

Final report

Integrated digital connectivity solution using long range wireless high-speed internet link to connect several adjacent properties: Build, commission & test

Project code: P.PSH.1182

Prepared by: Chris Peart
Stanbroke

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Abstract

The Australian red meat industry faces significant connectivity challenges, particularly in remote regions, where unreliable and slow digital infrastructure hinders productivity and increases costs. To address these issues, Stanbroke implemented a hybrid connectivity solution, leveraging high-speed fibre, Starlink, Telstra Small Cell Towers and 4G boosters to integrate remote stations with central management systems.

A high-level impact assessment was conducted to evaluate the economic, social, and environmental benefits of Stanbroke's AgTech investments over four years. Key findings highlighted economic benefits such as improved operational efficiency, reduced staffing costs, and enhanced cattle turnoff, with a mid-range Benefit Cost Ratio (BCR) of 4.78 and a payback period two years. (NB Stanbroke owns 6 cattle stations in the Gulf region of North QLD, over 1.2 million ha of prime grazing property carrying 200,000 head of cattle; abattoir and feedlots are also owned).

Beyond economic gains, improved connectivity enhanced employee safety, satisfaction, and data accuracy, supporting more effective cattle management. These benefits contribute to long-term returns through streamlined operations and increased productivity, ensuring Stanbroke remains competitive in the evolving agricultural landscape.

The insights gained from this project demonstrate a high level case study for improving digital infrastructure in remote agricultural regions. By demonstrating the value of enhanced connectivity, this initiative offers important insights for broader adoption across the red meat industry, in support of sector-wide productivity gains.

Executive summary

Background

The Australian red meat industry, particularly in rural and remote regions, faces significant connectivity challenges. Overburdened and disjointed services result in slow speeds and frequent interruptions, hampering productivity and increasing operational costs. The vast and sparsely populated geographical context of Australia complicates the deployment of conventional connectivity solutions in regional and remote areas. This situation risks leaving agricultural regions behind where poor digital connectivity does not allow deployment of advanced agricultural technologies to enhance productivity.

To address these challenges, this project undertaken by Stanbroke, successfully delivered a hybrid technological approach to enhancing connectivity infrastructure on stations. The strategy included leveraging the high-speed fibre network from Singapore to Townsville, accessed from Cloncurry, Queensland, and augmenting it with Starlink services and 4G boosters. The goal of this project was to investigate the benefits of integrating remote properties with central management and reporting systems.

Outcomes of this project are intended for industry stakeholders, policymakers, and agribusiness leaders seeking to improve connectivity and operational efficiency in remote livestock enterprises. The findings assist to inform future investment strategies and showcase the learnings from the adoption of digital infrastructure for wider industry.

Methodology

On top of the existing NBN Skymuster satellite connections, Stanbroke utilised four key technologies to provide connectivity to its remote sites. These were WiSky tower connections to high-speed fibre, Telstra Small Cell towers, CellFi Mobile 4G Boosters and Starlink Satellite dishes. The project includes a high-level assessment of the economic, social and environmental impacts on Stanbroke operations. Workshops with Stanbroke's team were essential in validating assumptions and refining these evaluations.

Results/key findings

The multi-connectivity network constructed by Stanbroke was found to provide high quality, reliable connectivity to the remote sites involved in the project. This was achieved mostly through the use of Telstra Small Cell Towers, Starlink Satellite internet and the WiSky tower connectivity solution. Another lesson learnt of the construction of the multi-connectivity was the importance of having multiple sources of connectivity that can be relied upon. Given the incidence extreme weather in Northern Queensland and its ability to knock out towers and satellite dishes, as well as the difficulty that can be experienced getting qualified technicians in to repair any damage that may occur, having multiple prongs of connectivity to rely on is critical.

The enhanced connectivity has unlocked high-bandwidth-dependent technological innovations including advanced communications and videoconferencing, remote IT support and real-time data collection and mapping. These innovations enabled synchronisation of Stanbroke's operations from grazing fields to the entire value chain. Key findings of the high-level impact assessment were centred on the stations and include:

Economic Benefits: The upgrade in connectivity has streamlined operations, reduced staffing costs, decreased staff turnover by enhancing job satisfaction, and improved cattle turnoff efficiency. The project's economic benefits ratio was reviewed on a high, medium and low balance with the mid-range Benefit Cost Ratio (BCR) demonstrating 4.78 under selected assumptions. This also delivered a payback period of 2 years.

