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MAPPING THE DIGITAL GAP

Measuring Digital Inclusion and Media Use in Remote Aboriginal and Torres Strait Islander Communities 2021-24

**KALUMBURU, KIMBERLEYS, WA
COMMUNITY OUTCOMES REPORT 2022**



Acknowledgement of Country

We respectfully acknowledge the Kwini and Kulari people and pay our respect to their Elders, past, present and emerging. We also acknowledge the Traditional Custodians and their Ancestors of the lands and waters across Australia where we work, live and undertake our research.

About the Mapping the Digital Gap Research Project

Mapping the Digital Gap is a 4-year research project working in partnership with local organisations in 10-12 remote First Nations communities, to generate a detailed account of digital inclusion and uses of digital services including news and media, track changes over time, and inform appropriate local strategies and services enabling informed decision making by remote Aboriginal and Torres Strait Islander people. It is being undertaken through RMIT University as part of Centre of Excellence for Automated Decision Making and Society, in partnership with Telstra.

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- + Kalumburu Aboriginal Corporation
- + Kalumburu Health Clinic
- + Kalumburu Remote Community School
- + Kalumburu Community Resource Centre
- + Wunambal Gaambera Aboriginal Corporation
- + East Kimberley Job Pathways

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1. EXECUTIVE SUMMARY



Figure 1: Welcome sign at Kalumburu air strip entry.

Kalumburu is a very remote community situated on the banks of the King Edward River in the Wyndham-East Kimberley Shire of Western Australia (WA). It is 279km north-west of the major town of Kununurra, and 615km north-east of the regional centre of Broome (886km by road). The community can be cut off by road for several months during wet season.

The traditional owners are the Kwini (Kuini) and Kulari people. According to the 2021 Australian Bureau of Statistics (ABS) Census, the population of Kalumburu is 388 with 88% identifying as Aboriginal, of which 14.9% of residents speak an Aboriginal language at home¹. There are approximately 120 residential dwellings.

Our first research visit to Kalumburu was undertaken from 8th to 13th June 2022. The RMIT University team worked with community research partner Kalumburu Aboriginal Corporation (KAC) and co-researcher Leanne Kelly, with support by KAC CEO Madeline Gallagher-Dann and staff. The team had a very productive week undertaking 49 surveys with residents and conducting ten interviews with agencies and community leaders. We thank all residents and agency staff who participated in the research and made us feel very welcome.

This report outlines the initial findings from our 2022 visit and highlights the current access to and use of media, telecommunications and online services, as well as the digital inclusion and service delivery challenges in Kalumburu.

This report is intended to assist local and regional agencies, including KAC, Kimberley Land Council, Wyndham-East Kimberley Shire, and the WA Government, to better understand the key barriers to digital inclusion in Kalumburu and community aspirations for the future. It is designed to provide a basis for a local digital inclusion plan. This report may assist in identifying infrastructure and program needs to enable a targeted approach for advocacy with government and industry stakeholders. This report will be updated following research visits in 2023 and 2024.

This report is also part of our commitment to Indigenous data sovereignty, to ensure data collected and research findings from this project are available to the participating communities to use for their own analysis, planning and advocacy. Please note that, in line with our commitment to Indigenous data sovereignty, this report provides initial findings from the raw survey data collected during our fieldwork. It is likely that, following data cleaning and weighting, the final results may differ slightly from that presented here. All Mapping the Digital Gap survey results, including Kalumburu, will be made available via the Australian Digital Inclusion Index website and data dashboards in July 2023, and it is this data that should be treated as authoritative.



¹ An additional 5.7% did not state their identity.

Summary of Findings

The following summary of findings are based on the initial analysis of surveys with 49 residents and 10 interviews with community leaders and service providers.

There are several communications systems in Kalumburu

- + There is an Optus satellite small cell providing 3G and 4G mobile coverage to a 3km radius, however it is heavily congested, and users described regular dropouts and audio issues. An upgrade was installed in October 2022 but there have been ongoing reports of congestion.
- + There were calls for a Telstra mobile service to supplement the Optus service. WA Government is planning to apply for funding for a Telstra satellite small cell under Round 3 of the Regional Connectivity Program.
- + A Wi-Fi mesh network was installed by Australian Private Network (APN/Activ8me) in November 2021, with seven repeaters providing household Wi-Fi connectivity to 128 dwellings and agency buildings, with six Sky Muster services as backhaul. Each dwelling has a VoIP phone installed, providing free local phone calls. The Wi-Fi network was not operating effectively at the time of our visit due to lightning damage. The network was subsequently repaired in August 2022.
- + Fixed line phone services are delivered via Higher Capacity Radio Concentrator (HCRC) microwave backhaul from Derby², supplying four public phones, agency buildings, staff homes and some residential households.
- + UHF and VHF radio are used by several agencies, including for land and sea management, boating and staff communications within and near the community. A UHF repeater is planned for Kalumburu.
- + Some surrounding homelands have Wi-Fi enabled Activ8me phones, providing communications for families and tourists, with eight more homelands to have Wi-Fi enabled Activ8me phones installed.
- + A Telstra satellite small cell is planned to be installed but no date given as yet.

