

KING ISLAND TELECOMMUNICATIONS



4 August 2019

Review of King Island broadband, landline
& mobile services and their economic, social,
safety & business impacts on the community



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King Island Telecommunications

REVIEW OF KING ISLAND BROADBAND, LANDLINE & MOBILE SERVICES AND THEIR ECONOMIC, SOCIAL, SAFETY & BUSINESS IMPACTS

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BACKGROUND

This report was commissioned and funded by the King Island Council. The scope of work was for the TechProject Group to review and update its previous 2015 report, and to review the usage and performance of all telecommunications services on King Island, to consider their economic and other impacts on the community, and to identify areas where improvements can be made.

This work was conducted in June 2019, involving research and review of materials, interviews with key users, businesses and organisations (both on-island and off-island), information sourced from service providers, and survey of the existing telecommunications services and facilities on the island. The report considered what are the needs of King Island both now and in the future, and what are reasonable expectations in 2019 for service levels and operating practices of telecommunications providers in Australia.

The members of the King Island community who contributed to this report are listed at the end.

The author of this report is experienced in the design, build and operation of telecommunications products, services and networks - both in Australia and overseas - and further details are contained at the end of the report.

ORGANISATION OF THIS REPORT

This report is set out as follows:

1. Background to King Island
2. Current Overview of Telecommunications Services on King Island
3. Experiences and Needs of Key Users, Businesses and Organisations
4. Summary of User Issues
5. Infrastructure and Service Gaps
6. Economic, Social, Safety and Business Impacts
7. Telstra and NBN
8. Future Available Options
9. Modelling
10. Observations and Recommendations
11. Contributors
12. About the Author
13. Attachments

BACKGROUND TO KING ISLAND

King Island is an island located in Bass Strait. It is 1098 sq km in size (being ~65 km long and ~25 km wide) located on the western edge of Bass Strait and is a part of Tasmania.

According to the 2016 Australian Census, the population of King Island was 1565. This figure comprises 411 family or group households, 842 occupied private dwellings. King Island Council have stated that the current population on 2019 is 1601.

The most compelling statistic from the 2016 Census is that 22.6% of the population do not access internet from their dwelling (significantly higher than the Australian average). In most other key demographic and financial aspects of the 2016 Census, the population of King Island is a cross section of a normal Australian community, other than the unemployment rate of King Island (3.3%) being less than half the national average (6.9%) and a greater proportion of employed King Island residents work 40 hours or more per week than the national average (49.5% vs 43%).

There are three major towns on King Island – Currie (the largest town and administrative centre), Grassy and Naracoopa. There are also ten other localities and villages.

The major industries on King Island are Beef, Cheese, Dairy, Fishing, Kelp and Tourism.

There are significant developments in progress for an export abattoir, a reopened scheelite (tungsten) mine, and international golf course developments. The mine is the largest tungsten reserve in Australia and the golf courses are world ranked. These new developments will provide a significant boost in revenues earned from King Island as well as a ~20% population increase within 20 months.

According to figures from National Institute of Economic and Industry Research, the Gross Regional Product of King Island has consistently outperformed the Tasmanian average GRP in terms of annual growth for the past 18 years, and factoring in the developments currently underway, King Island will be responsible for a GRP that is equivalent to almost 2% of the State of Tasmania. Details are provided in this report.

CURRENT OVERVIEW OF TELECOMMUNICATIONS SERVICES ON KING ISLAND

Approach

This report will review existing telecommunications services via a perspective that is meaningful to users rather than from a technology focus. Users identify with three kinds of service - broadband (or internet), landline and mobile, and this is the perspective we will use in this report.

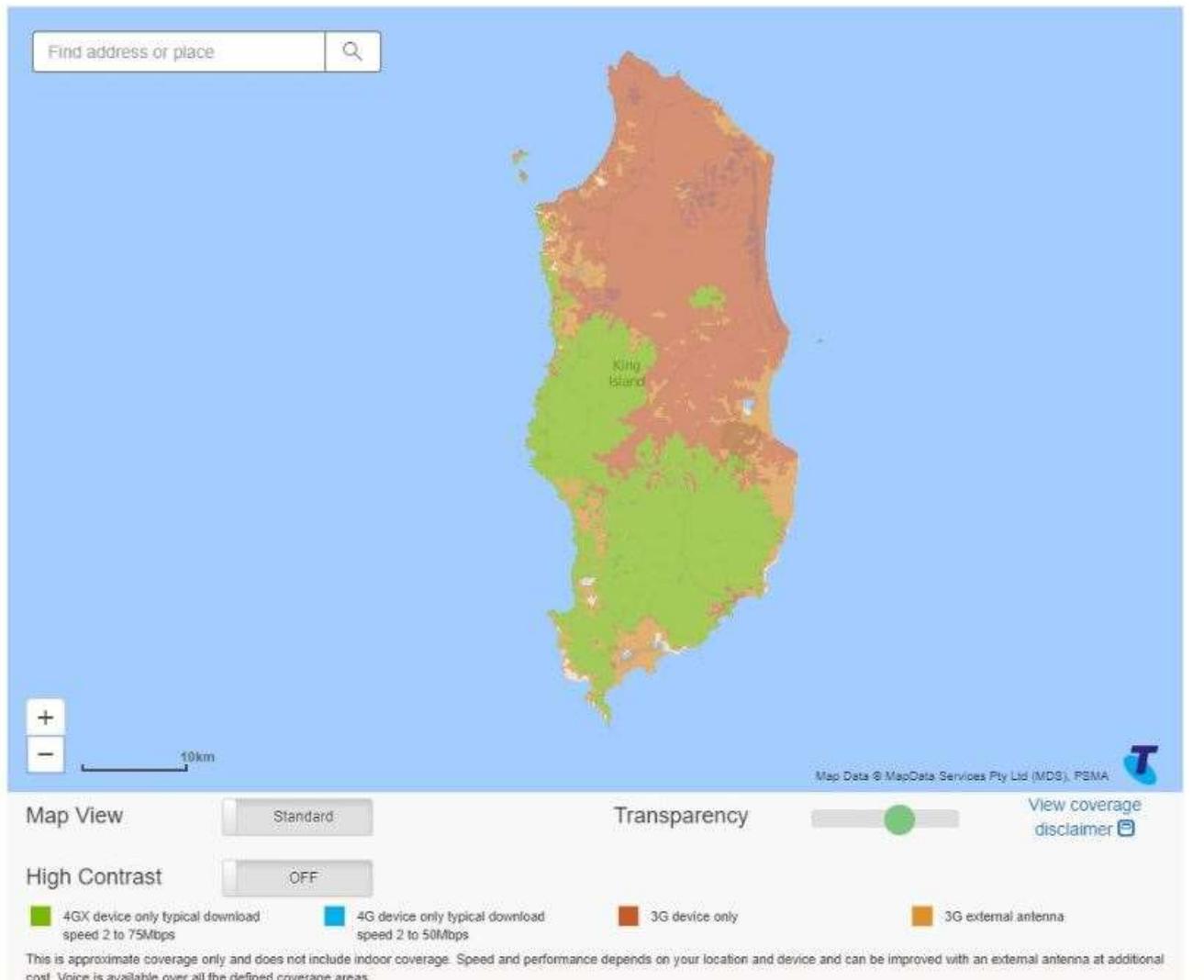
This review focuses on user experiences and did not focus on telecommunications service design or infrastructure, except where it relates directly to a user experience.

Mobile

Telstra is the only operator of mobile phone service on King Island. As domestic roaming is not supported in Australia, users of Optus and Vodafone networks visiting the Island have no service available. As WiFi internet also has limited availability and performance on King Island, then Optus and Vodafone users have limited options for using WiFi telephony products such as Skype, WhatsApp and Viber.

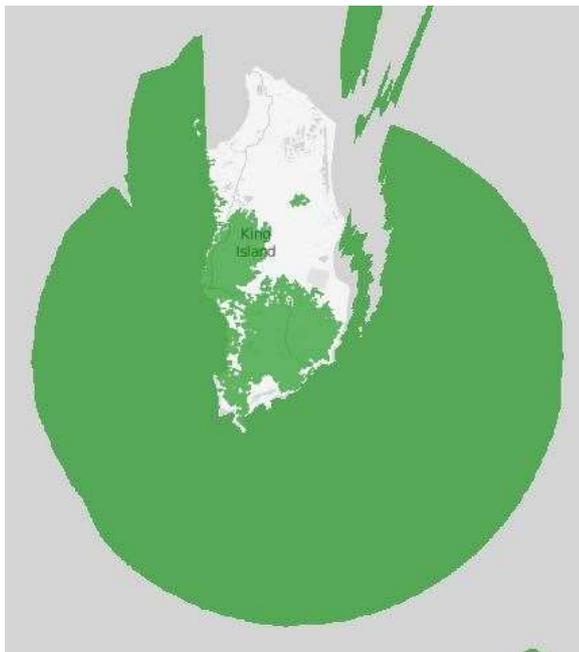
Telstra publishes the following coverage map for King Island on their website - which is used for sales and marketing purposes:

Coverage map



Whilst it appears superficially that there is 4G in the south of King Island and 3G coverage all over the island, there are some significant fine details that need to be considered.

There is an expanded version of this map available online at <https://www.telstra.com.au/coverage-networks/our-coverage> . If we look at the 3G and 4G projections of hand-held coverage from this source, we see the following:



4G



3G

It is important to note that the three above maps are all predictive coverage maps. That is a statistical prediction and it does not guarantee coverage in the areas shown for 100% of the time nor to 100% of mobiles. Also the predicted coverage does not take into account the impacts of vegetation, weather, in-building use, individual handset performance, nor all human influences (such as towns, man-made obstacles, user concentration and congestion, etc) at all.

However, what is clear from this coverage prediction, is that:

- 1) There is no 4G coverage predicted at all in 2 of the 3 towns on King Island (Grassy and Naracoopa) and that in much of the habited areas of these two towns the predicted 3G coverage excludes the use hand-held mobiles.
- 2) There is also no 4G coverage predicted and limited or nil 3G coverage predicted in a number of the key tourist areas of the Island.
- 3) There is limited coverage predicted east of Currie in Nugara, and also in the area just north of Currie where population, airport and businesses are located.
- 4) There are significant pockets of nil coverage at various populated places on the Island.

There was much comment received from users concerning the actual 3G/4G coverage experience on King Island versus the predictive coverage – and drive testing was conducted to validate that feedback. The results are presented in Attachment 1.

