefits of 5G.

Fibre Optic

On the fixed line side, fibre optic networks continue to expand.

There are a few types of fibre connections:

- Fibre to the Premises (FTTP) – fibre optic cable is laid all the way to a home or business premises. High capacity services for businesses can be installed using a Point to Point architecture as compared to the NBN Fibre to the Premise which uses a Passive Optical Network architecture.
- Fibre to the Curb (FTTC) – fibre optic cable is laid to your kerb or driveway, and then connects to an existing copper phone line.
- Fibre to the Node (FTTN) – fibre optic cable is laid to a central point in a locality, and then connects to the existing copper phone line for each premise.
- Fibre to the Building (FTTB) – in an apartment building, fibre optic cable is laid to a central point, and then connects to the existing copper phone line for each apartment or office premises.
- Cable (aka Hybrid Fibre-Coaxial, or HFC) is a broadband technology that uses the sort of cable used by pay TV to connect you to the world wide web.

WIFI 6

Once a location is wired with fiber, the next generation of Wi-Fi (Wi-Fi 6) will improve speeds while supporting many more connected devices. Wi-Fi 6 will make the biggest difference in crowded environments such as airports, apartment buildings, theatres, stadiums, public spaces, and homes with multiple internet users and smart gadgets.

It also extends the battery life of smart devices and IoT sensors by employing “target wake time,” which recognizes higher data transmission times instead of continuously scanning for signals. Users need to have Wi-Fi 6-ready devices, however.

LPWAN

Low-power wide-area networks (LPWANs) provide connectivity over broader areas and longer ranges. Different protocols, such as LoRa, NB-IoT, and Sigfox, compete in this realm, with no clear winner at this stage. Since LPWANs require less power from the devices they connect, they could enable batteries in those devices to last 10 years or more. This could set the stage for billions of additional battery-powered devices and sensors to come online. Beyond network developments, IoT sensors themselves are becoming more sophisticated and robust. They can perform more complex tasks, from location tracking and temperature measurement to small-scale processing. Even as they gain capabilities, unit prices are rapidly declining.

LEO Satellites

Like 5G, Low Earth Orbit (LEO) satellites enable other technologies, but their viability is less certain. If successful, they could deliver a breakthrough—not necessarily in network performance but in breadth of coverage. They could cover parts of the world where the economics do not work for laying fiber or building networks of towers (although providing coverage requires a constellation of many satellites orbiting at once). LEO satellite constellations could potentially substitute for mobile backhaul in disadvantaged or remote areas, essentially beaming broadband down from above, and providing coverage to those who lack connectivity today. The next generation of LEO satellite constellations promise substantial improvements over versions launched in the 1990s. However, OneWeb and SpaceX are the only companies to launch test satellites (as of this writing), and no commercial services are yet available.

8. High Level Options & Action Plan

Recommended Options

Network Resiliency focus

Careful analysis has been undertaken to identify Mobile Network Tower sites to be prioritised for resiliency upgrades.

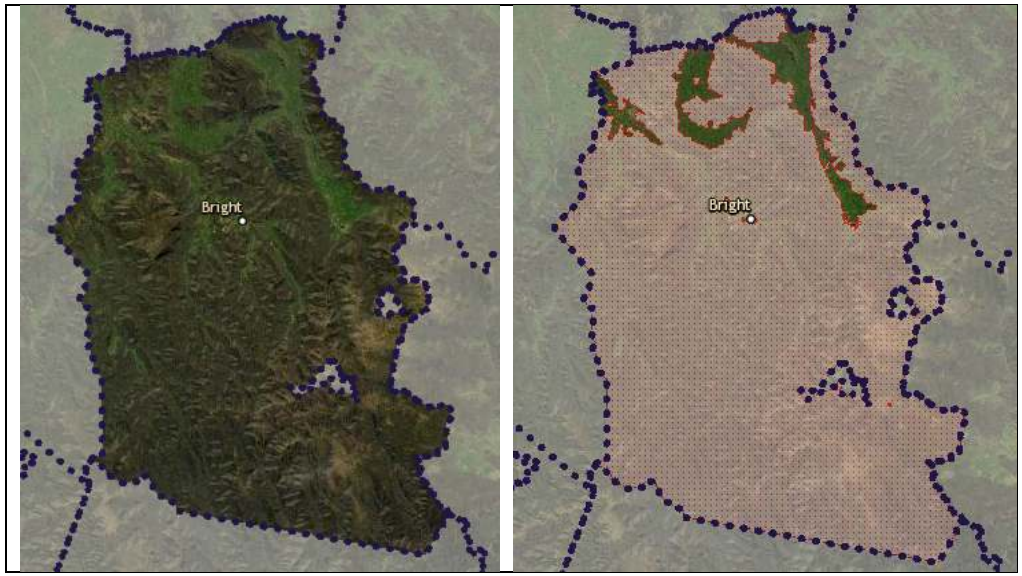
These upgrades may comprise either one or several of the following:

- the deployment of new generators;
- the upgrading of battery systems to increase power capacity;
- the addition of battery extension devices to enhance existing capacity;
- improving transmission resilience within interconnected mobile network clusters;
- and the physical hardening of sites against bushfire damage.

Our recommended baseline metrics for appropriate resiliency for mobile networks include –

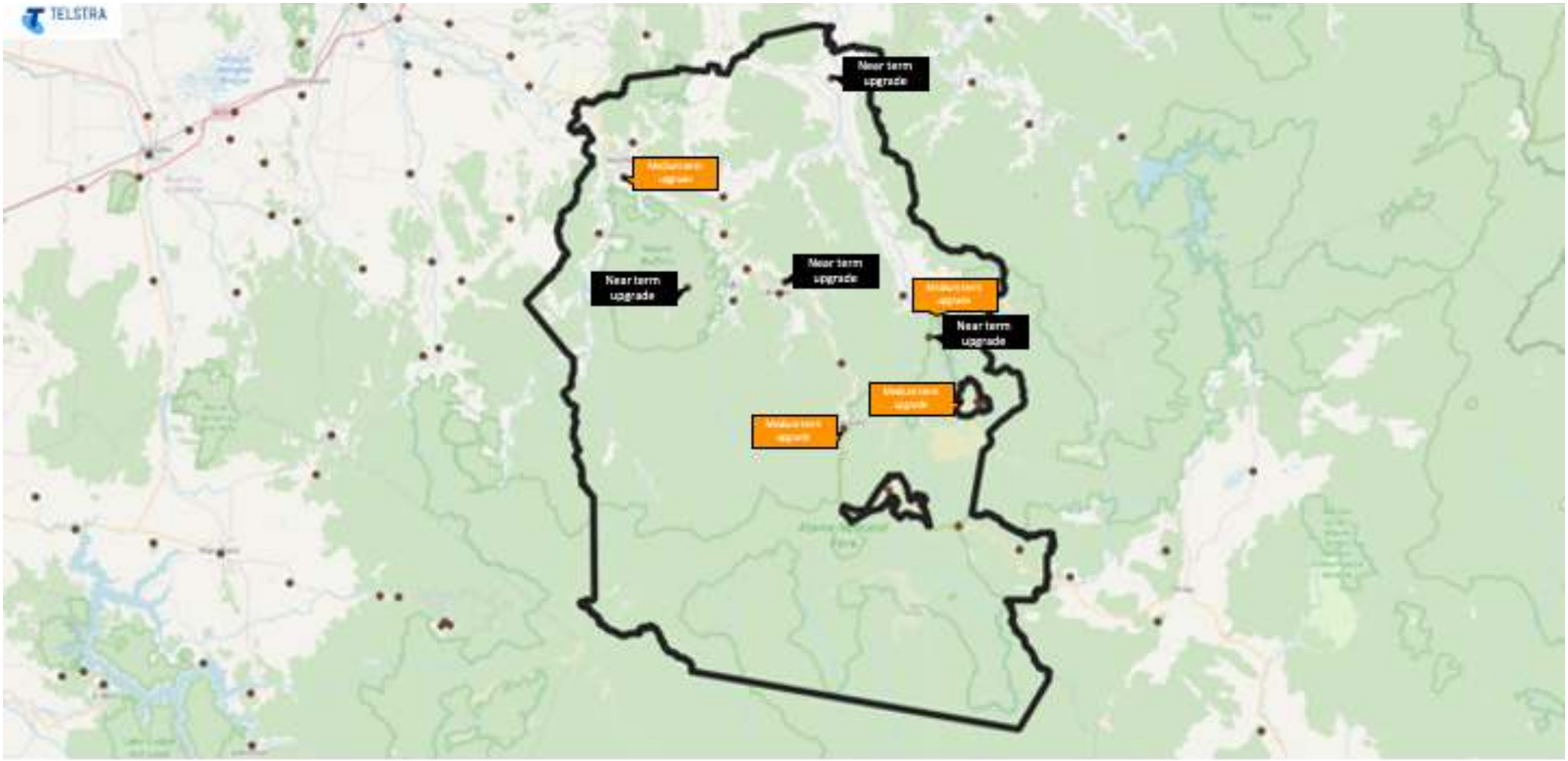
- upgrading power capacity to a minimum of 12 hours;
- provision of redundant backhaul;
- flood elevation;
- emergency power solutions, including generators, to rapidly restore services during or after a Natural Disaster event;
- expanding or enhancing a protection zone around a site to increase its resilience to a Natural Disaster threat; or
- other hardening measures to increase the resilience of a site