Mobile phones are the primary means of phone calls

- + 69% of survey respondents regularly used their mobile phone for phone calls, with 24% using someone else's mobile phone. There is extensive use of Wi-Fi Calling via the Activ8me Wi-Fi network.
- + 53% of respondents had used the public phone for calls, 35% use the phone at a community office or workplace, and 18% use the fixed line telephone in their home³. Only two of the four public phones were working when we visited.

There is high mobile phone ownership, with the majority using pre-paid services.

- + 80% of respondents owned a mobile phone, with 15% of these shared with others. There is an average of 2.4 mobile phone services per household.
- + Of those with phones, 92% had smartphones as their main mobile phone, and 97% used pre-paid services.
- + Many people have both Optus and Telstra phones due to Optus being available in Kalumburu but Telstra being the primary mobile service in regional centres such as Kununurra and Wyndham.

² Higher Capacity Radio Concentrator, a microwave repeater system used throughout remote Australia to reach locations without fibre optic cable, with limited speeds of up to 19.2kbps.

³ Home phone use includes the Activ8me VoIP phones, however this was not a separate survey option. Also, with the network not working properly, there appeared to be little use of VoIP phones during our visit.

The Wi-Fi mesh network is the primary broadband service, with some households having Sky Muster.

- + The Activ8me Wi-Fi mesh network provides the primary means of residential Internet access (when operational), however the speed and small data allocation (with only 1GB vouchers available) constrains high data use. The Wi-Fi hotspot near the community office is well utilised.
- + The Optus satellite small cell 4G service enables Internet use but slow speed, high latency and dropouts make it unreliable.
- + 18% of survey respondents have a separate NBN Sky Muster service at home, with NBN Sky Muster services also on most staff houses. 78% of respondents said they have no fixed home Internet.
- + 74% of survey respondents had used the Internet in the previous week, with a further 10% within the previous 3 months.
- + The Sky Muster satellite was utilised by most Kalumburu agencies for their internet use, with the exception of the school which used a different satellite system. Interviewees reported satellite connectivity issues during heavy cloud coverage or power outages, which have lasted up to a week, impacting service delivery, food security and community safety.

There is a moderate level of digital ability in Kalumburu

- + Of the 84% of survey respondents who had used the Internet in the last three months:
 - o 71% used the internet at least once a day, with 20% saying they used it almost constantly.
 - o 90% had used online banking in the previous six months, 85% had accessed a government service online, 59% had done online shopping and 41% had done online learning or study.
 - o 76% had used the Internet to keep in touch with family or friends in the previous six months, and 85% had used online entertainment services (e.g., streaming video/music, playing online games).
 - o 78% said that the statement 'I know how to send and receive emails' is 'very true' or 'mostly true' of them; 88% chose 'very true' or 'mostly true' to the statement 'I know how to open a new internet browser tab', and 83% chose 'very true' or 'mostly true' to 'I know how to complete online forms'.
- + There is staff support for people to access and use online services available at the Centrelink office and the Community Resource Centre (CRC).
- + The primary reasons given by the 16% of low Internet users (those who had not used Internet in the last three months) for not using the Internet was not having access (75%), cost (50%), and concerns around privacy, scams, inappropriate content and/or causing conflict (50%).

Affordability is an issue, but expenditure is reduced by the subsidised Wi-Fi network and limited mobile data capacity.

- + 46% of those who used the Internet within the last three months indicated that the main reason they do not use the Internet more often is because "The Internet is too expensive for me".
- + Kalumburu is a very isolated community, with very high costs for food, fuel, transport, and goods. With an income averaging \$296/week (ABS 2021), communication costs are a burden for many residents.

- + 41% of respondents indicated they sometimes had to cut back on essential household costs in order to afford personal or household Internet within the past six months, with 6% saying they often had to cut back. 73% of respondents said they compromised on connection speed and/or quality to prioritise affordability.
- + Of the 46 responses on household mobile expenditure, the average expenditure was \$97/month, with 4% paying over \$200/month. These rates are lower than most sites with mobile access, likely due to the subsidised Wi-Fi network, free Centrelink Wi-Fi and constrained Internet use via the small cell 4G service.
- + Those households with fixed broadband services reported paying an average of \$42 a month for these.