Drive testing was carried out with a software application on a hand-held phone inside a motor vehicle that was stationary at each place. In our opinion, this gives a closer measurement of actual user experience (as most usage is hand-held indoors or in vehicles).

The independent drive testing suggests that on all major roads (ie North, South, Grassy, Old Grassy, Pegarah, Fraser, Reekara, Ridges, and Cape Wickham Roads), it is generally not possible to make and hold a successful call from a vehicle or inside a building located by the road. Only in relatively few places on these roads does the service successfully operate at all/most times.

The independent testing also revealed that certain key areas outside of Currie (such as Nugara, Airport area, tourism sites on South Road, Wickham area) have very low levels of viable coverage.

As these tests were made in fine weather during non-peak times, this result is considered to be a coverage design issue, not a capacity or congestion issue.

The lack of 4G coverage on King Island is not an issue for making voice calls, but it is an issue for customers seeking to use mobile as a broadband service. There were some broadband performance measurements made at various locations on the Island and these results are presented throughout the report – however the average measured speeds were generally low and, in most cases, more than 10x below the independently reported average Australian 4G speed of 33 Mbit/s, and even further below the 50-75Mbit/s max capability claimed by Telstra in their published literature for King Island. 3G can be used for low speed broadband, although the measured rates on King Island were also lower than average Australian experience.

There are also a number of users with satellite phones. These were not reviewed in detail but are assumed to be Iridium phones (via Telstra) which would operate satisfactorily at this latitude within their design limitations (which include outdoor use and correct positioning of antenna). There are other satellite phone services sold in Australia – but due to the low elevation angle of their satellites these are unlikely to work well in King Island.

Landline

Telstra operate a landline service for fixed telephones on King Island. This is the traditional copper tail network to premise. There are a number of small rural exchanges in some villages across the island, and the services trunk to a Telstra facility in Currie.

It is assumed that local calls within the Island are switched and connected on the island, (whereas local mobile calls are likely not).

The age of the landline telephone network is likely to be very old and, based on feedback from users, is in need of repair and maintenance in many places. Water and storm damage are a frequent occurrence on the Island. Telstra no longer maintain a technician on the Island on a full-time basis.

Most users report significantly decreased or nil usage of their landlines – however many report keeping them for safety reasons due to lack of confidence in the mobile network.

The copper landline network is also used for ADSL based broadband services – although these are not universally available on the Island due to capacity, distance and line quality.

Telstra have a contract arrangement with the Commonwealth Government to deliver a Universal Service Obligation to all Australian residences and business. This was originally in the form of a standard telephone service and payphone service, however a new Universal Service Guarantee approach will broaden and modify this somewhat. Complete details of the new framework are still being settled. There is scope for King Island to take up deficiencies with the landline service with the Telecommunications Industry Ombudsman (TIO) for determination – which, if successful, can result in TIO directing Telstra to deliver more service.

Broadband

The following broadband services are available to users:

- Mobile broadband

- NBN Skymuster
- ADSL

And, in addition, some major users (such as Hydro, Health and the District High School) have their own corporate private network elements

A number of residents advise that Telstra is no longer supporting new ADSL south of Lymwood – meaning it is therefore no longer available in Grassy. Other users also report inability to obtain ADSL services due to lack of plant, quality of cable, or other capacity limitations.

The above service availability also means that relatively few people in King Island have the potential to access services at an interface speed of 10 Mbit/s or higher (ie only those with 4G or NBN Skymuster capability – and neither of these has a track record of consistent high committed rate services as far as King Island is concerned). The throughput of the mobile broadband service was also verified in several locations around the Island by this review – results are presented later in the report.

OpenSignal has reported on 4G speeds in Australia for a number of years. The average speeds in Australia over the past two years are in excess of 33Mbit/s download and 6 Mbit/s upload (with Telstra customers having marginally better results). In King Island however, measured 4G speeds well inside 4G coverage areas were around one-tenth of these levels.

A number of users have NBN Skymuster services. The overall King Island user feedback regarding NBN Skymuster reflects a level of dissatisfaction over performance and value for money – user experiences are detailed elsewhere in this report. Recently, there has been broader press articles and criticism of NBN Skymuster and NBN Fixed Wireless service performance. The reported perceptions and experiences of King Island users are not at variance with other users in Australia. Attachment 2 contains some publicly available information on recent Skymuster performance levels.

EXPERIENCES AND NEEDS OF KEY USERS, BUSINESSES AND ORGANISATIONS

Over the period 12th – 14th June, key users and businesses were interviewed on King Island. A community meeting was also held on 13th June, and community information was posted on the Council website inviting the general community to submit their views on the state of telecommunications on the Island, and many did this. In total, over 35 inputs/responses were received from businesses and the community.

There was also an earlier petition to Telstra regarding the poor mobile reception on King Island which was also tabled (but not included in this report).

The details of user interviews and feedback are set out in Attachment 5 to this report. This section also includes measurements of mobile coverage and upload/download speeds at user locations.

SUMMARY OF USER ISSUES

With respect to landline, mobile and broadband services, the following service issues and concerns have been identified by multiple users in multiple locations:

Landlines

- In poor condition in many parts of King Island.
- Repairs are difficult to report, expensive, and can take a very long time to occur.
- Landline services not available in some parts of the island now.
- Overwhelming feedback about poor service quality.
- Many people retain landlines only because the mobile service is so unreliable and much worse.
- Users have experienced severe degradation and non-availability periods extending to several days at time.
- Based on user feedback reports, these standards appear to be well below levels of service obligations that Telstra is expected to meet in the rest of Australia.

Mobile

- Every person and every business is dependent on and affected by mobile services.
- In much of the area of King Island (including 2 of the 3 towns) only 3G coverage exists.
- Whilst the coverage projections used in Telstra marketing information largely correlate with the measured performance in our independent verification, the user experience is that in most places on the island at most times it is not possible to reliably and repeatedly make or receive a phone call from a hand-held device in a building or vehicle. The independent verification measurements agree with this experience.
- There is overwhelming feedback about instances of WHS safety, business and personal risk and costs, related to mobile telephony failing to provide a service.
- Many users report that SMS messages can take several days to deliver.
- Service coverage is constantly varying in quality and signal strength, low capacity and coverage isn't optimised to where the population is.
- There is understandable and significant community concern regarding Telstra's announcement to withdraw the 3G service in future years.

Broadband

- ADSL has relatively limited coverage due to landline limitations – and feedback received suggests it is poor outside Currie.
- 4G mobile broadband only exists in the 4G coverage area and its capacity, speed and reliability appear well below (ie 10x below) average Australian experiences on the Telstra 4G network.
- 3G broadband is extremely slow – well below Telstra's advertised rates – and is reported to be unreliable on a day to day basis.
- NBN Skymuster is an expensive option for consumers (it is more of a business priced product) – and, in the view of users interviewed, it is not a particularly reliable service, nor does it offer fast internet. NBN Skymuster is an Australia-wide service and therefore this perspective may not be specific to King Island.

There are three more areas of user concerns that apply across all telecommunications services. These are equality, cost and Telstra – as follows:

Equality

- The best performance of telecommunications services appears to occur within the immediate township of Currie. It appears that in this confined area there is good 4G mobile coverage (although not always adequate for offered mobile broadband capacity), and also better performing – and available – landline and ADSL services.
- However, outside of Currie the situation is not the same. There are areas of poor landline performance, non-available or extremely slow ADSL services, and variable to nil dependably usable mobile coverage. The two largest townships outside of Currie (Grassy and Naracoopa) appear to have some of the worst telecommunications services on the Island, based on user reports.
- ~50-60% of the general population, and almost all of the key businesses and organisations that were interviewed, are located or critically depend on telecommunications services outside of Currie.
- For Currie based organisations that deliver service (such as schools and child care) there are issues of inequality in service delivery due to largely broadband and, to a lesser degree, mobile services that are available to clients' homes.
- Hydro Tasmania also reported that customers, including those with essential medical equipment in their homes, could have difficulty in reporting power issues promptly depending on their location.

Cost

Non-performing telecommunications services have both obvious and hidden costs to users. Obvious costs are things like the subscription that is paid for the service at times when it doesn't work. The less obvious or hidden costs are:

- Purchasing a service bundle that includes items you cannot possibly use (eg in the context of King Island purchasing a mobile telephone service with a high included data component that you can't reasonably use either due to your location in a 3G only zone, or due to the bandwidth capacity never being available to you).
- Retaining or purchasing an additional product because you have no confidence in the product you have purchased (eg retaining a landline service that you never use because you have little or no confidence in mobile, or purchasing Skymuster because you can't use mobile broadband for which you paid for a data allowance because it was bundled with your mobile service).
- Purchasing additional accessories in an attempt to improve service experience (examples (1) purchasing cellular booster at costs of up to \$2000 each, (2) investing in better home/office WiFi in a (misguided) attempt to improve service, or (3) investing in a top end iPhone solely to get better performing mobile service).
- Users often purchase a top end plan when there is poor performance in order to get an improved service (eg purchasing Skymuster 25Mbit/s with high included data instead of 12 Mbit/s – or a higher capacity Telstra Mobile Broadband service) – whereas a lower end plan would likely give identical underperforming service experience (including if its rate were throttled back).
- When mobile services experience dropouts and missed calls there are additional (otherwise unnecessary) calls made, often at a cost.
- Where broadband services do not operate well, there is often significant (unnecessary) retransmission of data and files. This uses up available data allowances and can incur additional

costs (NB most users on King Island have either Skymuster or mobile broadband – both of which will eventually charge for additional data).

The above costs are all hidden service costs which result in the user rewarding the carrier with more revenue in the event of a poor service experience. There are also costs of lost opportunity and business, inefficiency, and increased staff costs arising from poor telecommunications services. There was overwhelming feedback from King Island businesses about this, which is documented within this report.

Telstra

With the exception of NBN satellite service providers, Telstra is the only carrier providing landline, mobile and broadband services on King Island. Neither Optus nor Vodafone provide any mobile services, nor domestic roaming service via Telstra, and there appears to be limited awareness and capability for an Optus or Vodafone customer to purchase a prepaid Telstra mobile or broadband service on the Island.

All infrastructure on the Island is therefore funded by Telstra.