In conducting our network resiliency analysis we have taken into consideration the Bushfire prone areas of Alpine Shire including conferring with the Alpine Shire Planning Scheme (including the Bushfire Management Overlay), the Alpine Shire Municipal Fire Management Plan 2019-2022, and the Alpine Shire Municipal Emergency Management Plan 2021-2024.

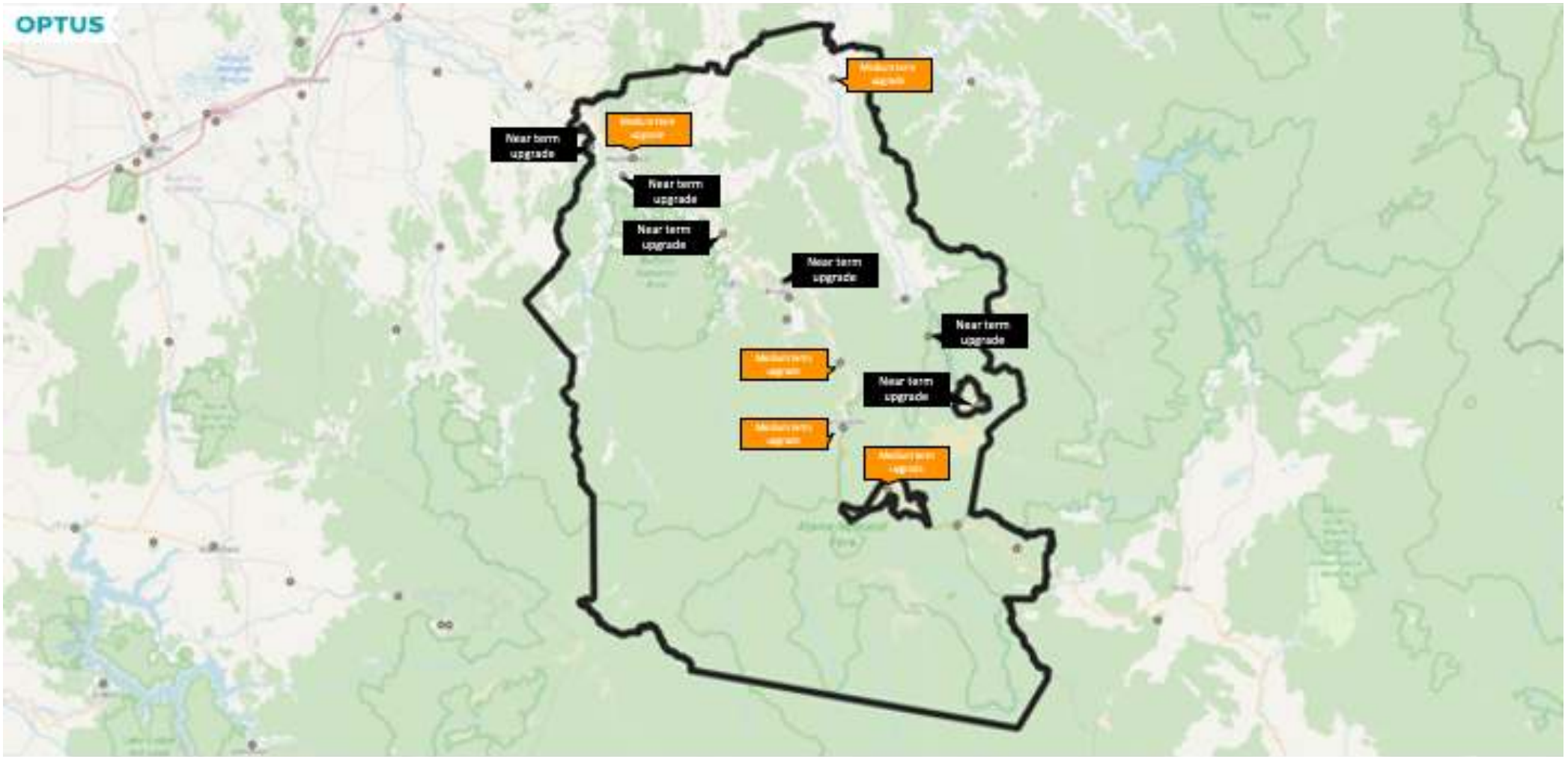


Alpine Shire Planning Scheme – Bushfire Management Overlay

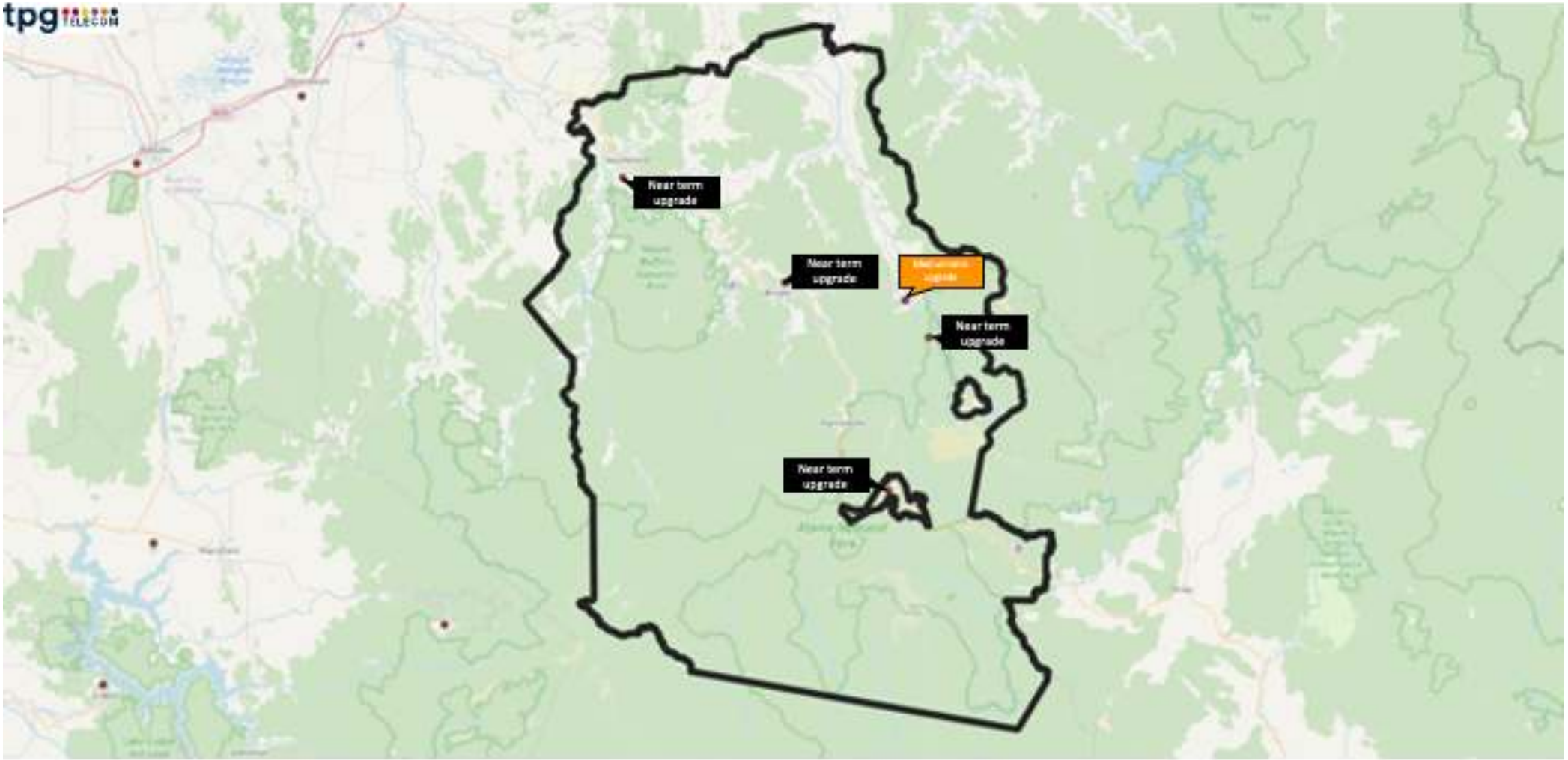
	Description of Resiliency upgrade	0 – 2 years	2 – 6 years	6+ years
ALPINE SHIRE COUNCIL	Alpine Shire Council advocate for the upgrade of one or several of the following – • upgrading power capacity to a minimum of 12 hours; • provision of redundant backhaul; • flood elevation; • emergency power solutions, including generators, to rapidly restore services during or after a Natural Disaster event; • expanding or enhancing a protection zone around a site to increase its resilience to a Natural Disaster threat; or other hardening measures to increase the resilience of a site	TELSTRA Upgrade at: • Telstra CMTS Site BIG HILL https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11959 • Telstra Site Apex Lookout Off Mount Porepunkah Road 1.5 km NE of BRIGHT https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11994 • Telstra Radio Terminal Mt Buffalo Chalet MT BUFFALO https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=36659 • Telstra Site off Crosthwaite Lane DEDERANG https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=300473	TELSTRA Upgrade at: • Telstra RBS Site Adj 39 Briggs Lane • https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9011065 • Telstra Exchange Mount Beauty to Falls Creek Road FALLS CREEK • https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=37445 • Telstra Tower MOUNT BEAUTY Tawonga South • https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=11958 • Telstra Site Alpine Rd Ovens Water Tank HARRIETVILLE https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=301322	TELSTRA Upgrade at: All remaining Telstra sites


TELSTRA
Near term upgrade
Near term upgrade
Near term upgrade
Near term upgrade

	Description of Resiliency upgrade	0 – 2 years	2 – 6 years	6+ years
ALPINE SHIRE COUNCIL	Advocate for the upgrade of one or several of the following – • upgrading power capacity to a minimum of 12 hours; • provision of redundant backhaul; • flood elevation; • emergency power solutions, including generators, to rapidly restore services during or after a Natural Disaster event; • expanding or enhancing a protection zone around a site to increase its resilience to a Natural Disaster threat; or • other hardening measures to increase the resilience of a site	OPTUS