Non-Economic Benefits: Equally important were the qualitative benefits that include enhanced employee safety through efficient communication, improved employee satisfaction and efficiency, immediate access to real-time technical support, and better accuracy in data collection focused on cattle management.

These improvements will deliver long lasting return on investment through refined management and operational efficiency, along with increased staff productivity.

Benefits to industry

The learnings from this project showcase a model for improving digital connectivity across the wider red meat industry, particularly in remote regions. By demonstrating the economic and operational benefits of enhanced connectivity, the project highlights how similar investments can drive efficiency, reduce costs, and improve workforce retention industry-wide. The integration of advanced digital tools and real-time data collection has provided better livestock management outcomes, leading to improved productivity and supply chain transparency. Additionally, the project showcases a viable approach to overcoming rural connectivity challenges, supporting broader adoption of AgTech solutions that will help to future-proof the industry.

Future research and recommendations

Further research is recommended to investigate the benefits of different connectivity approaches in different geographical contexts and into new connectivity technologies as that may become available after the publishing of this report. Research could also be conducted on collaborative connectivity infrastructure that has the potential to benefit multiple businesses at a lower incremental cost.

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1. Background

The Australian red meat industry, particularly in rural and remote areas, faces significant challenges with internet connectivity. Overburdened Satellite NBN services result in slow speeds and frequent service interruptions, hindering productivity. The unique geographical context of the country with its sparse population and extensive pastoral rangelands makes it difficult for conventional connectivity solutions to fulfil the requirements of large agricultural businesses. This situation has led to increased operational costs and compromised system efficiency. As the agricultural sector globally shifts towards advanced agricultural technologies to enhance productivity, certain Australian regions are at risk of falling behind due to such infrastructural limitations.

2. Project objectives

This project aimed to demonstrate an economically viable method of connecting rural agricultural business units to their wider supply chain. The key objective was to create a mixed technology internet link to connect Stanbroke business locations to high-speed internet so that the technology can be evaluated and used by other producers/lot feeders/processors. The research project aimed to change the way business is conducted in the remote Australia by creating a platform for:

- Internet of things
- Remote communications
- Remote monitoring
- Adoption of web based training
- Increased safety measures
- Feedbase sensors
- Animal health sensors
- Internal and external collaborations

At the beginning of the project there were no existing wireless links or supporting infrastructure around the proposed sites to connect to the homesteads, where remote monitoring and management capabilities are required. The network deployed as a part of this project connected each segment of the business to reliable internet and the same platform, thus allowing:

- Wide Area Wi-Fi services from WI-SKY to extend mobile coverage (VoWiFi)
- Access to industry leadership, support services and commercial R&D outcomes
- Access to industry innovation, communities and market knowledge
- Development of future Innovation/R&D applications
- Reporting on future Innovation/R&D applications
- Advancing the industry by providing the necessary tools to enhance market growth and global recognition
- Enabling profit gain through the widespread application of digital agricultural practices
- Provide an opportunity for the IT development/education of young people in rural areas
- Attracting people to remote locations and providing training for those people.

At the finalisation of the project, Stanbroke engaged an independent contractor to conduct a cost benefit analysis. The objective of this analysis was to identify economic and non-economic benefits derived from project P.PSH.1182 demonstrating the benefits of connectivity investments to the wider red meat industry.

3. Methodology

Project establishment

This investment project commenced in 2019/20 financial year and was completed in 2025/2024 financial year. With the project having stretched over this extended period of time, it went through a series of iterations. The effect of the extended timeline was compounded by this period having been punctuated by a series of disruptions to the project. Floods at the stations in North Queensland, which were the main site for construction, ongoing disruptions due to covid and the release of several new connectivity technologies such as Starlink significantly impacted the way that this project has progressed.

In its initial conception, P.PSH.1182 involved the construction of a series of towers to relay high-bandwidth connection from the Singapore to Townsville cable at Cloncurry to the individual stations.