General feedback obtained from the community towards Telstra was universally poor – the most common complaints against Telstra that were made to us during the review were:

- Four day near total telecommunications outage at Christmas 2018
- Other near total outages at other times (eg recent King Island Show)
- Telstra's withdrawal of a full-time technician from the Island and therefore having weeks when there are no technical resources available to do urgent work on landline repairs
- Poor condition of most landlines (eg crackly)
- Inability to report faults to Telstra for many users due to mobile telephone calls being unable to hold long enough on the Telstra customer queues, and inability to use broadband
- Difficulties in getting refunds from Telstra where service was unavailable for long periods, and the (trivial) quantum of refunds when they are actually offered
- Time taken to repair landline faults (up to six months)
- Being recommended Telstra boosters as a solution to mobile problems, having paid the expensive cost, and found they do not meet expectations
- How the perceived mobile service quality has decreased over time – from CDMA (which appears to have been universally agreed to be good), to 3G (which was perceived as a lesser quality service due to holes in coverage that were not there with CDMA) to 4G (which has been perceived to have been disappointingly over-represented and under delivered)
- Lack of ADSL new capacity and existing performance
- Value for money (ie perception of how much revenue Telstra extracts from the Island versus how much it appears to spend on the Island)
- Equality of treatment with the rest of Australia

In our observation, the King Island community has developed such a cynical attitude towards telecommunications service provider integrity that some kind of initiative is necessary to reset that once some positive developments can be proposed.

To be fair to Telstra, there is also a reasonable level of cynicism from NBN Skymuster users about performance and value for money. These attitudes are not necessarily any different to other places in Australia, but they do appear to be affecting take-up of Skymuster in King Island.

A meeting was held with Telstra on 24th July 2019, where some of these issues were discussed, and this is summarised elsewhere in this report.

INFRASTRUCTURE AND SERVICE GAPS

The problem space for telecommunications on King Island exists in four areas:

- 1) Capacity between King Island and the rest of Australia
- 2) Capacity between centres and different parts of King Island
- 3) How users connect to the network (ie local distribution network, mobile base stations)
- 4) Network resilience and support

This review is not a detailed engineering assessment of the design of the King Island network, however the following observations are made regarding infrastructure and gaps.

Capacity between King Island and the rest of Australia

Telstra advised King Island is connected to the rest of Australia via a 1 Gbit/s digital radio link to Cape Grimm.

With that information and in the context of received user feedback, the following observations are made:

- The general trend in use of telecommunications services everywhere has been decreased use of local landline telephone services, and increased usage of mobile telephony and broadband (both mobile and fixed line).
- Local calls on King Island that are made between two landlines are likely switched on the Island. However calls that are made from, or to, a mobile as well as broadband internet and calls, all travel off-Island to complete – even if both parties are on the Island. This rapidly uses up capacity on the Island-Mainland link.
- Therefore, even if there is no change in usage, the trend of mobile and broadband means that an increasing amount of traffic needs to travel off Island (and often back again).
- Even local PSTN (telephone) calls made from emergency services radio or to ambulance paramedic pagers have to travel off Island to complete.
- There is a 25% increase in population and significant increase in technology-based business activity forecast in the next 12 – 24 months. This will also drive significant demand for Island-Mainland capacity.
- 1 Gbit/s is not a significant amount of capacity in the above context – it is around 600 kbit/s per (resident + residence).

From the observations above, it would appear prudent to have a dialog with both Telstra and NBN to determine what are the projected capacity requirements for King Island in the future and how these requirements will be met.

There are various solutions available including technology to do greater handling of King Island traffic on King Island, and additional digital radio point-to-point links, as well as submarine cable solutions which offer quite different cost, capacity and lifetime characteristics.

A digital undersea fibre cable would be a significant paradigm-changer for King Island and would render it with digital equality to the rest of Australia.

There are many network products available in the market that are suited to small territory deployments – such as Islands, scattered population clusters, etc. These include micro GSM systems (HLR, MSC products on small computers), commercial satellite equipment, mini and micro base stations, and point to point link technology. Many of these products are not within Telstra's national network design and do not fit their

normal approach for Australia. However, they are relevant to island communities and examples can be seen in various parts of the world (and previously including some Australian external territories, and South Pacific nations).

There are also a range of products that NBN could potentially offer to King Island and currently doesn't (eg business satellite services, fixed wireless/private LTE).

Capacity between different parts of King Island

During the review, it was clearly evident that call success rates appeared to be different at different places on King Island. Some businesses – such as Hydro Tasmania – also made very significant investments in cross-island fibre for their private network purposes. We know that the future Scheelite Mine, new Export Abattoir and TasPorts all require significantly more capacity from Grassy/Yarra Creek to Currie than can be provided on the existing Telstra network. Individual users and organisations also report instances of rejection of new service requests in the Grassy and Lymwood areas due to lack of capacity. In particular the Ballarat Clarendon College reported reducing student accommodation capacity due to non-functional/unrepaired landlines. We also have feedback from TasPorts that, unlike all other ports they operate from, the Grassy Port does not have enough capacity to even bring back CCTV security to their management centre.

In addition, the situation regarding capacity between local rural exchanges, base stations etc is unknown – and could potentially account for performance issues in some parts of the Island.

In meetings with Telstra, they also identified intra-Island capacity as a significant issue for them, and they also identified some current intra-Island links as unreliable (such as Cape Wickham to Counsel Hill).

We also know that the three most significant business and industrial developments in King Island are in areas that are grossly short of capacity – Cape Wickham area, Grassy and Yara Creek area (near Lymwood).

These issues combine to suggest that there needs to be an audit and planning exercise to determine what are the projected intra-capacity requirements for King Island in the future – and how these requirements will be met. This would require the active participation of Telstra, and also possibly NBN.

Private microwave is a possible and potentially cost-effective solution for business here, if other arrangements cannot be made.

How Users connect to the Network

Landline and ADSL broadband customers connect to the network via an individual line per customer. This either works or it doesn't – there is no issue of contention for the resource. One common issue that arose with several users was where landlines go over private property. Whilst at the time most of these lines were laid they were the maintenance responsibility of Telstra (or Telecom Australia before that), they are now the responsibility of customers. In a number of cases, these lines are in poor condition (either through age or the quality of initial installation) and consumers do not have the significant funds available to repair/replace them – and hence then rely on mobile.

Mobile customers (telephony and broadband) do not have individual connections and contend with each other to connect to the network. They do this via their proximity to base stations, by the available RF spectrum, and by the behaviour of other users. In addition, other factors (such as weather and unusual events) impact their ability to connect to the network.

Individual cell towers may radiate one single cell (via an omni-directional antenna) or more than one cell (in the manner of flower petals arranged around a stem) via sectorised antennas, which are usually shaped to suit the location and density of the demand. Sectorised antennas are more common in dense areas like cities – they give a stronger signal to a small area, and permit several cells to share one physical tower. Omni-directional antennas are more common in rural areas where usage is sparse and many users also have external antenna or boosters. Height of the antennas is also a factor in coverage – it can be an advantage in that increased height can provide greater coverage or a disadvantage in that it creates interference and reduces usage capacity. Cell towers may also have one or more frequency channels – which provides more usage capacity per cell.

Noting all of these factors, and without having information from Telstra, we cannot determine what kind of improvements could be made to the RF side of the cellular mobile service – however in generality, we can say that:

1. Visual inspection of some cell towers suggests that omni-directional antennas are used. Investment in sectorised antennas and additional electronics, creating a greater number of cells, would potentially increase capacity, performance, and coverage of the RF component of the cellular mobile service without requiring additional towers to be built.
2. Investment in one additional (or upgraded) and optimally placed new tower in each of Naracoopa and Grassy would provide a positive impact to a very significant number of users, and relieve usage on landlines.
3. Optimisation of the network would likely provide a significant increase in overall customer satisfaction – there are a very large number of customer reports of being in sight of a cell tower and not being able to make a call, or having varying signal levels.
4. Assuming the towers were originally placed to support a CDMA service – which was upgraded to 2G, then 3G, then 4G – it is a reasonable assumption that the positioning of towers, height and orientation of antennas, etc is possibly not optimised to the technology that the towers are currently carrying. This appears to be borne out in 100% user feedback about the CDMA network having fewer black holes and a better user experience.

In subsequent discussions with Telstra (24th July 2019), it was hypothesised that the following steps would significantly improve mobile coverage and access in all places on King Island:

- Various actions (including optimisation, sectorisation and raising height of the existing towers) at Currie, Gentle Annie, Counsel Hill, Grassy, King Island Dairy, Cape Wickham.
- Additional towers or upgrading in Naracoopa, Yambacoona and Grassy

The above three sections relate only to network access – ie the different capacity issues discussed earlier. The network support issues discussed next are also required to be addressed for a user to have a working service experience.

Network Resilience and Support

There was a lot of feedback from the community about network resilience and support. Specific major points were:

1. Multiple multi-day outages in telecommunications services in the past 12-18 months
2. No qualified Telstra technical support on Island for periods of a week at a time

3. Concerns regarding back-up power availability at key mobile towers and sites

In addition to the above, there was a larger collection of user reports about the landline, broadband and mobile services performing poorly and/or mobile coverage varying at various times of the day in various locations. These may well relate to peaks on usage congestion, backhaul network capacity, RF design, and/or susceptibility of the network to certain factors (eg rain/water in landlines, old landlines, wind, interference).

Partly through active encouragement by Telstra in response to customer complaints, there are a significant number of cellular boosters installed on King Island. Whilst many of these are recommended Telstra products and solutions, it is reasonable to expect from normal customer behaviour that a number are likely not. It is also possible that some of these may cause RF interference with the mobile service if they were not properly installed and configured. Whilst there are reports of customers being told by Telstra that their mobile issues are a result of interference from illegal transmitters, there were no verified cases presented to us (and this issue is straightforward to verify). Illegal boosters should be discouraged, but equally there needs to be no “overselling” of the benefits of the recommended Telstra booster product, because it will not solve all problems for all people. If “oversold” then the failure to meet expectations could drive certain users towards exploring other available technology “solutions”. Of course, if the King Island mobile network performed as well as the Telstra mobile network in the rest of Australia, the entire subject of boosters could be largely avoided.

In discussions with Telstra on 24th July, they agreed that there was a collaborative role they could play with the community in providing more information about correct application, use and installation of boosters. They also made the statement that they don't profit from booster sales (it is an “at cost” item). Based in our own research and experience with purchase and installation of boosters, we broadly agree with this statement.