Upgrade at: • SPI Tower 159 Merriang Gap Road GAPSTED https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=305388 • CMTS Site off Clemans Lane MYRTLEFORD https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=301318 • Optus Site Eurobin Westons Lane EUROBIN https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135803 • Optus Site Bright Apex Lookout BRIGHT https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135501 • Optus Site Bogong Mt Big Hill off Mt Bogong Tourist Rd BOGONG https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=134551 • Optus Monopole Adj Ski Patrol Building https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9012710	OPTUS Upgrade at: • Optus Monopole Crosthwaite La https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=9001511 • Lookout Hill Lookout Road Myrtleford https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=41099 • Bright West 63B CHURCHILL AVENUE Bright https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=10014067 • Telstra Site Lot 77 Brookes Lane (Smoko Creek Rd) SMOKO https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=304268 • Optus Site Mt Hotham Mt Hotham Summit HOTHAM HEIGHTS https://web.acma.gov.au/rrl//site_search.site_lookup?pSITE_ID=135125	OPTUS Upgrade at: All remaining Optus sites


OPTUS
Near term upgrade
Near term upgrade
Near term upgrade
Near term upgrade
Near term upgrade
Near term upgrade

	Description of Resiliency upgrade	0 – 2 years	2 – 6 years	6+ years
ALPINE SHIRE COUNCIL	Advocate for the upgrade of one or several of the following – • upgrading power capacity to a minimum of 12 hours; • provision of redundant backhaul; • flood elevation; • emergency power solutions, including generators, to rapidly restore services during or after a Natural Disaster event; • expanding or enhancing a protection zone around a site to increase its resilience to a Natural Disaster threat; or • other hardening measures to increase the resilience of a site	tpg TELECOM Upgrade at: • As per Telstra & Optus sites above	tpg TELECOM Upgrade at: • As per Telstra & Optus sites above • Any new Vodafone / TPG Telecom sites	tpg TELECOM Upgrade at: • As per Telstra & Optus sites above


tpg TELECOM
Near term upgrade
Near term upgrade
Near term upgrade
Near term upgrade

Improved Community and economic development focus

Digital connectivity – or 'smart infrastructure' or 'digital infrastructure' – is the utility of the twenty-first century, underpinning every aspect of the modern economy and all aspects of smart cities. This includes cellular wireless – 2G, 3G, 4G, and 5G – and Wi-Fi, wired (including full-fibre) technologies, Internet of Things (IoT), and emerging non-terrestrial networks such as low-earth orbit satellites.