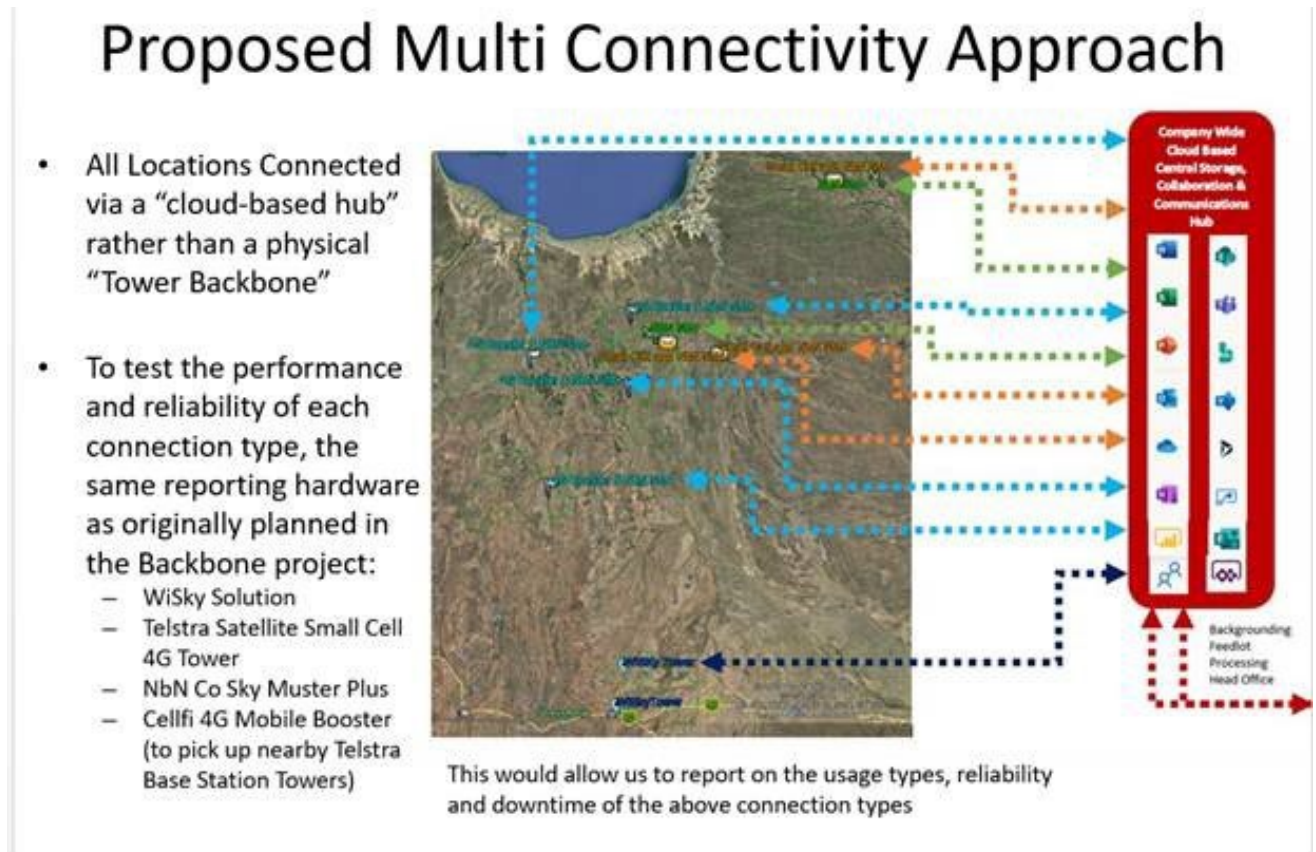


Figure 1: Initially planned tower network

With the intervention of weather, covid, and new technologies on the horizon that could potentially replicate the results of the tower network with a lower capital cost, MLA and Stanbroke agreed to conduct a cost benefit analysis to assess possible options for achieving the high-speed internet connection with the best return on investment.

The independent CBA found that a mixed connectivity approach, which utilised a cloud-based hub rather than physical connectivity towers to achieve the same outcome, had the greatest net present value of investment. This vastly outweighed the other connectivity options with its ability to provide cross supply chain data capture, sharing and analysis to boost productivity and performance.