The other network resilience issue related to NBN Skymuster. From current available performance information (see Attachment 2) and also various articles in the current Australian press, its clearly has a lesser reliability than a reasonable consumer would expect. In general, King Island consumers are not happy with Skymuster's value for money proposition – and most appear to have only taken this path out of lack of options available from Telstra. This is a problem not confined to King Island.

ECONOMIC, SOCIAL, SAFETY AND BUSINESS IMPACTS

Economic

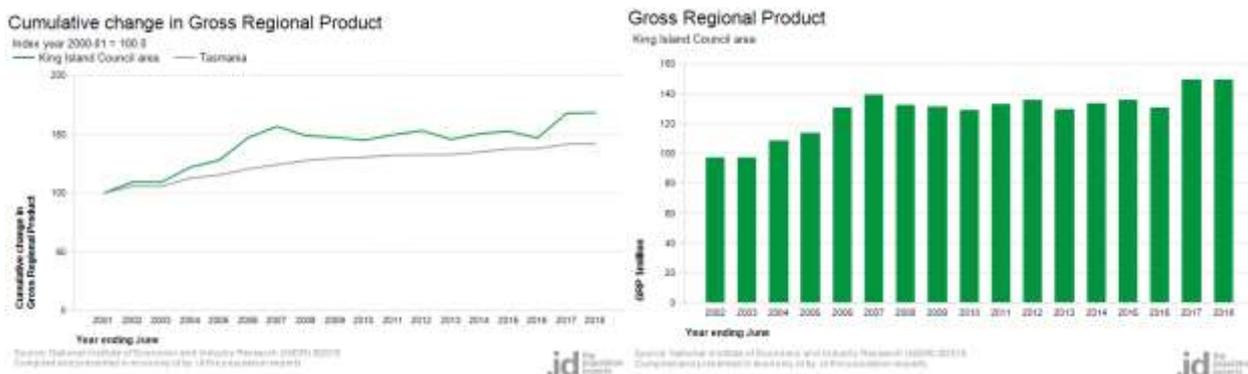
This section considers the current position of the King Island economy and the coming changes due to industry commitments in the next 1-2 years.

Present Situation

According to the 2016 Australian Census, the population of King Island is 1,585 people. There are 842 private dwellings and 384 families. There appear to be no significant demographic variances with any comparable (LGA) local government area in Australia, other than the unemployment rate of King Island (3.3%) is less than half the national average (6.9%) and a greater proportion of employed King Island residents work 40 hours or more per week than the national average (49.5% vs 43%).

According to the National Institute of Economic and Industry Research (NIEIR), in 2018 the Gross Regional Product of King Island LGA was \$150m and growing much faster than the average growth rate for other

Tasmanian LGAs. King Island GRP has grown 68% in the past 15 years and accounts for 0.5% of the overall GRP of Tasmania. See graphs below:



These results suggest a current GRP of ~\$100K per person, and do not include a number of key industries that are wholly located in King Island but report results in another state as a consolidation (eg King Island Dairy).

0 – 24 Month Outlook

There are three significant economic developments identified in this review that are committed for King Island in this period. All of these developments contribute significantly to the local economy and all require telecommunications solutions that do not currently exist, nor are on any committed plan.

Cape Wickham Links

The course is rated #24 in the world and #4 in Australia. It was opened 4 years ago (2015). It currently has 16 villas, one 18-hole course, and a temporary clubhouse. The course currently does 5000-6000 rounds of golf per annum and employs 18 full time people.

The business was recently purchased by an overseas consortium who have plans to build a new clubhouse, expand the villas to 90 (multiple bedroom) villas, and to eventually build a second 18-hole course.

As the business grows, they predict they will do 25,000 rounds per year on the current course. When the second course is built, they predict that they will do 40,000 rounds per annum.

When the next round of expansion is complete, the facility will likely house over 300 people in the 90 2-3 bedroom villas, have over 100 players on each course at a time, and another 10-30 in the clubhouse, plus over 20 staff on site at any time. The current internet and mobile facilities clearly cannot cope with that sort of increased usage (and in fact don't cope with current usage). International and mainland visitors will have expectations of communications services which are not currently being met.

The economic impact of a successful Cape Wickham development is estimated at:

- 10 additional full-time jobs
- Additional 300 tourists on the island at any time
- \$16m pa additional in income (35,000 additional rounds at \$200 ea, 74 additional villas at 75% occupancy at \$400/night, Other clubhouse revenues of \$1000/day)

King Island Scheelite Mine (Grassy)

The mine will be located between Grassy and Grassy Port. It will comprise the open pit, a processing facility, and an administration building. Details are in Attachment 4.

The mine will be locally operational in 20 months and have 55 staff – some of these workers will be FIFO, but the majority will be permanently based on King Island with their families. As such they will come with an expectation of having good internet and phone facilities in their homes.

Published information about the mine suggests an average annual production of 200,000 metric ton units (mtu) of WO₃. At a price of US\$350/mtu this suggests annual gross revenues of A\$105m. This is also one of the worlds highest grade tungsten deposits.

The economic impact of a successful Scheelite mine at Grassy is estimated at:

- 55 full time jobs (the majority full time residents with family)
- \$105m revenues per annum (rough indicative estimate only)
- Additional trade for local businesses (eg commerce, housing) and TasPorts

Export Abattoir (Yarra Creek)

The new export abattoir will commence in late 2019 and process up to 180 animals per day – 80% export, and 20% national (Australian) market. It has been independently verified that for every \$1 invested it will expand the King Island/Tasmanian economy by \$2.54 (this was demonstrated in Court). Also 20% of the Tasmanian red meat market is based in King Is – and 70% of that is premium non-commodity meat product.

The abattoir will be located near Lymwood (Yarra Creek Rd) – and a 5 day/week operation employing 80-85 people at peak (50% at other times). The company will spend \$43m on the abattoir and \$3m on employee housing (for 30-40 people). The office will also employ 10 people.

The economic impact of a successful export abattoir at Yarra Creek Rd is estimated at:

- 50 full time and 45 part time jobs
- \$3m invested in King Island housing
- Net positive impact on the King Island / Tasmanian economy of \$116m from the investment
- Net revenue of \$150m pa (based on a set of assumptions regarding market price, volume and processing costs of prime Angus beef)

Economic Situation in 24 Months

These are three major committed projects that assume significant improvements in telecommunications services on King Island will occur (NB at the current time the required services do not exist). These three projects will deliver over \$300m pa additional to the GRP of King Island, over 110 full time jobs, over 40 part time jobs, up to 300 additional tourists on the Island per day, and flow on investments in consumer demand, housing construction etc.

If we factor in the above key developments, together with an estimate for King Island Dairy (which doesn't report its results in Tasmania but is wholly located there), and the historical reported GRP data, then the King Island economy should exceed GRP of \$500m within two years, which is almost 2% of the entire Tasmanian economy.

Social

There are significant social impacts today for a community that does not have access to modern telecommunications services, and in particular, mobile and broadband internet services.

In this section of the report, we will not consider the actual costs and other qualitative impacts on business and individuals – but we will highlight the quality of life/social impacts that affect individuals, and also affect an outsider perception of King Island as a place to live, to work or do business with.

Lack of useability for, or basic access to, broadband internet is a major issue for young people. It isolates them from friends, their community, from certain employment, and from opportunities. It will be a major factor in young people leaving a community to seek opportunity elsewhere (NB this is a reasonably well documented phenomena in rural Australia, which generally has better internet services than King Island).

Equally, workers (particularly with families) are less likely to move to King Island if it is difficult to maintain contact with their homes, friends and family off-island. This is not only social, but also perceived disadvantage in business, education and opportunity. It is a distinct disadvantage for FIFO workers, but newly settled workers who brought families to the island will also be affected by inability to make contact during the day with families at home.

Also people who want to access education on King Island are disadvantaged. Universities and training colleges have minimum assumed internet performance levels for remote students accessing courses, resources and exams. Students who don't meet these levels are forced to travel to meet a part of their education course commitments – examples of this were cited in the review. Significantly, travel off King Island isn't efficient with almost all trips required to be multi-day due to airline frequency and schedules.

All businesses in Australia need to engage more frequently with online systems such as Xero, MyGov, MYOB, banking and payments, and industry systems such as LPA and NLIS for beef producers, etc. Many of these systems, for practical and cost purposes, are now effectively mandatory. There are penalties and costs for non-use and late submission. In 2019 it is almost no longer understood by business and government agencies outside of King Island that the performance of the internet, and multi-day lack of connectivity, could be reasons for late payment and late submission of mandatory documentation. Many organisations now make no provision for non-internet based submission or payment. As well as obvious costs to business, this has social and stress implications on people who have to operate businesses in such a difficult environment.

Entertainment services – such as radio, free-to-air TV, subscription television – have made huge transitions to internet-based options. Digital radio, Netflix, Stan, Google Movies and TV, ABC iView, Yahoo7, SBS OnDemand, etc are a significant proportion of mainstream filmed entertainment and TV in Australia now. These new media channels represent all of the growth, and the traditional channels of broadcast TV and AM/FM radio have been in audience decline for a number of years. Furthermore, most newspapers are now consumed online. Lack of access to good internet services will further and further isolate the King Island community from the entertainment and news options available to other Australians. It will also require the King Island Council to continue to invest in terrestrial re-broadcast facilities – and to increase that investment.

One of the items that tourists require of a destination are good internet and mobile phone communications facilities. King Island cannot offer connectivity to Optus and Vodafone customers (who collectively are a greater proportion of the market than Telstra) – nor is there a Telstra prepaid product solution easily available for new arrivals. The inability to use internet at the holiday destination is a deterrent to returning. This issue is also more important to higher socio-economic/higher net worth tourists (who are possibly more likely to be motivated to visit King Island resorts).

Finally, one of the unique King Island behaviours noticed during this review was the practice of people leaving their homes and driving their vehicles to certain places on the island where there was sufficient coverage to do email (on a laptop PC) and make necessary phone calls. This is a social disadvantage

and imposition to home and family life, which, if it was a necessary practice in any city in mainland Australia, would be widely criticised and condemned.