A further description of some of these opportunities are presented below –

NBN Business Fibre Zones

In mid 2020, NBN announced the expansion of business fibre zones to key regional areas within Australia to provide business grade Fibre to the Premise services to more areas at metropolitan pricing. This initiative would also provide the potential for extension of enterprise grade broadband to service local agribusinesses and industry clusters, many of whom are located in areas that could be prioritised.

NBN Fibre to the Premise upgrade

As outlined in the current state assessment, a number of Alpine Shire townships are currently served with NBN Fibre to the Curb / Node, Fixed Wireless and Satellite. These towns should be advocated for Alpine Shire and implemented by NBN for upgrade to Fibre to the Premise (FttP) as a minimum fit for purpose fixed line infrastructure before the end of the decade.

Next Step for Alpine Shire Council

Advocate with the Commonwealth Government and the Victorian State Government for NBN to

- implement NBN business fibre zones and NBN FttP for the major service centres of Alpine Shire (Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford);
- Harrietville's NBN upgraded from Satellite to Fibre to the Premise;
- Dinner Plain NBN upgraded from Fixed Wireless to Fibre to the Premise;
- Tawonga / Tawonga South NBN upgraded from Fixed Wireless to Fibre to the Premise; and
- Wandiligong NBN upgraded from Fixed Wireless to Fibre to the Premise.

Priority – High
Action for Council – Advocacy and potential Regional Communications funding applications
Community outcomes – Delivery of improved broadband infrastructure

Upgrades to Mobile Networks using Shared Radio Access Networks

Increasingly, the ability to deliver increased 4G and 5G coverage, capacity and choice of provider through shared infrastructure deployment are becoming more viable. Passive and Active sharing of enabling infrastructure and Radio Access Networks (RAN) is being proven overseas and this has been recognised by the Commonwealth Government through the recent changes to the Mobile Blackspot Program guidelines that promote these architectures. The Alpine Shire would provide an opportunity for at minimum, a Proof of Concept with other Government Partners and Mobile Network operators to deploy shared mobile infrastructure for regional Victoria.

Next step for Alpine Shire

Advocate for Shared Radio Access Networks to be rolled out by the Mobile Network Operators for improved coverage and capacity for Alpine Shire Council.

Priority – Low to Medium
Action for Council – Advocacy
Community outcomes – Delivery of improved mobile network coverage and capacity in various areas of Alpine Shire

Open Access Duct investment in key centres

There are viable opportunities to install open access duct infrastructure in key centres as part of Streetscape projects. The increment extra cost of installation when trenches are open is the cheapest way to install appropriately designed passive infrastructure that can attract outcomes including NBN infrastructure uplift, the introduction of additional Telecommunications providers and the ability to attract access revenues to offset some of the cost of deployment, operations and maintenance.

Next Step for Alpine Shire Council

Engage assistance to review current designs to ensure that appropriate telecommunications pit and pipe and associated infrastructure is correctly dimensioned and develop a commercial and facilities access framework to promote open and equitable access.

Priority – Medium
Action for Council – Implementation of Open Access Duct strategy (approximate investment: $20K to $30K)
Community outcomes – Delivery of improved broadband infrastructure over time through investment in Duct infrastructure available for usage by Telecommunication Providers

Whole of Region Policy – Common Telco Facilities Access and New Duct in New Development and Construction projects

An important way that local government can enable long term telecommunications and connectivity outcomes is to develop a common Facilities Access Framework across all Council owned assets that can house telecommunications equipment in the region. This can include Land, Buildings, Water Reservoirs, Poles and other Street level assets such as Bus Shelters. A common framework that allows for timely access, approvals and appropriate lease rental costs can position the region as attractive for accelerated investment in both fixed and mobile networks. In addition, the adoption of a 'Dig Once' policy for the introduction of Council owned duct and smartpoles in new developments and construction projects such as new roads and road upgrades can contribute to important passive assets that can be leveraged to encourage future connectivity access.

Next Step for Alpine Shire Council

Engage assistance to develop the Policy based on best practice and engage with relevant stakeholders

Priority – High
Action for Council – Implementation of Open Access Duct strategy (approximate investment: $20K to $30K)
Community outcomes – Delivery of improved broadband infrastructure over time through investment in Duct infrastructure available for usage by Telecommunication Providers

Scoping of Mobile Network Repeaters & Boosters for low coverage areas across Alpine Shire Council

A mobile phone repeater is a type of "active repeater" antenna. It's a telecommunications device that takes a mobile signal and re-broadcasts it through a specific area, and are particularly useful in rural, regional and remote areas of Australia. Repeaters receive a mobile signal at a location where it's strong (which includes via cables to a passive antenna on your roof), and broadcasts (or repeats) the signal. Repeaters such as these require licensing from the network that they're broadcasting. They can only broadcast one network There are several key locations in Alpine Shire that may be suitable for the use of Repeaters including but not limited to Buffalo Valley, Buckland Valley and Happy Valley.

Next Step for Alpine Shire Council

Engage assistance for site surveys and high level network planning

Priority – High
Action for Council – Scoping for low coverage areas across Alpine Shire Council (approximate investment: $20K to $30K)
Community outcomes – Delivery of improved mobile network coverage and capacity in high priority rural areas of Alpine Shire

In relation to Community members wishing to implement mobile network signal boosters themselves, typical setup steps are outlined below

Step 1: Set up the outdoor antenna at the place where you have the best signal (aim for as high as possible and, if you can, direct the antenna towards the nearest cell tower for your network).

Step 2: Use the cable to connect the outdoor antenna to the repeater.

Step 3: Connect the indoor whip Omni ceiling or wall antenna directly to the repeater.

Step 4: Plug the repeater into the power supply. The repeater should immediately begin amplifying your signal, giving you 5 bars.

Installation Tips

If your signal at ground level is only 1-2 bars after installation, it may be that your outdoor antenna is too low and you need to move it to a higher place (such as the roof). It is recommended that the antenna is positioned 3-5 metres above the ground

ATTENTION – Never plug the repeater into the power supply before you confirmed that the antenna and cable are connected! Doing so may result in damage to the repeater.

Minimum and maximum cable length (in metres) from the outdoor antenna to the repeater:

100 sq. m. repeater	Min 8 / Max 20
150 sq. m. repeater	Min 8 / Max 25
300 sq. m. repeater	Min 8 / Max 25
600 sq. m. repeater	Min 8 / Max 30
1000 sq. m. repeater	Min 8 / Max 30
1500 sq. m. repeater	Min 8 / Max 60