Figure 2: Multi Connectivity approach



Construction of the mixed connectivity network

Construction on the main connectivity network began in early 2021 and was mostly complete by the end of 2021. Some sites encountered delays due to weather and hardware availability. The evolution of technology also played a part in the ongoing works on the connectivity network, especially with Starlink becoming available in July 2022.

In its final iteration, the multi-connectivity network consists of four distinct technologies built to supplement the existing NBN SkyMuster connections at the remote sites.

WiSky Solution: This is the tower relay connection to the Singapore – Townsville high-speed fibre cable that was originally planned to be the backbone of the entire connectivity network. One of the stations is close enough to Cloncurry that it only required one tower in Cloncurry to receive this connection.



Figure 3: Typical WiSky solution tower



Figure 4: Typical receiving house installation for WiSky solution

Telstra Small Cell 4G Tower: small cell towers are towers built under an agreement with Telstra to provide Telstra cellular service for a given area around the tower. The technology uses low-powered radio transmitters to provide the cellular service. The towers were expected to provide cellular service to a radius of around 4km.

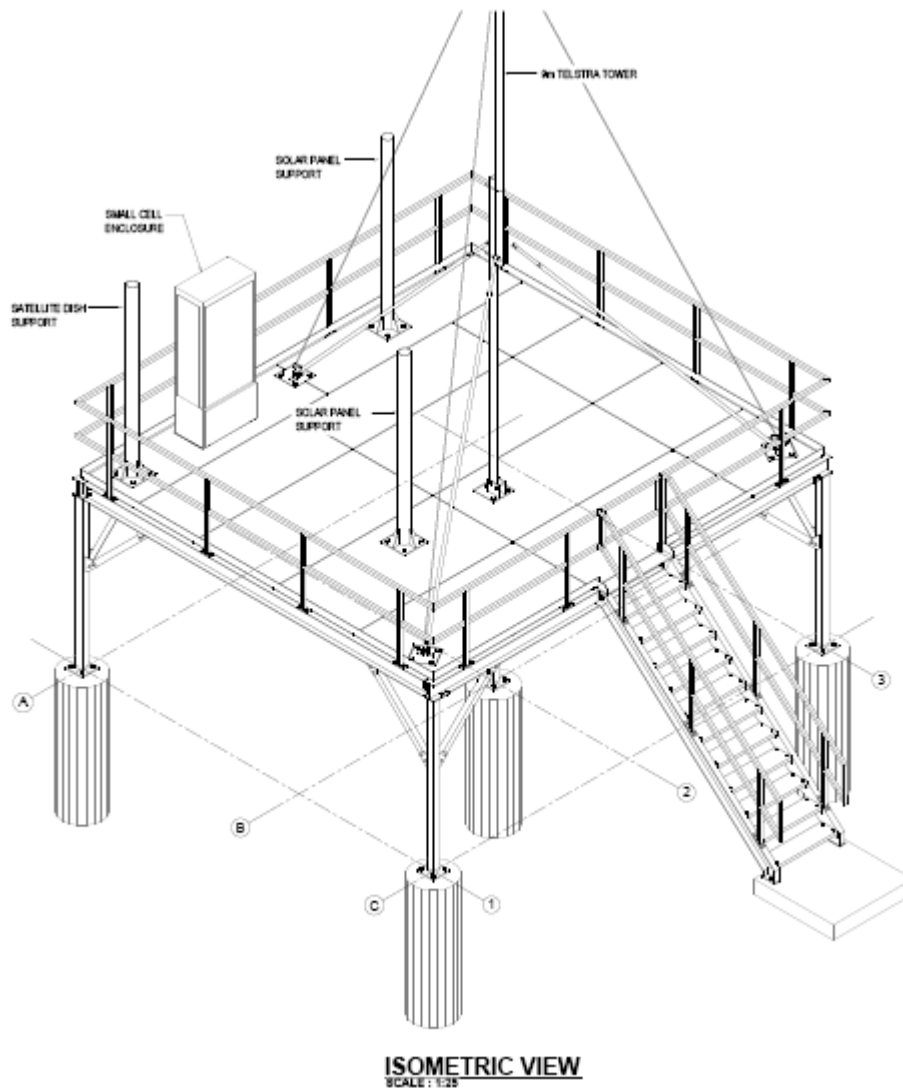


Figure 5: Engineering drawing for a Telstra Small Cell Tower

CellFi Mobile 4G Boosters: these boosters, which are a modified version of a car booster antenna that has been mounted on a pole, were installed at three station homesteads. Two of these locations are within 30km of a Telstra tower, which enables the booster to broadcast the Telstra signal across the homestead complex. The third location was 70km away from Telstra tower, which significantly impacted the performance of the CellFi booster at this location, discussed further in the results section.

Starlink Satellites: The Starlink dishes were installed at all 5 stations in the first quarter of 2023, after severe weather at one of the sites demonstrated how reliance on one or two connection methods would leave a site vulnerable to outages due to severe weather. Starlinks self-tracking satellite dishes automatically tracks and connects to the best suited satellites for each location – providing reliable, strong WIFI even when other services such as NBN Satellite drops-out.

With the addition of the Starlink satellite dishes at each of the stations, this signified the last of the upgrades to the evolving multi-connectivity system.

Independent cost benefit analysis

Stanbroke engaged a third party to conduct a high-level (confidential) impact assessment to assess the impact of connectivity investments over the past four years through a focused cost-benefit analysis (NB ancillary investments in other AgTech during this time was excluded). The impact assessment undertook to quantify the overall economic, social and potential environmental impacts from the connectivity solutions deployed.