Safety

A number of very clear safety issues were identified by various businesses and organisations that were interviewed. These are identified earlier, but include:

- Ambulance Service – ability of people to call an Ambulance in an emergency, as well as the ability of the Ambulance Service to activate paramedics and volunteers, both of which lead to worsened paramedic response times (NB use of mobiles to call emergency services is a positive initiative as the position of the mobile can be automatically reported to the emergency control centre);
- Hydro Tasmania – ability of people to alert them of power supply issues and emergencies, and also their ability to communicate between the power station and their centres and to coordinate activities with their workers in the field. There are important issues of electrical safety, continuity of power to essential equipment (including medical equipment in homes) and also safe-working practices of staff;
- TasPorts – unable to obtain the necessary capacity of communications to Grassy Port to operate security, video and other systems in accordance with the practices in other ports;
- Child Care and Early Learning Centre – difficulties in access to correct records (including medical records) and with contacting parents in emergencies;
- Safety at Sea – despite the information on published Telstra marketing materials, there is limited viable mobile phone coverage in many locations and areas off the coast of King Island – this is an issue for vessels without satellite or other alternative communications;
- Safety on Golf Courses – both Cape Wickham and Ocean Dunes reported issues with player safety and an inability to quickly react to players in medical difficulty;
- Road safety - ability to call for assistance in event of breakdowns and traffic accidents; and
- Building, construction and trades – many businesses reported potential and actual safety issues with locating and communicating with their workers and machinery that may be at jobs in various parts of the island. This safety issues was also identified by all farming businesses interviewed.



Finally, on the subject of safety, a draft of the King Island Municipal Emergency Management Plan (MEMP) was also reviewed. The purpose of this document concerns how the community is prepared for responding to and recovering from various emergency and disaster scenarios, and also how these are

mitigated and prevented. A typical MEMP address and defines important roles and responsibilities during such incidents. Other important functions that are assumed in a MEMP are:

- The ability of emergency and other services to communicate with each other;
- Dissemination of information and warnings to the community;
- Contacting and making arrangements with the world outside King Island

The above issues are all related to communications and there are a few concerns in this regard that are very specific to King Island. These are:

- Possible lack of Telstra resources on the island at the time of an incident
- Lack of communications facilities due to multiple single points of failure (eg power supply, towers)
- Lack of identified, available generators and local spare parts to support likely failure scenarios in telecommunications services
- Inability of much of the community to receive emergency instructions – by effectively accessing websites, receiving text messages, and/or making/receiving calls – particularly if the network is under any kind of duress
- Inability of disaster and recovery teams to use mobile phones (NB this aspect is never a formal requirement of a MEMP, but it is universally acknowledged that mobile phones are useful and used in such circumstances).

TELSTRA AND NBN

Telstra

Telstra were invited but did not participate during this review, however a meeting was held at the conclusion (24th July) to discuss some matters arising.

Availability of PrePaid SIMS

If a tourist or visitor were made aware that there was no Optus or Vodafone coverage on King Island and (importantly) were also made aware that the broadband internet on King Island was not good enough for IP messaging and telephony (eg WhatsApp, Viber, and Google Messenger) then, we believe, almost every person would be seeking a Telstra prepaid mobile SIM for use on arrival on the Island.

Having a sales capability at the Airport or in accommodation places in Currie, could satisfy this demand. It would also have three more advantages for Telstra:

- 1) Some proportion of sales may actually convert to long term customers;
- 2) Prepaid is extremely profitable service for Telstra due to the higher implicit tariff and the card breakage levels;
- 3) A significant number of additional customers using the King Island mobile service gives Telstra an improved business case for bringing the standard of mobile coverage and mobile broadband up to equality with the levels enjoyed by the rest of Australia.

At our meeting on 24th July, Telstra agreed that this was a good initiative.

Landline Maintenance

Telstra has a contractual obligation to the Commonwealth for the Universal Service Obligation (USO) for standard telephone service and payphones. There have also been some changes in recent years to these

arrangements with the Commonwealth looking more broadly at universal service guarantees – refer <https://www.communications.gov.au/what-we-do/phone/phone-services/universal-service-guarantee-telecommunications>

This review did not look deeply at Telstra’s legal requirements under this subject, however the following observations and recommendations are made:

- 1) Over the years, there has been a shift in focus by the Commonwealth from a standard telephone service/payphone definition to something more broad. However, this shift has occurred during a period where service problems with the basic standard phone and payphone in Australia have dissipated due to either the services now being maintained properly, or not being required due to other replacement technologies. Neither of these changes have occurred on King Island – and the situation there is largely unchanged from time of the original USO.
- 2) Prima-facie it is difficult to conceive that the USO or universal service guarantee is being met on King Island where we have an environment of multiple multi-day outages of basic telecommunications services affecting most or all of the island; where landline maintenance resources have been reduced and removed from the Island for significant periods of time and have to be flown in to deal with work; and, where the usual replacement alternative technology – mobile – is also unreliable across the Island.
- 3) It is suggested that the above be fully investigated and escalated to the local member of Federal Parliament.

3G

It is a matter of public record that the 3G service is being shut down in Australia. When it does shut down before 2030, it will be a total shutdown - including King Island.

3G operates in Australia under two frequency bands: Band 5 (850 MHz) and Band 1 (2100 MHz). Most 3G phones can operate on both bands, but some phones (possibly early models) are limited to either Band 5 or Band 1. According to OzTowers.com (which has also been quoted by Telstra as a source) there were in 2016 approximately 217 Band 5 towers and 38 Band 1 towers in the Telstra network in Tasmania.

In 2016 Telstra announced that the 3G network would be shut down, commencing with 2100 MHz spectrum in 2020, and followed by a geographic but eventually complete shutdown well before the Commonwealth guideline of 2030 – most likely complete by 2022. (NB the purpose of the shutdown is to release spectrum for 4G and other mobile technologies).

Telstra also advised that the 2100 MHz Band 1 spectrum was largely being used for additional capacity, not exclusively used for coverage. This means that 3G users with phones that work in both bands (which is the majority) would not be affected by the Band 1 shutdown in 2020 until the major shutdown occurred.

From the independent drive testing on King Island, no Band 1 signals were detected. We therefore conclude, given this observation and Telstra’s own announcement, that its likely that the 2100 MHz shutdown would have minimal impact on King Island (NB Telstra confirmed on 24th July that there was no Band 1 spectrum used on King Island. However the question of how progressively and when 3G will be shut down on King Island remains open).

Obviously the main 3G shutdown – possibly towards 2022 – would have a major impact on King Island given the current state of 4G coverage.

4G

All available literature suggests that Australians enjoy some of the fastest 4G speeds in the world. The average download speed in Australia for 4G was measured to be in excess of 33 Mbit/s by OpenSignal (with Telstra customers enjoying a slightly faster rate) – and it has been improving each year. Telstra’s own statements about their 4G product portfolio state a minimum download speed of 2 Mbit/s and maximums of 50 MHz, 75MHz and higher. (refer <https://www.telstra.com.au/coverage-networks/telstra-4gx>)

The 4G experience on King Island isn’t anywhere close to the average Australian experience, and in fact in many cases that were it tested failed to meet Telstra’s stated minimum level inside their coverage areas. This is likely to be due to all of the following issues combined: limited capacity from King Island to Australia; limited trunk capacity within King Island; as well as access to the network by mobiles. Furthermore, the service coverage area does not reach over half of the population, nor most of the tourist destinations.

Given the higher dependence on mobile broadband on King Island due to the state of ADSL/landlines and NBN, we believe that this (4G) is an area that requires significant future work and enhancement.

Co-Investment

It is understood that some preliminary discussions had occurred between the King Island Council and Telstra regarding potential paths for improving local telecommunications services through co-investment. No specific details were available for review.

Co-investment can be a pro-active and constructive option – however the following observations and recommendations are made:

- There are competitive options available for co-investment. Telstra is not the only player and at the least NBN should also be consulted;
- Any co-investment should be evaluated on net benefit to the community (in terms of either committed improvements to services that the community is using, or a financial return on investment in infrastructure) – for example, a proposal for an investment in a piece of infrastructure without a perspective of service level return or financial return (which might be termed as a “capital contribution”) should be reviewed seriously;
- Government grants, black-spot program funding, interest-free loans, and business contributions may all be available sources of funding.

It is our hypothesis that the best outcome for King Island consumers and small business is a single network technology that covers the entire island with an acceptable level of services and breadth of supported products in all areas of the Island where it is required. The alternative of separate networks (landline/copper/ADSL, plus mobile, plus satellite broadband) simply means there is greater overall investment necessary by service providers and actually also by customers. Of the existing network infrastructure on King Island, the 4G/LTE technology network is the closest thing to the recommended solution. However it requires significant investment and increased capacity within the Island, and between the Island and the mainland. Therefore, there is some logic that says this direction should have the lowest requirement for new co-investment. Whether or not that is the case would depend on Telstra’s position and response.

Summary Issues to Pursue with Telstra

- Expansion of local sale and promotion of prepaid SIMs (for mobile and broadband) so that it is easier for tourists to obtain them. (It is not clear that the Post Office has viable prepaid broadband SIM stock at all – most of these products requires good working broadband to activate and apply credit)
- Support (financial, information and resources) for providing education and information to the community about optimum use of telecommunications (eg boosters, use of phones in marginal areas – see details at end of report)
- Landline service performance levels (and also pursue with TIO and Federal Member if necessary)
- Confirm 3G shutdown arrangements
- Understand future 4G developments planned
- Additions to intra-island trunk capacity and capacity to mainland Tasmania or Victoria
- Discuss more specifics regarding any co-investment opportunities

NBN

General

NBN (the network) and *nbnco* (the company) are owned by the Commonwealth Government. *nbnco* has an obligation to provide broadband internet services to all Australians at a minimum download speed of 25Mbit/s. There have also been legislative regulations protections put in place to enable *nbnco* to fulfil this obligation.

King Island is not an exception to the requirement that Australians have access to 25 Mbit/s.

The NBN has “wired”, “fixed-wireless” and “satellite” options as follows:

Wired – includes (i) fibre to the premises (FTTP) which is the fastest and most consistently performing service available. It reaches about 15% of Australian homes, (ii) HFC, which is broadband delivered over Telstra PayTV cable infrastructure, and (iii) fibre to the node (FTTN) which brings fibre to a locality and reuses the existing copper network, replacing ADSL with VDSL technology – this is projected to reach at least 60% of Australian wired access users.

Fixed Wireless – is where users have an antenna and the broadband is delivered by radio broadcast to them. This is LTE technology (which is the same technology as 4G).

Satellite – this uses a satellite dish and it is the NBN Skymuster service. It is only sold by *nbnco* where fixed wireless and wired access options do not exist.

NBN on King Island

Whilst *nbnco* has the option to deploy any of the above technologies on King Island, it is only currently deploying satellite and has advised at this stage it has no other plans.