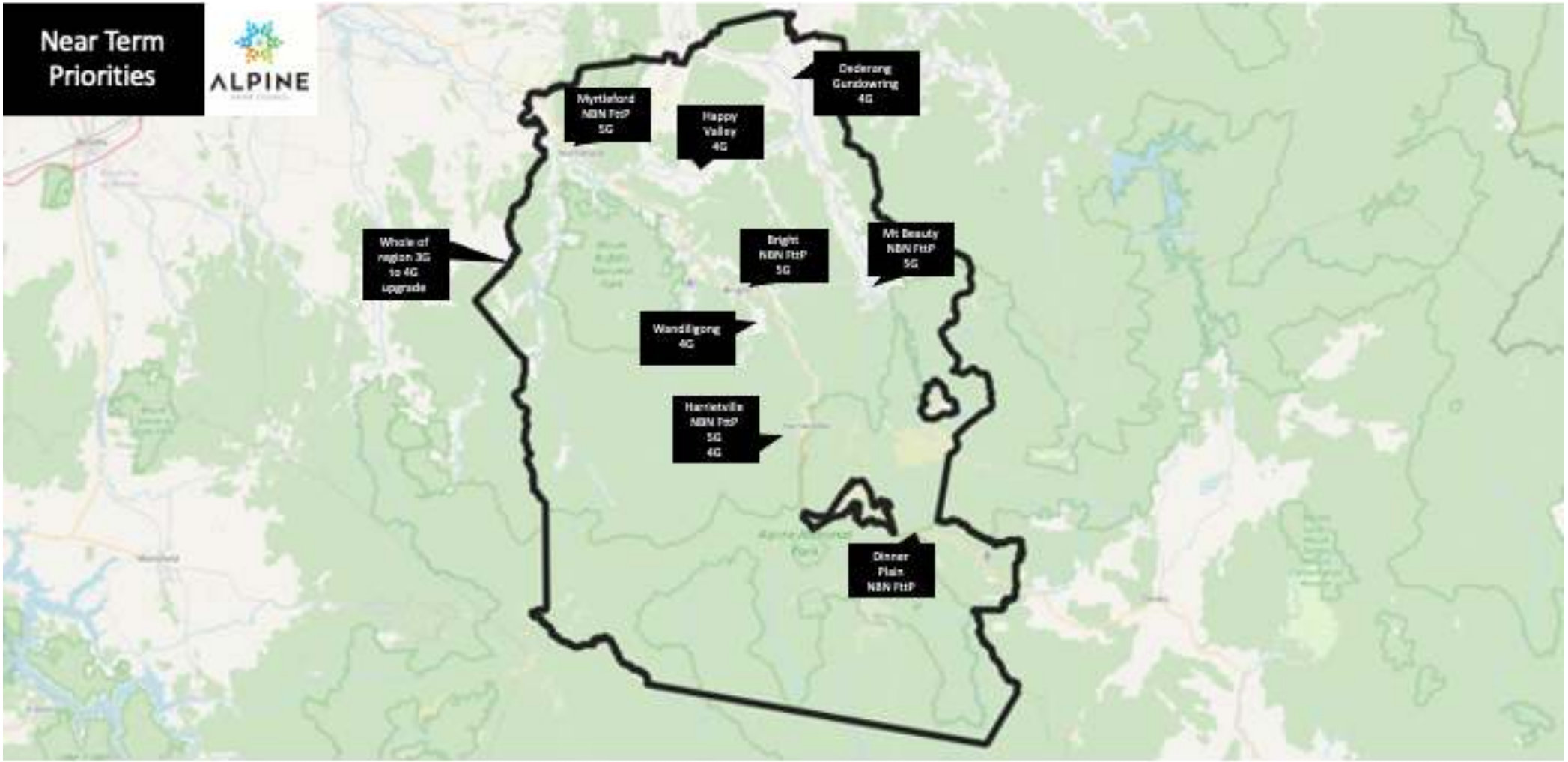
Minimum and maximum cable length (in metres) from repeater to indoor antenna:

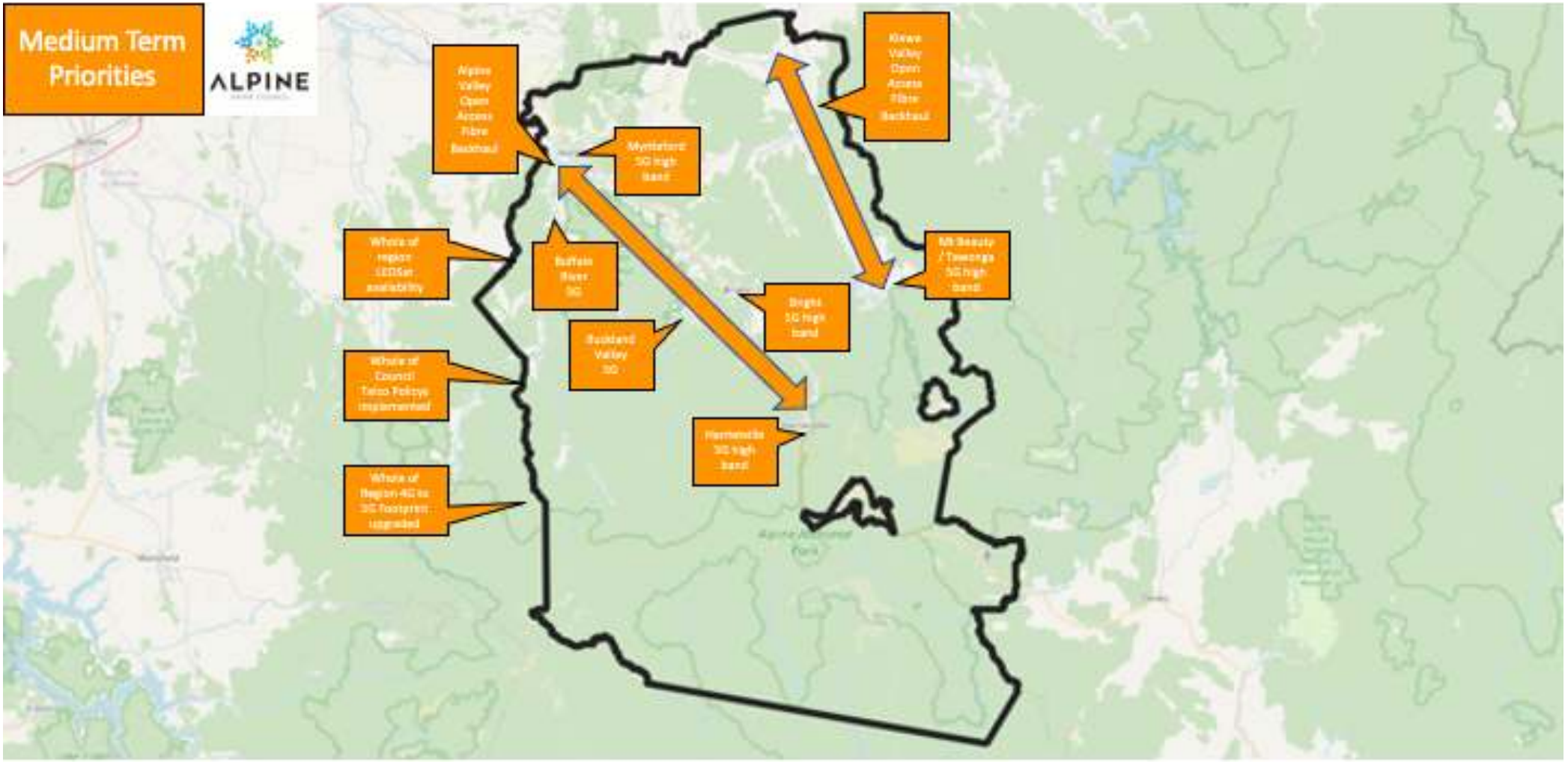
100 sq. m. repeater	Min 3 / Max 10
150 sq. m. repeater	Min 3 / Max 15
300 sq. m. repeater	Min 3 / Max 15
600 sq. m. repeater	Min 3 / Max 30
1000 sq. m. repeater	Min 3 / Max 30
1500 sq. m. repeater	Min 3 / Max 60

Improving the connectivity landscape over the coming decade will be crucial to the ongoing economic and social viability of the Alpine Shire region. The recommended options are summarised below.