The analytical process relied on a mix of quantitative and qualitative data, gathered through desk top analysis and consultations with Stanbroke, to draw conclusions founded on an understanding of Stanbroke's performance indicators. Workshops with Stanbroke's team were used to validate underlying assumptions and refine evaluations of economic impacts. This component delved into the collation and analysis of data and production metrics to establish average baseline figures, crucial for isolating the productivity gains attributable to the connectivity investments. The effort here was to clearly ascertain the extent to which the initiatives have influenced productivity trajectories, aiming to quantify the direct contributions of the connectivity investments to productivity improvements. To facilitate a strategic and operationally reflective outcome, workshops with Stanbroke personnel were held to assess initial observations and fine-tune findings before the final report.

It is recommended when enterprises are developing an investment case for connectivity solutions a decision needs to be made if the following attributes are to be considered as part of CapEx/OpEx:

- Individual costs of sensors, ear tags and other monitoring devices.
- Fuel / labour savings from reduced helicopter mustering.
- Head office / managerial time savings.
- Ad hoc use of contractors on a per annum basis

4. Results

Connectivity Results

Overall, the connectivity results of the mixed connectivity network were highly satisfactory. Prior to this project the only available internet service on the stations was a large telco commercially available satellite service, with limited available bandwidth and delivering an unsatisfactory internet service to the office and staff. Productivity was severely hampered due to unreliable speeds and frequent dropouts.

The implementation of the multi-connectivity network vastly improved the network speeds available to staff. Previously, the network that was available on station could only handle one or two staff doing rudimentary work at unreliable speeds with a maximum speed of 15mbps. With the implementation of the multi connectivity network, internet speeds are reliably above 40mbps and the network is able to handle the activity of up to 20 people who might be at a station in any one day.

Out of the technologies implemented, the ones with the strongest results were:

- WiSky solution: though this solution has a high upfront capital cost, at the one station where it was opportunistically implemented (to take advantage of its close proximity to Cloncurry) it provided strong, reliable connection able to handle the stations entire traffic and maintain speeds above 40mbps.