Attachment 2 provides comments on the performance of the NBN Skymuster service – there are clear issues with this service that mean it is unsuitable for business and heavy internet usage.

However, in specific discussions with senior *nbnco* executives in June 2019 regarding King Island the following additional options were identified as viable for consideration:

- 1) A business version of the NBN Skymuster product will be available in late 2019. Whilst no technical details are available publicly, it is understood that this new (and higher priced) service

will address many of the issues that businesses face with the current Skymuster service, including committed access rates, reliability and symmetry. This service will not be available universally, and it will require an *nbnco* business decision to extend the NW Tasmania beam to include King Island.

- 2) There is available LTE spectrum licenced to NBN on King Island for use with a future fixed wireless system.
- 3) *nbnco* has stated it is willing to discuss any co-investment scenarios with King Island. It has done this with other organisations and corporate businesses in Australia. This includes potentially anything up to and including a fibre link to the mainland.
- 4) If there was sufficient demand and capacity, *nbnco* could consider the viability of converting some of the existing ADSL services around Currie to FTTN (ie VDSL – wired access)

Comments and Summary of Issues to Pursue with NBN

Fixed wireless NBN has had significant recent bad press in Australia concerning its inability to reliably deliver 25 Mbit/s to users. Various reasons have been proffered outside *nbnco* for this outcome, including the quality of the particular technology being used, the RF design of the systems, and potential overuse by more customers than originally projected. However, even at its worst projections of 8-10 Mbit/s, fixed wireless would still provide a significantly better service on King Island than anything else does today. A fixed wireless service – being LTE – could be relatively cheaply and quickly deployed relative to many other options. (NB relatively cheaply does not mean inexpensively).

The business satellite version of Skymuster looks like the most straightforward to implement, should *nbnco* decide to implement on King Island. The potential concerns would be:

- Whether Business Skymuster would deliver on its projected performance, or grossly underdeliver to the same degree as Residential Skymuster; and
- Its cost is unknown

The summary issues to pursue with *nbnco* are:

- Improvements to current Skymuster performance, speeds and data allowances
- Whether the Business Skymuster product will be available for King Island
- Potential LTE service extending to King Island
- Potential co-investment projects (given their expressed willingness to discuss them)

Our analysis of NBN possibilities for King Island are that unless *nbnco* are prepared to look at supplementing the existing 1 Gbit/s digital radio system to the Island (either through direct or co-investment with a government grant) then we are limited to satellite services for King Island. The only satellite service today is Skymuster – its problems are well documented and its problems are not limited to King Island. The potential future service is Business Skymuster but we do yet know its performance guarantee, nor costs – and we also have no confirmation yet that it will even be available on King Island.

The point should also be made that at \$150 connection fee, plus \$150/month, the cost that would be imposed on the community (900 homes) for residential Skymuster exceeds \$1.7m pa. This is for a service that has significant levels of poor user feedback (nationally), low effective speeds, and significant downtime. Business Skymuster would certainly cost more and based on residential Skymuster performance, it requires a lot of confidence from customers to assume it will meet any of its stated objectives. At these levels of annual cost, other investment options (outlined herein) look attractive.

FUTURE AVAILABLE OPTIONS

Throughout this review process and this report, a number of short, medium and longer terms options that can be pursued by the community to improve telecommunications have become evident. These are summarised below and we believe that all of these options offer some improvement to user experience. Some of these options are easy and low cost to implement, and could provide immediate relief to the current difficulties.

They include:

- 1) Giving the community information for getting the most out of telecommunications – including setting phones in marginal coverage to 3G-only usage, correct use of antennas and boosters, specific mobiles with better RF characteristics, height, phone power settings, etc. This is an information program that could be managed by the Council, and perhaps some funding could be obtained from Telstra.
- 2) Having a specific power backup plan with generating equipment identified and having equipment available at specific telecoms facilities.
- 3) Add more telecommunications specific arrangements to the current DISPLAN for King Island
- 4) Having at least one senior experienced ACMA accredited comms technician on island to advise and assist with any telecoms or onsite premise work.
- 5) Providing some solutions information to the community – such as:
 - Using an additional data SIM in a designed RF router in lieu of a phone hotspot – for better broadband experience.
 - How to join two independently unreliable telecoms broadband services together to achieve a more reliable outcome
 - Simple low cost technology solutions to permit a property owner to secure a working mobile broadband signal on one part of their land and bring it back via another point-to-point technology to the house/building where it is needed
 - More locally relevant information on instances where cellular boosters would be a benefit, and correct ways to source and install these
(NB Telstra should be asked to fund some of these)
- 6) Using community leverage (ie the community acting as one customer) with carriers to secure their investment in King Island based infrastructure
- 7) Using federal member of parliament to actively lobby the cause for Federal funding, and secure blackspot funding for mobile communications (as has been done in other federal seats)
- 8) Create an agenda of options with *nbnc* (including private LTE spectrum and business satellite services)
- 9) Create an agenda of options with Telstra for maintenance resources on island, for more optimisation of the mobile networks, and an agreed priority list and timetable for improvement in the 4G network
- 10) Engage with potential other providers/operators who may be prepared to build infrastructure on King Island in return for participation in revenue (some details of who these organisations may be and what they may offer is contained in Attachment 3)
- 11) Taking specific safety, security, WHS and maritime safety issues to appropriate authorities for funding
- 12) A community/business cooperative to co-invest in new services and facilities

These options are discussed further in the final recommendations.

MODELLING

Revenue and User Assumptions

The following is a baseline economic model estimate of King Island:

Baseline

Residential

Assume that:

- 33% of 900 dwellings have landlines at \$30/month (~\$107,000 pa)
- 250 dwellings have ADSL at \$70/month (\$210,000 pa)
- 95% of 1500 residents have mobile phones at \$40/month (\$685,000 pa)
- 100 homes have NBN Skymuster at \$150/month (\$180,000 pa)
- 900 mobiles have additional data plans/usage for mobile broadband at \$35/month (\$378,000 pa)

This suggests on the current island population and usage that ~\$1.6m is spent by the residential market on telecommunications service revenues.

Business

Excluding the new business developments, as well as excluding Hydro Tasmania private links, the Hospital and Public High School, then if 70 businesses spent an average of \$750/month on telecommunications – this annualised spend would be \$630,000)

The above suggests that the current per-annum spend on telecommunications from King Island residents and businesses is roughly \$2.2m pa

Tourism

Assuming 750 tourists per month (at the current levels) then if they were to spend \$30 each on telecommunications whilst on King Island, that would add \$270K pa to the annual spend. This figure is likely to be higher if there were solutions on the island for Optus and Vodafone customers.

Therefore minimal tourism, and a conservative production of residential and business brings the baseline spend on telecommunications to around \$2.5m pa excluding Hydro, the hospital and high school.

Potential Upside

If we consider the impact of the three major business developments that are happening in the next 20 months, this adds approximately 250 people to the general population, 100 dwellings, and up to 300 tourists per day in peak season. In addition, there are three new major businesses that require significant telecommunications.

If we roughly model the impact of these increased numbers against the earlier baseline assumptions, it suggests a conservative view of the total telecommunications expenditure could be in the \$3.5m area.

Investment Metrics

The following is an extremely “back of an envelope” analysis of investment metrics and possible directional scenario for King Island. It is not a recommended direction without significant detailed due diligence having been undertaken. The purpose of this analysis is to make a directional statement that will generate discussion with a view to then forming a solution.

- 1) Based on the \$3.5m annual revenue figure, and applying “normal ballpark” telco carrier margins and rough costs, we believe this level of revenue would be sufficient to support a capital investment of about \$4m in infrastructure that had a 10 year operating life.
- 2) The most cost effective way of providing a suite of telecommunications services to King Island would be to provide a single network infrastructure that supports all required consumer services – which in this case would be mobile voice/telephony, fixed telephones, mobile and fixed broadband and video. This network technology would be a mobile/radio technology that supported fixed services.
- 3) A particular network technology that would meet the needs of (2) is LTE/4G (and possibly Telstra’s investment in 4G at the expense of landline investment reflects their agreement with that strategy as a direction)
- 4) Using rough and untested cost estimates for design, construction and commissioning of the following kinds of network assets, being:
 - a. Cellular tower and equipment enclosure - \$100K per location
 - b. Cellular electronics - \$20-50K per tower (sectored cells)
 - c. Point to point microwave link - \$30K ea
 - d. Switching node (MSC, HLR, BSC) - \$1m
 - e. High Capacity STM4 (2.5 Gbit/s) Digital Microwave to Mainland - \$500K
 - f. Potentially supplement the off-Island capacity with a large dish C-band VSAT service (NB large dish to support faster uplink speeds) for additional internet capacity

You then arrive at a budget of \$2.5m - \$3m for building an independent LTE/4G infrastructure with 6 base stations, and increased capacity to mainland.

The purpose of the above metrics and analysis is not to recommend a design, nor argue a case for a replacement of the current infrastructure, but to make the point that King Island isn’t an unprofitable venture for a telecommunications operator and King Island’s levels of usage can certainly support a proper investment in telecommunications infrastructure. King Island should not permit itself to be regarded as a low priority “after-thought” or “charity case” – it is one of the fastest growing parts of the Tasmanian economy and has a significant economic base.

Note the above revenues in this model were a conservative estimate (no party that was interviewed claimed to spend this little on telecommunications) and telecommunications infrastructure estimated were basic but likely to perform significantly better than the current services.

It is important that King Island Council have some independent knowledge of the Island telecommunications usage economics, and of general investment metrics for telecommunications, when seeking Federal funding and negotiating co-investment scenarios with NBN and Telstra.

OBSERVATIONS AND RECOMMENDATIONS

The state of telecommunications services on King Island were first reviewed by TechProject in 2015 and were considered to be poor. They have not improved significantly since that time, and some aspects have become worse (such as landline based services). However since 2015, the rest of Australia has seen marked improvements in their mobile and broadband services and King Island has actually relatively gone backwards versus the rest of the nation.