	0 – 2 years	2 – 6 years	6+ years
ALPINE SHIRE COUNCIL	• All service centres (i.e. Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford) served by NBN business fibre and NBN fibre to the Premise • All service centres (i.e Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford) served by 5G from each of the three Mobile Network Operators • The regions 3G Footprint is upgraded to 4G by each of the three MNOs by potentially using Shared Radio Access Network • High Speed Public WiFi implemented at Bright, Myrtleford, Mount Beauty and Harrietville	• LEOSat services are available throughout the entire region • Policies including Open Access Ducts and Common Telco Facilities Access is implemented • The regions 4G Footprint is upgraded to 5G by each of the three MNOs by potentially using Shared Radio Access Network • LPWAN services are available throughout the entire region • New open access Fibre Backhaul implemented adjacent to Alpine Way and Kiewa Valley Highway	• All service centres (i.e. Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford) served by 6G from each of the three Mobile Network Operators
Mobile Communications	• New or Improved 4G Mobile Network coverage and capacity for – Harrietville (Telstra, Optus and TPG Telecom / Vodafone) Wandiligong ((Telstra, Optus and TPG Telecom / Vodafone) Happy Valley (Telstra, Optus and TPG Telecom / Vodafone)	• High band (26GHz or mmwave) 5G from each of the three Mobile Network Operators for all service centres (i.e. Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford) • New or Improved 5G Mobile Network coverage and capacity for –	• All Mobile Network Tower sites are upgraded with either fibre or LEOSat transmission capacity to allow higher capacity 5G and 6G services

	Dederang & Gundowring (Telstra, Optus and TPG Telecom / Vodafone)	Buffalo River (Telstra, Optus and TPG Telecom / Vodafone) Buckland Valley (Telstra, Optus and TPG Telecom / Vodafone)	
Internet Communications	• Harrietville's NBN upgraded from Satellite to Fibre to the Premise • Dinner Plain NBN upgraded from Fixed Wireless to Fibre to the Premise	• Tawonga / Tawonga South NBN upgraded from Fixed Wireless to Fibre to the Premise • Wandiligong NBN upgraded from Fixed Wireless to Fibre to the Premise	• NBN Satellite services are upgraded to LEOSat


Near Term Priorities
ALPINE
Myrtleford NBN FttP 5G
Happy Valley 4G
Cedarong Gundowring 4G
Whole of region 3G to 4G upgrade
Bright NBN FttP 5G
Mt Beauty NBN FttP 5G
Wandiligong 4G
Harrietville NBN FttP 5G 4G
Dinner Plain NBN FttP


Medium Term Priorities
ALPINE
Alpine Valley Open Access Fibre Backhaul
Myrtleford 5G high band
Kiewa Valley Open Access Fibre Backhaul
Mt Beauty / Tawonga 5G high band
Buffalo River 5G
Bogong 5G high band
Buckland Valley 5G
Harrietville 5G high band

9. Funding opportunities

Funding Opportunities to close gaps

In order to proceed with any of the identified options, there may be value in exploring funding options from government sources as set out below:

Commonwealth Government

Regional Connectivity Program

The Regional Connectivity Program (the RCP) is a grants program funding the delivery of 'place-based' telecommunications infrastructure projects to improve digital connectivity across regional, rural and remote Australia.

https://www.infrastructure.gov.au/media-technology-communications/internet/regional-connectivity-program

Mobile Black Spot Program

The Australian Government is improving mobile phone coverage and competition in regional and remote Australia through the Mobile Black Spot Program. The Government has committed $380 million to the Mobile Black Spot Program (the Program) to invest in telecommunications infrastructure to improve mobile coverage and competition across Australia. The Program is supported by co-contributions from state and local governments, mobile network operators (Optus, Telstra, TPG Telecom Ltd (formerly Vodafone) and Field Solutions Group), businesses and local communities.

https://www.communications.gov.au/what-we-do/phone/mobile-services-and-coverage/mobile-black-spot-program

Peri-urban Mobile Program

The Peri-Urban Mobile Program (PUMP) is a grants program that provides funding to improve mobile connectivity in bushfire priority areas along the edges of Australia's major cities.

https://www.infrastructure.gov.au/media-technology-communications/phone/mobile-services-coverage/peri-urban-mobile-program

5G Innovation Initiative

The Australian 5G Innovation Initiative will test technologies that make use of 5G to drive productivity and growth across Australia in key sectors. The 5G Innovation Initiative will fund trials demonstrating different future 5G uses, including Internet of Things applications, which will help build Australia's 5G ecosystem. The Initiative will support the rigorous, commercial and replicable testing of 5G uses and showcase the productivity boosting applications of the technology. The Initiative is an open, competitive grants program with two rounds of funding over three years to encourage private sector investment.

https://www.communications.gov.au/what-we-do/spectrum/australian-5g-innovation-initiative

NBN Regional Co-investment Fund

NBN Co has also allocated $300 million to co-invest with councils, state, territory and federal governments in programs to boost regional connectivity. The co-investment fund is expected to assist in expanding fixed line services to more regional areas.

https://www.nbnco.com.au/content/dam/nbn/documents/about-nbn/reports/reports-and-publications/nbn-rcif-guidelines.pdf

Mobile Network Hardening Program

The purpose of the Mobile Network Hardening Program (the Program) is to increase the resilience of (i.e. to harden) Australia's mobile telecommunication networks to help prevent, mitigate and manage outages during bushfires and other Natural Disasters.

https://www.infrastructure.gov.au/media-communications-arts/phone/improving-resilience-australias-telco-networks

State Government

Connecting Victoria

The Victorian Government is fast-tracking better mobile coverage and broadband across the state through the $550 million Connecting Victoria program.

The program will focus on getting more Victorians access to business-grade broadband and upgrading mobile coverage, improving 4G mobile coverage, helping more places become 5G ready, and improving access to safety information during bushfires and other emergencies.

https://djpr.vic.gov.au/connecting-victoria

Local Government

It has been noted previously that Alpine Shire Council could contribute to the advancement of telecommunications throughout the region by investing cash, budgeted on the basis of it being utility infrastructure, necessary for the development of the economy, community and safety for the region.

Council could also make available, some of its existing infrastructure, such as water towers, buildings, etc. where transmission devices could be located.

Private Investment

There is also the possibility that private organisations, or individuals could be willing to contribute. Service providers might be encouraged to invest in the expansion of their networks if critical demand mass could be aggregated, or potential users willing to meet or offset some of the capital cost involved in delivering the necessary infrastructure.