- Telstra small cell towers: their construction helped to alleviate several 'black-spots' across Stanbroke Properties. From experience, the range of cellular service provided by Telstra's small cell towers is up to 4km from the tower itself, depending on the terrain in the area. Due to each tower's locality to their respective homesteads, largely improved connectivity to the 4G network has therefore been possible for all staff at the stations where these towers were installed. Limiting the remoteness of these properties through extended cellular coverage has allowed workers to report safety incidents and contact required parties when issues/concerns arise away from the homestead. These properties have cattle yards within the radius of coverage which allows workers to contact the livestock analyst if errors arise when handling cattle, largely aiding in efficiency and limiting the time cattle spend contained in yards.
- Starlink Satellite Connection: though Starlink has a higher ongoing cost, its performance and reliability stand out. Starlink was initially brought in to provide internet to a station that had lost its other connections due to a severe weather event but has since been rolled out to all 5 remote sites. Its reliability and the speed of the internet provided (sometimes up to 300mbps) stands out as a key technology for staff when doing high-bandwidth reliant work.
- The CellFi Mobile 4G Boosters were a good, low cost addition to the multi-connectivity network that was installed. However, especially for stations that were further than 30km away from their nearest Telstra tower, the boosted signal from the CellFi towers struggled to provide a connection strong enough to handle more than a few devices performing rudimentary browsing activity and some calls.

However, the greatest lesson learnt from the installation and operation of the multi-connectivity network is the importance of having multiple sources of connectivity to provide reliability to staff at these remote sites. Given the incidence extreme weather in Northern Queensland and its ability to knock out towers and satellite dishes, as well as the difficulty that can be experienced getting qualified technicians in to repair any damage that may occur, having multiple prongs of connectivity to rely on is critical. This is especially true as the business becomes more accustomed to, and reliant on, having high speed connectivity to perform its regular business functions.

CBA Results

The final cost benefit analysis found that the enhanced connectivity has unlocked high-bandwidth-dependent technological innovations including advanced communications and videoconferencing, remote IT support, real-time data collection and mapping. These innovations enabled synchronisation of Stanbroke's operations from grazing fields to the entire value chain. For this study, key findings were centred on the stations only and include:

Economic Benefits: The upgrade in connectivity has streamlined operations, reduced staffing costs, decreased staff turnover by enhancing job satisfaction, and improved cattle turnoff efficiency. The project's economic benefits ratio was reviewed on a high, medium and low balance with the mid-range BCR demonstrating 4.78 under selected assumptions. This also delivered a payback period of 2 years.

Non-Economic Benefits: Equally important were the non-quantified benefits that include enhanced employee safety through efficient communication, improved employee satisfaction and efficiency, immediate access to real-time technical support, and better accuracy in data collection focused on cattle management.

These improvements will deliver long lasting return on investment through refined management and operational efficiency, along with increased staff productivity.

Modelled benefits

Economic Benefits

Improved turnoff: Progressive connectivity upgrades implemented across the stations are driving a notable uptick in cattle turnoff efficiency. This leap forward provides station managers with real-time insights and data, facilitating better-informed decisions about when to round up the cattle and the most strategic timing. For Stanbroke, analysis of Wagyu and 100 day grain fed stock classes showed that improved data availability (enabled by improved connectivity) can optimise turnoff and finishing to best achieve desired marbling, weight and yield specifications.

Reduced staff turnover: As employees now enjoy the benefits of staying connected to the world and accessing the internet for leisure in their free time, the workplace environment has seen improvements in efficiency and ease of operations. This enhancement in job satisfaction has led to employees dedicating more years of employment to the company and a decline in turnover. Consequently, this stability allows for a reduction in the costs associated with onboarding and preparing new recruits for their roles.

Reduced staffing: The upgrade in connectivity at the stations has streamlined operations significantly. This technological improvement allows for a reduced core team, supported by contractors who are brought in for peak times and specific projects. This flexible approach enables the stations to efficiently respond to increased demands without the necessity of a full-time staff throughout the entire year, thus optimising costs and enhancing overall efficiency.

Non-Economic Benefits

Employee safety: Enhancing the communication infrastructure within the station provides a significant advantage in terms of employee safety; it ensures efficient and effective communication, allows for real-time monitoring of staff whereabouts and facilitates immediate emergency response through swift and reliable emergency calls and regular check-ins.

Real time support on-farm: The upgraded connectivity at the yards enhances the efficiency of station managers by enabling immediate access to technical support and direct communication with the head office when for instance operating their cattle management systems, thereby mitigating the necessity for time-consuming trips back to the homestead to obtain telephone assistance and ensuring more timely and precise support when it is immediately needed.

Employee satisfaction: The upgraded network infrastructure at the station has opened a gateway to the world, enriching employees' lives by facilitating seamless communication with their families and friends and providing them with ample entertainment options, such as streaming their favourite movies and television series, contributing to a happier and more contented workforce.