The full survey results are available in Appendix 1. A detailed audit of community demographics, relevant information, and communications and media services available in Kalumburu at the time of this research is provided in Appendix 2.



Figure 2: Photo of research team - left to right: co-researcher Leanne Kelly, Lyndon Ormond-Parker, Kalumburu CEO Madeline Gallagher-Dann, Ashlyn Hassett, Julia Campbell and Daniel Featherstone



What is Digital Inclusion? How is it measured?

Digital inclusion refers to equitable and reliable access to and use of information and communication technologies for participation in social and economic life.

The Australian Digital Inclusion Index (ADII, Thomas et al., 2021) is an annual national survey that measures three dimensions of digital inclusion: Access, Affordability and Digital Ability. ADII scores range from 0 to 100. The higher the score, the greater the level of digital inclusion. ADII scores are relative: they allow comparisons across different social groups and geographic areas, and over time.

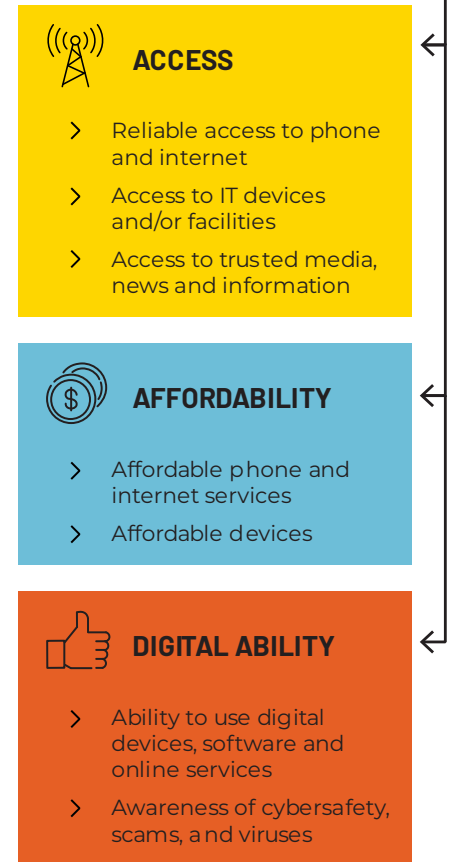
People living in Australia's 1100 remote Indigenous communities are likely to be among the most digitally excluded Australians. The ADII has previously found that people in remote communities often have extremely limited access to digital infrastructure and services and encounter very high costs for Internet access, especially in relation to their income (Thomas et al., 2018; Thomas et al., 2019).

The Mapping the Digital Gap project uses an amended version of the survey that underpins the ADII (the Australian Internet Usage Survey) to collect digital inclusion data. The Mapping the Digital Gap survey results will be available on the ADII website, with interactive charts that will provide insight into community-specific results as well comparison with other participating communities and national results collected by the ADII.

In 2021, access to information and services enabling participation in informed decision making regarding their own lives was introduced as a new Closing the Gap outcome (17). This new target 17 includes a goal of equal levels of digital inclusion for Aboriginal and Torres Strait Islander people by 2026.

The Mapping the Digital Gap project is targeted at remote First Nations communities and does not include digital inclusion of First Nations people living in urban and large regional centres. However, it is hoped this project will provide data that will help in measuring the scale and nature of this digital gap over time, as well as insights into strategies to address key obstacles and reduce the digital gap for all First Nations people.

DIGITAL INCLUSION



2. INTRODUCTION

Having had only limited residential phone and broadband services until recently, there are now a range of communications systems in use in Kalumburu. These include the Telstra HCRC microwave telephony system, initially installed in the early 1990s, Optus 3G and 4G satellite small cell mobile services (installed 2018 and 2020 respectively), NBN Sky Muster (available since 2016) and the relatively new Wi-Fi mesh network, installed in November 2021 (See case study in section 6). Some agencies use more traditional modes of communication, such as UHF and VHF radio, which can operate when other services are not working. Starlink's low earth orbit satellite service became available in northern Australia in November 2022⁴, however we are not aware of any agencies using this service in Kalumburu yet (as at March 2023).

The Kalumburu Wi-Fi Mesh Network is an innovative community-wide communications solution, co-funded by WA Government and the Commonwealth's Regional Connectivity Program (RCP) and installed by Australian Private Networks (APN/Activ8me). There was initial positive community response with good use of data and VoIP phones. Unfortunately, following a lightning strike to one of the repeater towers in early May 2022, the network was awaiting repair at the time of our visit (in June 2022). The network was upgraded and repaired in August 2022. Research on the utilisation of the service will be conducted on our next visit in mid 2023.