10. Condensed Action List

Condensed list of Actions

The list of actions we have recommended throughout this report is presented in the condensed table below

Page Number	Action	Actioning Organisation(s)	Partnering Organisation(s)	0 – 2 years	2 – 6 years	6+ years
76	**Advocate for Telstra to** • **provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain** • **provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**	Alpine Shire Council	Telstra Australian Government Victorian Government	☑	☑	
77	**Advocate for Telstra to** • **prioritise resiliency upgrades to each of these sites including Improved backup power and other infrastructure hardening measures, such as improved facility design at key telecommunications facilities (such as mobile base station feeder sites and exchanges) and backhaul transmission redundancy.**	Alpine Shire Council	Telstra Australian Government Victorian Government	☑	☑	☑
83	**Advocate for Optus to** • **provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain** • **provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**	Alpine Shire Council	Optus Australian Government Victorian Government	☑	☑	
83	**Advocate for Optus to** • **prioritise resiliency upgrades to each of these sites including Improved backup power and other infrastructure hardening measures, such as improved facility design at key telecommunications facilities (such as mobile base station feeder sites and exchanges) and backhaul transmission redundancy.**	Alpine Shire Council	Optus Australian Government Victorian Government	☑	☑	☑
88	**Advocate for TPG Telecom / Vodafone to** • **provide 5G upgrades to existing Tower sites and potentially new 5G Tower sites servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain** • **provide upgrades to existing Tower Sites with 4G mid band spectrum (i.e. 1800MHz, 2100MHz and or 2600MHz) servicing Bright, Myrtleford, Mount Beauty, Tawonga, Harrietville and Dinner Plain**	Alpine Shire Council	TPG Telecom / Vodafone Australian Government Victorian Government	☑	☑	
88	**Advocate for TPG Telecom / Vodafone to** • **prioritise resiliency upgrades to each of these sites including Improved backup power and other infrastructure hardening measures, such as improved facility**	Alpine Shire Council	TPG Telecom / Vodafone Australian Government Victorian Government	☑	☑	☑

	design at key telecommunications facilities (such as mobile base station feeder sites and exchanges) and backhaul transmission redundancy.					
92	**National Broadband Network** **Areas for Alpine Shire advocacy include specific items outlined in the Action Plans in this strategy and generally the following:** • **NBN infrastructure improvements and extensions** • **Business grade NBN access** • **Satellite technology improvements**	Alpine Shire Council	NBN Australian Government Victorian Government	☑	☑	☑
92	**Mobile Network coverage, capacity and choice** **Areas for Alpine Shire advocacy include specific items outlined in the Action Plans in this strategy and generally the following:** • **Mobile network blackspots and Commonwealth Mobile Coverage Blackspot program funding** • **Uplift of Mobile network capacity in key centres** • **Shared infrastructure opportunities** • **Low Power Wireless Networks for Sensors delivered by mobile networks**	Alpine Shire Council	Telstra Optus TPG Telecom / Vodafone Australian Government Victorian Government	☑	☑	☑
93	**Last mile connectivity alternatives and Fibre Backhaul** **Areas for Alpine Shire advocacy include specific items outlined in the Action Plans in this strategy and generally the following:** • **High speed Network alternatives to NBN (Fixed Wireless, Microwave etc.)** • **Low Power Wireless Networks for Sensors delivered by non-mobile networks** • **Increased opportunities for Fibre Backhaul connectivity**	Alpine Shire Council	Australian Government Victorian Government	☑	☑	☑
101	**Telstra Resiliency upgrades**	Telstra		☑	☑	☑
103	**Optus Resiliency upgrades**	Optus		☑	☑	☑
105	**TPG Telecom / Vodafone resiliency upgrades**	TPG Telecom / Vodafone		☑	☑	☑
107	**NBN Business Fibre Zones & NBN Fibre to the Premise upgrade** **Advocate with the Commonwealth Government and the Victorian State Government for NBN to** • **implement NBN business fibre zones and NBN FttP for the major service centres of Alpine Shire (Bright, Dinner Plain, Harrietville, Mount Beauty and Myrtleford);** • **Harrietville's NBN upgraded from Satellite to Fibre to the Premise;** • **Dinner Plain NBN upgraded from Fixed Wireless to Fibre to the Premise;** • **Tawonga / Tawonga South NBN upgraded from Fixed Wireless to Fibre to the Premise; and** • **Wandiligong NBN upgraded from Fixed Wireless to Fibre to the Premise.** **Priority – High** **Action for Council – Advocacy and potential Regional Communications funding applications**	Alpine Shire Council	NBN Australian Government Victorian Government	☑	☑	

	Community outcomes – Delivery of improved broadband infrastructure					
111	**Upgrades to Mobile Networks using Shared Radio Access Networks** **Advocate for Shared Radio Access Networks to be rolled out by the Mobile Network Operators for improved coverage and capacity for Alpine Shire Council.** **Priority – Low to Medium** **Action for Council – Advocacy** **Community outcomes – Delivery of improved mobile network coverage and capacity in various areas of Alpine Shire**	Alpine Shire Council	Australian Government Victorian Government			☑
111	**Open Access Duct investment in key centres** **Engage assistance to review current designs to ensure that appropriate telecommunications pit and pipe and associated infrastructure is correctly dimensioned and develop a commercial and facilities access framework to promote open and equitable access.** **Priority – Medium** **Action for Council – Implementation of Open Access Duct strategy (approximate investment: $20K to $30K)** **Community outcomes – Delivery of improved broadband infrastructure over time through investment in Duct infrastructure available for usage by Telecommunication Providers**	Alpine Shire Council			☑	
112	**Whole of Region Policy – Common Telco Facilities Access and New Duct in New Development and Construction projects** **Engage assistance to develop the Policy based on best practice and engage with relevant stakeholders** **Priority – High** **Action for Council – Implementation of Open Access Duct strategy (approximate investment: $20K to $30K)** **Community outcomes – Delivery of improved broadband infrastructure over time through investment in Duct infrastructure available for usage by Telecommunication Providers**	Alpine Shire Council		☑		
112	**Scoping of Mobile Network Repeaters & Boosters for low coverage areas across the Alpine Shire** **Engage assistance for site surveys and high level network planning** **Priority – High** **Action for Council – Scoping for low coverage areas across Alpine Shire Council (approximate investment: $20K to $30K)** **Community outcomes – Delivery of improved mobile network coverage and capacity in high priority rural areas of Alpine Shire**	Alpine Shire Council		☑		
114 & 115	**Various Near Term, Medium Term and Long Term Mobile and Internet Telecommunications upgrades**	Various	Various	☑	☑	☑

11.Conclusion

Conclusion

The Mobile and Internet Communications Strategy has identified that there is a significant requirement to improve digital connectivity within the Alpine Shire

region. We have outlined a number of near, medium and long term initiatives that will require significant levels of investment which will be beyond the funding capabilities of local government alone. The overarching recommended options for the Alpine Shire are summarised in the condensed list of actions on page 119.

Investment priorities for all relevant programs need to ensure multiple service provider outcomes as much as possible, require little to no matching funding contributions for remote locations and should always prioritise towns based on their service provider status, not necessarily in population ranking.

Other jurisdictions such as the Australian Government and New South Wales[3] have recognised that State Government funding support is required for digital connectivity co-investment, especially in rural and remote areas where government funding intervention is the only method that allows for infrastructure improvements in non-commercial environments.

Our strong recommendation is that Alpine Shire, in collaboration with Towong Shire Council and Ovens Murray Regional Partnership, advocate to the Victorian State Government for significant amounts of co-investment funding that can be leveraged with Commonwealth Government funding and Telecommunication Provider co-investment to implement 21st century digital connectivity infrastructure in the Alpine Shire region.