Employee efficiency: With the implementation of the latest connectivity solutions, employees can now engage in more rapid and effective communication exchanges, both sending and receiving vital information with greater ease. Such advancements free up valuable resources and time, enabling staff to dedicate increased attention to refining other essential duties and optimising the station's operations.

Improved data accuracy: By incorporating online, real-time cattle management systems in proximity to the crush, station managers and staff are now equipped with advanced tools that facilitate the

collection of data with greater accuracy, thereby significantly improving upon the data quality achievable with earlier approaches.

This also enables 3rd party data, such as genetic testing results, to be easily pushed into cattle management systems so it is available crush-side as quickly as possible. Having access to an animal's full genetic and lifetime history in the yards allows farm managers to make efficient decisions about that animal's management with its probable end destination in mind from early in the animal's life.

Mustering efficiencies: Another benefit that was evident is the communication enhancement during the livestock mustering and yard processing phase. By having the ability to consistently send and receive messages, as well as conduct phone calls, staff experienced a significant increase in the timeliness of their decision-making process. This led to more efficient and accurate operational activities, in stark contrast to the prior reliance on assumptions for logistical planning, such as the number of trucks required.

Attracting people to the industry: The introduction of internet and connectivity on stations has transformed them into appealing workplaces, where individuals can remain connected to loved ones through video calls and social media, submit timely entries for camp drafts and stay engaged with their roles due to the integration of technological advancements.

Assumptions underlying draft modelled benefits

In assessing the high level CBR for the program, payback on investment was indicated to be within 2 years based on a range of factors linked to both efficiency improvements and productivity gains. Results indicated that these gains are unlikely to have been seen without improved connectivity, even factoring in prevailing seasonal conditions and commodity prices over the last 5 years. To be conservative farm gate prices were discounted on forward projections by 15% on the historical averages. Based on a 5-year benefit period, to align with expected life span of the investments and contracted service and maintenance costs, a mid-range CBA of 4.78 is demonstrated and is considered commensurate with what was expected and now being realised. This does not include allowances for depreciation however discount factor remains at 5% and CPI at 2.75%.

5. Conclusion

Key findings

In conclusion, this project successfully demonstrated the benefits of improvements in connectivity within Stanbroke's stations, with a hybrid technological approach leveraging high-speed fibre, Starlink, Telstra Small Cell Towers and 4G boosters to integrate remote stations with central management systems.

While immediate economic benefits were realised, there are numerous other advantages observed that were not explicitly modelled. These include enhancements in employee safety through improved communication infrastructure, increased job satisfaction due to better connectivity and the overall efficiency of operations across the grazing fields with ability for real time reporting.

Additionally, further benefit realisation is anticipated to evolve over time. Post the project completion it is expected to continue to unlock additional opportunities for innovation and improved business practises. For instance, non-quantifiable benefits such as enhanced staff

wellbeing and engagement will likely contribute to a more stable and motivated workforce, fostering long-term operational success.

In summary, this connectivity project not only addressed existing infrastructural challenges but also sets the stage for sustained growth and technological advancement within the operation. It ensures that Stanbroke remains competitive and capable of meeting evolving industry demands.

Benefits to industry

The learnings from this project provide a high level case study for those considering improving digital connectivity particularly in remote regions. Whilst innovations and new to market Ag Tech continue to be demonstrated to the livestock industry this project again highlights the importance of underlying connectivity to drive efficiency, reduce costs, and improve workforce retention industry-wide. The integration of advanced digital tools and real-time data collection illustrates the potential for better livestock management, leading to improved productivity and supply chain transparency. Additionally, the project showcases a viable approach to overcoming rural connectivity challenges, supporting broader adoption of AgTech solutions that will help to future-proof the industry.

6. Future research and recommendations

From this research, it can be clearly seen that there are strong benefits to be gained from investing in connectivity infrastructure for remote agricultural businesses. Additional future work could focus on further validating these findings in different geographical contexts and with any new technologies that may come online after the publishing of this report and the potential for collaborative connectivity infrastructure.

7. References

N/A No references used for this report.