To summarise the key problem issues:

- 1) Whilst Telstra markets that it has 4G on King Island, the reality of the situation is that most of the population and businesses are outside of the 4G coverage area. Even within the advertised coverage area, most customers have more difficulties in making calls than the average Australian user, and the broadband data speeds are often less than the advertised minimum rate of 2Mbit/s and much less than the average speed of 33Mbit/s which is available to others in Australia
- 2) Going more broadly and considering 3G also, in most places on the island at most times, it is not possible to reliably make or receive a phone call, or use mobile data, from a hand held device in a building or vehicle.
- 3) The closure of the 3G network has been announced – commencing 2020. However in King Island, 3G is still the network used by the majority of the population due to lack of 4G coverage.
- 4) Landlines are in poor condition in many parts of King Island, and repairs are difficult to report, expensive, and can take a very long time to occur. There is overwhelming feedback about poor service quality
- 5) The landline service appears to be well below levels of service obligations that the community expects Telstra to meet in the rest of Australia
- 6) Broadband services are poor with most users struggling to get very low access speeds (>2 Mbit/s) from mobile broadband and ADSL. Even where NBN Skymuster is used, it is unreliable, it is expensive and it has an uplink speed so slow that it limits effective usage.
- 7) The Island has experienced regular multi-day outages in telecommunications services.

These issues arise from limited investment in King Island telecommunications infrastructure, and in particular limited capacity off-island (1 Gbit/s system), limited capacity between key locations on King Island, and a limited 4G coverage and capacity on the Island. These issues are having a detrimental business and social impact on King Island and are also basic safety issues in many cases. If left unaddressed, the lack of viable communications will have a detrimental effect on the local economy.

There are some significant new business development occurring on King Island which require telecommunications services in places where they do not currently exist in these locations. These new businesses will bring significant economic growth to the Island and they must proceed.

The following recommendations are made to King Island Council:

- a) Council develop a program to address Items 1 – 5 under Available Future Options. These are all fairly simple initiatives that are low cost and short term, and will bring some relief to problems that

people are currently encountering in their use of telecommunications. From discussions with Telstra on 24th July, we believe they would be prepared to make a contribution to these initiatives.

- b) Council seek King Island community and major business views on the practicality of Item 6 under Available Future Options. If exploited, such an approach will gain King Island a purchasing power/commercial leverage similar to a major Australian corporate and is likely to also encourage interest of new carriers and operators considering investment in King Island.
- c) Council lobby the relevant Federal Member regarding securing special purpose Federal funding – based on the position with NBN and the economic benefit, as well as lobby regarding the black spot program for obtaining Commonwealth funding of mobile network improvements. Given recent funding decisions and precedents in the black spot program and the current issues on King Island relating to the state of the network, we believe if the Federal Member is prepared to make representation then there should be a positive funding outcome. Telstra advised that the recent mobile network improvements on Flinders Island (5G) were partly the result of a Federal grant.
- d) On behalf of the community, and in regular consultation with the community stakeholders, Council should create a regular formal dialog and agenda for discussion with *nbnco* and Telstra as per the recommended items in this report. This includes the agenda for co-investment in new facilities and recognise that there is also some ability for these organisations to compete with each other.
- e) Council to take specific safety, security, WHS and maritime safety issues to other appropriate authorities for funding contributions.
- f) Council to engage with potential other providers/operators who may be prepared to build infrastructure on King Island in return for participation in revenue. This may require for formation of a community cooperative of willing participants who would direct their business to parties who invest in local infrastructure.

CONTRIBUTORS

The following individuals, businesses and organisations in the King Island community contributed to this report.

Ballarat Clarendon College
Bass Strait Electrical
Beef Producers Group
Beth Vellekoop
Cape Wickham Links
Clare Anderson
“DM”
Duncan McFie
Grassy Progress Association
Harcourts King Island
Hydro Tasmania
Ian Allan
Jarred Perryman
“Joey”
King Island Child Care & Early Learning Centre
King Island Cloud Juice
King Island Council
King Island District High School
King Island Hospital

King Island Scheelite Mine
King Island Sea Salt
Lee Jefferies
Meat Your Beef
Naracoopa Progress Association
Ocean Dunes Golf
Ocean Dunes Hotel
“Reg”
Robbie Payne
Russell Masters
RW Earthmoving
Sandun Ineshka
Shelley Graham
Tara Clark
TasPorts
The Eat Group
Thor Clemons
Tracey Collyer

ABOUT THE AUTHOR

Stephen Hogben has almost 40 years experience in telecommunications, media and internet delivered services. As a senior engineer for OTC/Telstra International he designed and built some of the first telecommunications services to Australian External Territory island communities, as well as significant Australian-based facilities. Stephen was also a senior executive in NSW Government and an initial member of the NSW Emergency Services and Rescue Management Board and the design of the NSW Government Radio Network. He also had several senior engineering and management roles in Optus during their initial Australian network deployment – including Head of Mobile and Switch Engineering, Head of Network Design, and Head of Product Development. Under his management, Optus deployed national GSM network in all states of Australia, satellite services, business and consumer products, laid fibre optic network nationally, and built switching and network facilities throughout Australia. He has also been a member of the Standards Advisory Committee of the Australian Telecommunications Authority, which set all telecommunications standards in Australia, and a member of the Cable And Wireless (UK) Group Development Board, which oversaw the Group's investment in telecoms development in over 50 countries. Stephen then transitioned to new media and internet technology businesses – where he worked for mezzanine capital investment companies and as a contractor for Macquarie Bank Technology Fund, setting up their new media businesses throughout Asia Pacific. This include new startup video on demand streaming businesses in HK, Singapore and other places in Asia Pacific, working in partnership with local telcos. He has also held CIO roles for a major Australian retail store network and for an Australian/NZ entertainment company. As a consultant Stephen has also done significant technology advisory roles for Village Roadshow, SkyTV, Telecom NZ/Spark, Optus, Telstra and PBL. He has been a Vice President of Gartner in a telecommunications/advisory role in Asia-Pacific, advising major corporations and governments. For many years, Stephen was a regular Expert Witness for the High Court of New Zealand in matters of technology and telecommunications.

Perhaps more relevantly than all of the above, Stephen Hogben has lived in rural NSW (outside of regional towns) for many years and is fully experienced with the challenges of rural telecommunications services being more limited versus the city, yet rural people having a greater overall need for communications for work and safety. He is intimately familiar with the attitudes of many Australian telcos towards their rural customers. He is sadly familiar with paying as much for telecoms service as people in the city, yet receiving disproportionately less service and, because the nearest telco store is hundreds of km away, he is also unfortunately familiar with spending many hours dealing with offshore telco call centres and web robots trying to resolve very simple matters.



ATTACHMENTS

Attachment 1 – Cellular Drive Testing Results

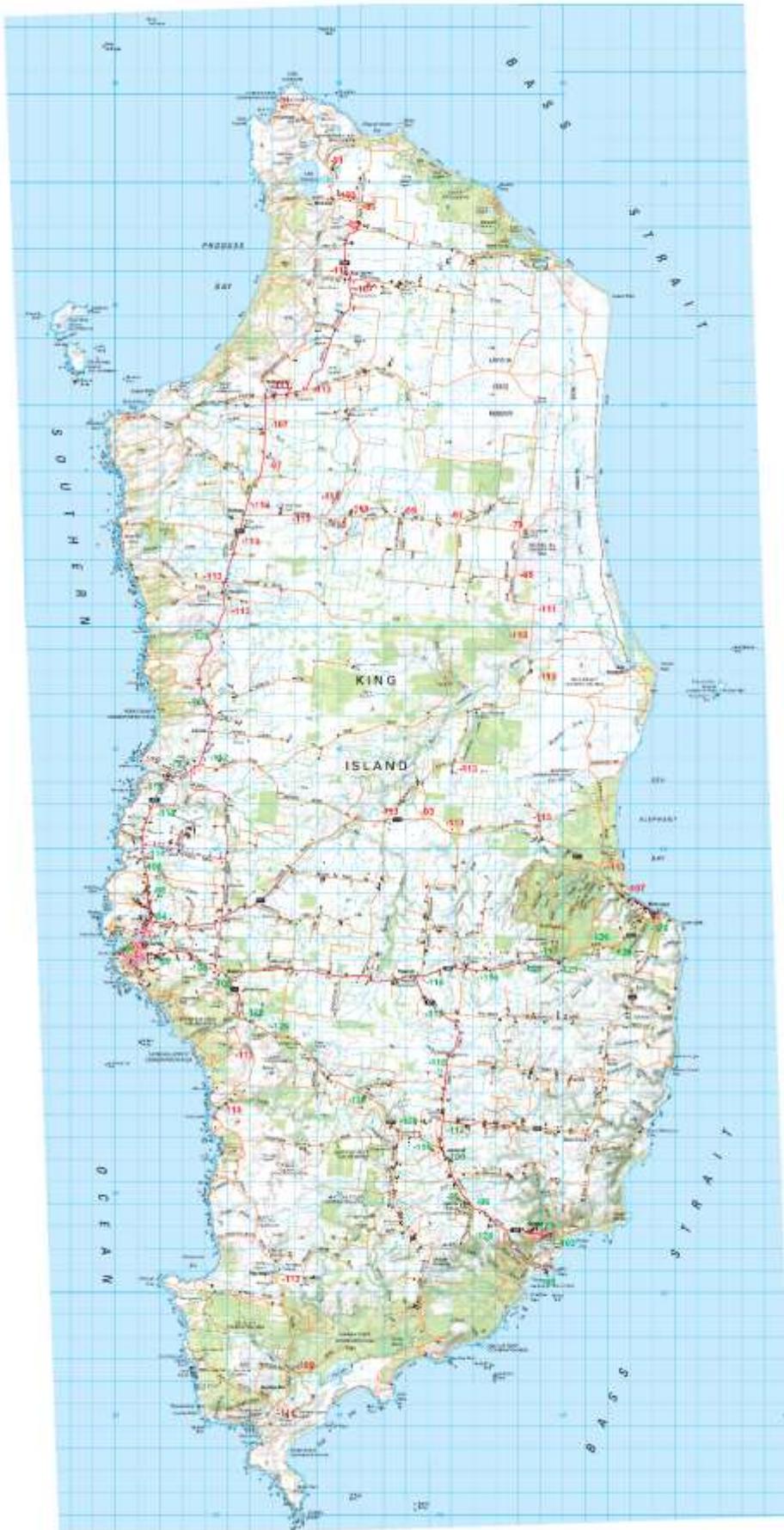
The readings in the following map were taken with a handheld Samsung Note 8 running a measurement application in a stationary motor vehicle at each place. 3G is shown in red and is dBm RSSI, 4G is shown in green and is dBm RSRP. Where multiple readings were taken, the average was used.