[3] https://www.nsw.gov.au/snowy-hydro-legacy-fund/regional-digital-connectivity-program/gig-state

12. Glossary

Glossary of Terms	

Backhaul	Backhaul typically refers to the mid to long-distance transport of data from a series of disparate locations back to a more centralised location. The backhaul portion of the network comprises the intermediate links between the core, or backbone, of the network and the small sub-networks at the 'edge' of the entire hierarchical network. In the context of the NBN, backhaul services are the data carriage services provided over highspeed, high-capacity fibre lines, which carry aggregated network traffic between a Point of Interconnect (PoI) and a centralised or 'core' part of the network, for example an Internet Service Provider's data centre.
Bandwidth	Refers to the capacity and rate of data transfer over a network, usually measured in kilobits, megabits or gigabits per second.
Blackspot	An under-served premises, or area, usually in remote or rural locations and sometimes on the edges of cities, which is unable to obtain adequate, metro-comparable broadband or other communications services. Reasons for blackspots are normally related to the limitations of technologies, geography or a lack of investment.
Broadband	Broadband is a term used to refer to 'always on' high speed Internet or other network access. In the past, broadband services and technologies were defined in terms of a capability to transfer information at higher rates than traditional dial-up services.
Cloud Computing	Cloud computing is an Internet-based technology which stores information in servers and provides that information as an on demand service. Under cloud computing consumers can access all of their documents and data from any device with internet access such as a home or work PC, a mobile phone or other mobile internet enabled device.
Dark Fibre	It is the equipment at either end that dictates what capacity can be delivered over an optical fibre— ranging upwards from about 100 Mbit/s (at the low end). The term 'dark fibre' simply refers to optical fibre that is available for use and is provided without any equipment at either end. The term was originally used when talking about the potential network capacity of telecommunication infrastructure, but now also refers to the increasingly common practice of leasing fibre optic cables from a network service provider.
Digital Divide	The gap between people with effective access to digital and information technology and services, and those with very limited or no access at all. It refers both to a person's physical access to technology and the resources and skills available to effectively use the technology. Often used in Australia to describe the different levels of communications service available between metropolitan and regional areas.
Fibre Optic	Also known as optical fibre, fibre-optic cable is made up of thin threads of glass that carry beams of light. In telecommunications, data is translated into pulses of laser light that can be transmitted along the fibre cables. Fibre-optic technology is less susceptible to 'noise' and 'interference' than other data-transfer mediums such as standard copper telephone lines and can be used more reliably over longer distances without loss of speed or quality. Fibre is

	used extensively in backbone and international submarine networks, and to connect the base stations of mobile and wireless networks. It is increasingly being used for the last mile connection to home and business premises in FTTX networks.
Fibre to the Curb (FttC)	Refers to networks in which fibre connections are provided to a kerb-side equipment cabinet, in which the fibre's optical signal is converted to an electrical signal and delivered to premises over copper wires— typically over a maximum distance of 100 metres or less.
Fibre to the Node (FttN)	Similar to FTTC but using a neighbourhood node that serves more premises rather than a kerb-side node. Copper distances are typically up to around 1 km.
Fibre to the Premise (FttP)	Similar to Fibre to the Home, but a more neutral term that includes non-residential premises, such as schools, hospitals, and workplaces, as well as households. Fibre connections are provided all the way to premises, including individual units in multi-dwelling buildings
Fixed Line	Fixed line refers to technologies that use physical infrastructure, such as copper wires, rather than wireless infrastructure to deliver data connections. Traditional voice services, dial-up internet, xDSL, HFC cable and FTTP are all forms of fixed line services
Fixed Wireless Broadband	A family of wireless technologies that, as opposed to mobile wireless, delivers broadband services to a particular premises or fixed location. These services are sometimes called 'point-to point' or 'point-to-multi-point' and require an antenna that is generally permanently attached to the user's building. Fixed wireless can be used for backhauling in certain cases but also as an access technology, particularly in rugged or remote terrain and areas with low population densities that may make a fixed line alternative impossible or uneconomic. Wireless technologies are limited by the availability of wireless spectrum, the number of concurrent users, distance from the cell antenna and physical impediments such as hills and valleys interrupting signals.
Gigabit per second (Gbit/s)	A measure of communications speed equal to 1 000 000 000 bits per second. Also expressed as Gbps and Gb/s.
Greenfield	A term used to describe a piece of undeveloped land, either currently used for agriculture or completely unused.
Internet	A worldwide, publicly accessible series of interconnected computer networks that transmit data using the standard Internet Protocol (IP). It is a 'network of networks' that consists of millions of smaller domestic, academic, business, and government networks, which together carry various information and services, such as electronic mail, online chat, file transfer, and the interlinked web pages and other resources of the World Wide Web (www).

Internet Service Provider (ISP)	Also known as a Retail Service Provider (RSP), an organisation that offers access to the Internet to its customers. ISPs generally also provide other services such as electronic mail accounts, data storage and web hosting to their customers. ISPs may employ a combination of their own and third party infrastructure, or simply resell services provided by a wholesale carrier.
Last mile infrastructure	Infrastructure used to provide the link from a customer's premises to the provider's nearest point of aggregation. For example, a provider offering a wireless broadband service to the customer would be providing last-mile infrastructure using wireless broadband technology. The "digital divide" is attributed to the lack of suitable "Last mile infrastructure' in lower population density areas.
Latency	The delay in data transmission caused by the time it takes for data to get from one designated point to another.
Megabits per second (Mbit/s)	A measure of communications speed equal to 1 000 000 bits per second. Also expressed as Mbps, mbps, Mb/s and mb/s.
Mobile Wireless and Mobile Broadband	Broadband services supported by mobile networks, such as '3G' and '4G' networks, offering mobility and flexibility for users of handheld and laptop devices. Wireless technologies are limited by the availability of wireless spectrum, the number of concurrent users, distance from the cell antenna and physical impediments such as hills and valleys interrupting signals.
Point of Interconnect (PoI)	The connection point that allows Retail Service Providers (RSPs) and Wholesale Service Providers (WSPs) to connect to NBN Co network infrastructure.
Quality of Service (QoS)	The use of a range of networking technologies and techniques to provide guarantees on the ability of a network to deliver predictable results. Network performance within the scope of QoS can include availability, bandwidth, latency and error rate.

Satellite Broadband	Satellite broadband uses a radio dish to bounce a signal off a satellite and down to an earth station. It is common in rural and remote areas with low population densities, where fixed line alternatives are uneconomic. One-way satellite connections utilise a satellite link to download data to the broadband user and a standard telephone connection for uploading data back to the Internet. Two–way satellite connections use the satellite link to both upload and download information. The suitability of satellite broadband for some applications is impacted by the large physical distances between satellites and the earth's surface, which results in latency (delay) in the sending and receipt of data. Quality may also be affected by the number of simultaneous users and adverse weather conditions.
Smart Infrastructure	The application of communications technologies to infrastructure to make better, more efficient use of resources. Smart infrastructure can be used within the transport, energy, communications and water sectors.
Wholesale Service Provider (WSP)	A provider of infrastructure and services that deals only with other providers and does not have a commercial relationship with end-users or consumers. In telecommunications, a wholesale service provider allows other companies to lease access to equipment and services and avoid the expense of building their own infrastructure.
Wireless Broadband	Wireless broadband uses radio frequencies to transmit and receive data between customers and a local transmission point. Normally, this requires a number of base stations, similar to mobile phone towers, which transmit to customers who have a small transmitter/receiver connected to their computers or other digital devices. Wireless technologies are limited by the availability of wireless spectrum, the number of concurrent users, distance from the cell antenna and physical impediments such as hills and valleys interrupting signals.
Wireless Spectrum	Often referred to as the Radio-Frequency Spectrum, this is the array of electromagnetic radio frequencies used for communications, including mobile broadband, television, AM and FM radio, defence and any other service employing a wireless technology. The spectrum is divided into many frequency ranges, or bands, and usually allocated for a specific technology, device, use or service. Wireless Spectrum is a finite and regulated public asset, and in Australia is administered by the Australian Communications and Media Authority (ACMA), often through a licensing regime.