Interviewees described the Optus satellite mobile service as highly congested and unreliable with regular dropouts and audio quality issues. There are upgrades planned to the Optus mobile network. The combined technical issues led to high levels of frustration by users of both the mobile and Wi-Fi mesh networks, with calls for services to be upgraded and made more resilient.



"We got Activ8me here, we've got Optus and we've got some Telstra [land lines]. ... Are we going to accept a new broadband network to come in the community [or] upgrade all the current ones we got? We need [the] community Wi-Fi [fixed], we need [better] Optus ... and we need a proper upgrade for Telstra."

- *Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022*

With speed and data limitations on the Wi-Fi network, up to 20 residential households now have dedicated Sky Muster services, as well as most staff houses and local agencies. However, many service providers expressed frustration with their existing satellite broadband services due to limited speeds and low monthly data allocations with domestic-grade services being shared by multiple users. Interviewees outlined the need for higher capacity and more reliable communications services for effective service delivery, health and safety, communication with clients, and connecting to virtual networks and cloud-based services.



"[We need] a lot more data, a lot more assistance. We're at the top of the Kimberleys ... we need these services [to] be sustainable ... to move forward."

- *Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022*

⁴ <https://www.abc.net.au/news/2022-11-13/starlink-available-kimberley-internet-remote-communities/101643422>



"If telecommunications were a bit more reliable, that would be better for everyone's connectivity and wellbeing and safety as well. Things happen, you want to be able to be in contact."

- *Fiona Greig, Principal, Kalumburu Remote Community School 2022*

In 2020-2021, the COVID-19 pandemic resulted in WA closing its border to other states and putting remote area travel restrictions in place. This resulted in restricted access by service providers from Kununurra and Broome to deliver health, education, training and other services, with some of these services moving to online delivery. While there was low vaccination uptake in many remote Western Australian communities, Kalumburu clinic reported that the community worked proactively to overcome misinformation and get high vaccination rates prior to the COVID-19 pandemic reaching Kalumburu, reducing the impact of the eventual outbreak in early 2022.

Also in early 2022, an extended power outage resulted in loss of all communications services. The community store had to close due to its reliance on EFTPOS and a no-cash policy during the pandemic. This caused significant food security issues during this period, with KAC distributing meat and food parcels to households.



"[When the power and EFTPOS goes down, it] makes it very difficult, because then suddenly the food security is gone. It's a major problem."

- *Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022*

While there were examples of tele-health being used via Microsoft Teams (MS Teams) or FaceTime at the clinic, access to online patient records system was unreliable with latency over the satellite service. The school principal described difficulty with students using online learning applications due to slow speeds on the school's existing satellite system, with a replacement system planned. The community power outages during the NAPLAN testing period impacted the school Wi-Fi system and students' ability to complete the online tests.

Maintenance of communications infrastructure and IT equipment was also raised as an issue, with lengthy delays and high costs to get technicians from Kununurra or Broome to undertake repairs or upgrades.

The lack of maintenance funding for local broadcasting services has left the community without radio services for an extended period. We assisted Pilbara and Kimberley Aboriginal Media (PAKAM), the regional First Nations media organisation, to reinstate both PAKAM and ABC radio services during our visit. We have found that many remote communities do not have ABC radio services due to lack of funding to maintain these services.

There is limited free-to-air television access in Kalumburu households. Our survey found that 51% of respondents did not have Viewer Access Satellite Television (VAST) direct-to-home satellite TV services, with KAC estimating a higher rate of 60% of houses without VAST TV services working. There has been no funding for maintenance or upgrades since the VAST equipment was installed in 2014. Some VAST satellite dishes were damaged or moved by recent cyclone winds, however the most common cause of failure is the set-top box, with high replacement cost.



"The majority of the houses [don't have] TV working. The VAST box itself is so expensive ... about \$570 ... basically someone's fortnightly income."

- *Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022*

Our survey found a moderately high level of digital ability among Kalumburu residents, with 84% of respondents reported using the internet in the last three months. However, usage is predominantly via mobile devices and apps, with limited use of computers or having keyboard skills. Interviewees and survey respondents outlined challenges with activating SIMs, setting up online service access, and accessing online help services, partly because of limited Internet access and lack of identification records. Fortunately, KAC employees at the Centrelink office and CRC office actively support people to complete applications, source identification records, and use online services and apps.