(NB Note that all figures are negative numbers – hence the lower the figure the higher the reading)

In our opinion, reliable handheld coverage indoors or in-vehicle requires at least -100 dBm or better for 4G and -90 dBm or better for 3G. Levels below these amounts will see frequent call dropouts and/or missed calls unless the user is outside or using an external antenna. At levels worse than -110 dBm (4G) and -100 dBm (3G) a user can expect difficulty in using the service at most times, and at -120 dBm (4G) and -105 dBm (3G) it is fairly unusable.

Selected download/upload speed testing was made of mobile broadband at various places also – these results are in the text of this report.

These tests were all done in fine weather and at non-peak usage times.



Attachment 2 – NBN Skymuster

NBN Skymuster is a residential-grade broadband internet service that is provided by NBN in areas of Australia that are not served by any other NBN network. Nbnco is required to provide a minimum of 25 Mbit/s to every Australian residence and business, and Skymuster is the “fallback” solution for this.

Skymuster is sold via various distributors (sometimes under slightly different product names) but it’s always the same product. There are two variants 12 Mbit/s (down)/ 2 Mbit/s (up) and 25 Mbit/s (down)/5 Mbit/s (up) with a variety of download limits – however NBN mandate a maximum download limit of 200GB (peak) and 100GB (offpeak) per month usage and the maximum access speeds above.

As of 30 May 2019, NBN published figures state there are 95,489 activated NBN Skymuster services in Australia and 442,248 premises that are ready to connect. There has been speculation that the take-up rate of NBN satellite services has been slower than forecast – refer

<https://www.itnews.com.au/news/nbn-sky-muster-satellite-take-up-starts-to-worry-govt-500297>

The performance of NBN Skymuster has also been the subject of comment and speculation since its original launch. The following news articles are typical:

<https://www.itnews.com.au/news/nbn-co-sky-muster-knocked-offline-by-software-update-519989>

<https://www.itnews.com.au/news/sweeter-banana-co-op-slips-up-on-sky-muster-514444>

<https://www.abc.net.au/news/2017-05-02/sky-muster-service-massively-improved-in-rural-areas-nbn-says/8488884>

<https://www.news.com.au/technology/online/nbn/unhappy-with-the-nbn-these-residents-are-taking-matters-into-their-own-hands/news-story/6fd21e2ba590cfb8299d28e90ddc1258>

<https://www.smh.com.au/national/i-promised-you-dollars-you-promised-me-internet-a-tale-of-nbn-woe-20190620-p51zlt.html>

<https://www.smh.com.au/national/phone-dead-zone-delays-000-fatal-heart-attack-call-20190618-p51ywq.html>

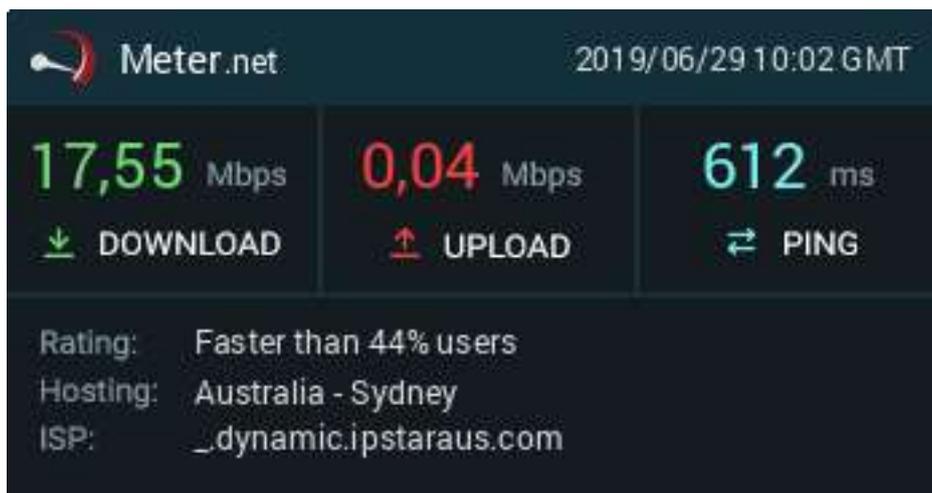
Some of the above issues related to the performance of the service itself but other comments relate to how NBN may be managing competing priorities for its satellite capacity.

The reported experience of King Island users during this review was typical of comments from general Australian users. Therefore, as a part of this review, we examined the recent performance record of NBN Skymuster as reported on www.skymesh.net.au/support/network-status as follows:

1. For the period 1 – 25th June 2019 (600 hours) there were 14.5 hours of reported outage, and 21 hours of degradation/outage time
2. This relates to a “service operating” uptime of 97.5% and a “service not graded” uptime of 94.1%
3. This extrapolates to 21 full days per year of degraded service.

The above results do not consider any issues that were not reported on the website, nor issues that were particular to specific service providers, nor issues related to external events (such as weather and power), nor do they consider any capacity or congestion issues (which are not classified as downtime). Therefore the individual experience of any user could be worse than projected here.

Another potential issue for users is symmetry. The speed test results below show a random speed check on a Skymuster service (NB not a King Island based service, but that isn't relevant):



Whilst the download speed isn't unacceptable (although materially below the advertised 25 Mbit/s), the upload speed is a concern at 0.04 Mbit/s. Many common applications (such as video streaming and file transfer) require a viable backchannel for acknowledgement of receipt using TCP/IP protocol. Even though the apparent direction of transfer is a download, the speed of download is limited by the capability of the uplink. For good video streaming, we require at least 15% capacity in the opposite direction – therefore in the case above the effective download speed that could be used for streaming a video would be in the order of 0.3 Mbit/s – which is non-viable. This means that whilst this download speed looks acceptable, it isn't usable for many applications that a normal user would use the service for. This also isn't a scenario that is reported as degraded service either.

The above is not an issue that's limited to Skymuster, but in our observation it affects a lot of Skymuster users.

Obviously applications like video conferencing require a more significant uplink speed (as the video goes in two directions)

In our conclusion, whilst the issues experienced by King Island Skymuster users aren't acceptable, they are likely typical of the experience of most Australian Skymuster users.

Finally, a commercial viability concern exists regarding Skymuster. In rural areas where there is viable 4G access it is a lower cost and more reliable solution to use mobile data. The following random measures were made at the same time in a low peak usage time (Sat AM) in Central West rural NSW – approximately 1km from a 4G tower:

Skymuster 25/5 plan (\$160/month plan) - .9 Mbit/s (down) – 0.06 Mbit/s (up) and 650 msec latency (best of three readings); versus

Telstra 4G - Additional \$5 data SIM on an unlimited capacity mobile phone plan) - 21 Mbit/s (down), 18 Mbit/s (up) and 35 msec latency (worst of three readings)

The commercial issue is that the data mobile service obtained by a \$5 incremental investment on the existing mobile plan, performs better and has more included data than the \$160/month NBN service. With the coming of 5G services to Australia, and the expansion of mobile coverage, this may cause commercial issues for some of NBNs current products.

Attachment 3 – Potential Network Investment Partners

Carriers

Australian carriers such as Optus, Vodafone, TPG and others are all potential organisations with which King Island could have co-investment discussions for infrastructure improvements for the local community and business.

Obviously discussions should be also held with Telstra as they are the best placed to make improvements to current King Island services.

There are also specialist network infrastructure builders and operators – such as Vertel – who can provide a range of solutions that may be cost effective and appropriate for King Island users (eg private microwave).

NBN

NBN has the obligation to provide a 25 Mbit/s internet service to all Australians. With technology today and if properly designed and delivered – then ideally such a service replaces much of the need for landlines and fixed phones. The problematic issue is that the current service doesn't achieve that outcome today, and is extremely expensive if it were to be taken up by the entire community.

NBN has indicated a willingness to have discussions with King Island, and does this already with other major customers, to develop paths for offering improved levels of service in specific areas.

Others

Section 7 of the Commonwealth Telecommunications Act provides some protections for NBN and limitations for private construction of network for retail purposes – unless Ministerial approval is given. However, given precedents and given the state of King Island's options, we believe this approval could be obtained

There have been a number of initiatives in Australia (mainly out of agricultural industries and communities) that address lack of broadband and telecommunications. One example was cited in the report via a URL. Another example is SmartFarmNet – and some information will be separately provided to King Island Council on their capabilities.

Another possible partner who could develop a telecommunications services proposition, and/or a funding proposition for community telecommunications solutions for King Island is TechProject Group itself. We would be happy to discuss this option further.

Attachment 4 – King Island Scheelite Mine





Investment Highlights:

HIGH GRADE

One of the world's highest grade tungsten deposits

Resources

9.60M tonnes @ 0.9% WO₃

Open Cut Reserves

3.14M tonnes @ 0.73% WO₃

Historical production

10M tonnes @ 0.67% WO₃

LOW COST

Low OPEX & CAPEX compared to peers

ALL APPROVALS GRANTED

Mining license, Environmental approval (EPA) and further exploration licences

SUBSTANTIAL UPSIDE

Potential for expansion/extension both underground and at Bold Hill

INFRASTRUCTURE

Owns all associated land and is 1km from the Port of Grassy and existing infrastructure, substantially reducing CAPEX

OFFTAKE

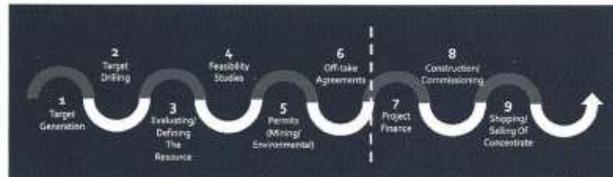
Signed Agreement with Wolfram Bergbau und Hütten AG a subsidiary of the Sandvik Group



@Kischeelite

www.kingislandscheelite.com.au

Time Plan:



Development Plan:



8 year approved open cut mine, average annual production of 400,000 tonnes of ore per annum, yielding 200,000 mtu of WO₃ (1mtu = 10kg)

Ore to be crushed and processed, primarily through a gravity circuit supplemented with a simple flotation circuit

Option to double mine life through mining existing underground resource

Contact:

Johann Jacobs
Executive Chairman

+61 (0) 416 125 449 | Email: Johann.Jacobs@kisltd.com.au

Attachment 5 – User Interviews and Feedback

[Note: A number of submissions were received and interviews held during the course of this consultation period. To protect the private and commercial information of these parties, their submissions are not included in the public report. A list of businesses and individuals who contributed to this report is included in the Contributions section, page 31.]