Compared with other communities visited, there was little concern raised by interviewees about cyber-safety issues and scams. However, there was demand for more digital skills training and support, especially for elderly people, including to use online services and apps, manage data usage, and build cyber-safety awareness. There was also demand for more workforce readiness training including training for specific software applications, keyboard skills, and applications specific to each workplace. There were also calls for a digital mentor role, to be a funded position, to provide appropriate support in using online services and to reduce pressure on existing staff.

Affordability of Internet data and pre-paid mobile services is a limitation on usage, with personal income averaging only \$296 per week (ABS 2021), and very high costs of food, fuel and other services. There are proactive measures to enable affordability of access in Kalumburu, including the introduction of the Wi-Fi mesh network, with free internal phone calls, 1GB monthly usage per user and unmetered access to government services. A planned upgrade to Sky Muster Plus backhaul in mid 2023 means the only metered data use is on video and VPN traffic between 4pm and midnight daily. Other measures include providing free Wi-Fi and internet access at the Centrelink office and Telstra making calls from public phones free of charge since 2021. However, more support is needed to help people reduce data costs as Internet usage increases.



“[People have limited] awareness of how much data [they use. Kids use the data on YouTube, so parents go] to the shop and pay for a little bit more. When you’ve got people who aren’t having lunch and dinner, that they’re having data instead, that challenges me.”

- *Fiona Greig, Principal, Kalumburu Remote Community School 2022*

To address the media and communications needs identified in this report, and support improved digital inclusion and service delivery, it is recommended that a Digital Inclusion Plan be developed for Kalumburu. Based on our audit of existing media and communications services (see section 4 and Appendix 2), and analysis of surveys and interviews with residents and stakeholders (section 5), a list of potential strategies for a Digital Inclusion Plan is outlined in section 7. As part of our ongoing research work with the Kalumburu community in 2023–24, the Mapping the Digital Gap team can assist with developing this plan.

3. HISTORY OF COMMUNICATIONS TECHNOLOGY IN KALUMBURU

Kalumburu’s remote location has resulted in it having limited communications access until recently, with mobile coverage arriving in late 2018 and a community-wide Wi-Fi Mesh network installed in late 2021. However, there have been significant changes in communications technology since the 1960s.

1960s to 1990s

During the Drysdale River Mission era, external communications would have been via HF radio, the primary mode of communication in remote Kimberley communities and stations up to the 1990s. Radio telephones were introduced in the 1960s, enabling people to call an operator over the HF radio and have calls connected to the Public Switched Telephone Network (PSTN). However, most community use was via the shared radio channels, often with multiple overlapping conversations conducted in language at any time. This many-to-many mode of communications changed to one-to-one when phone lines were introduced in the early 1990s:

- + “When the phones came through, people became more isolated ... because the HF radios were done away with. As a result, there wasn’t that communal radio chatter that usually happened in the morning because phones were very intimate. They were from person to person ... unlike the party lines.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)



Figure 3: Kalumburu Mission

In the early 1990s, Telecom installed phone services throughout remote Australia using the DRCS (Digital Radio Concentrator System) to deliver basic phone connectivity via a microwave repeater backhaul network. A string of about 15 solar-powered repeater towers were installed over about 550km from Derby to Kalumburu. Telstra public phones were installed and fixed lines into offices and some houses. These were the primary modes of communication available to residents since the 1990s up until the late 2010s, with the only upgrade being from DRCS to HCRC (Higher Capacity Radio Concentrator) microwave repeaters⁵ in the early 2000s. Fax was used as a primary means of conveying messages or records between agencies and communities.

- + “When I first came here [in the early 2000s] there was only payphones and people with home phones or business phones. And even that was very limited in the community. No one had Wi-Fis at their home ... [it] was all plugged in. If you needed to do internet banking or anything you had to go to the local office, otherwise see if the local clinic will let you run a fax from there. Very, very limited service ... Just basic satellite internet and fax machines and that was it.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

⁵ The HCRC upgrade provided more reliability with less line interference and a slight increase in speed from 9.6kbps to 19.2kbps, enabling improved use of fax and very basic dial-up Internet for email use.

Satellite Internet

There were satellite services available in the 1990s for internet access, however these were quite costly and most had relatively slow speeds. In about 2000, Telstra introduced the one-way satellite internet, a more affordable service which enabled faster download speeds⁶. In 2002-3, the Telstra two-way satellite Internet services were rolled out under the Commonwealth's Extended Zones contract, providing more accessible and affordable Internet, mostly in community agencies and staff houses:

- + “Then as the internet grew, round about 2000 we saw Telstra introducing a lot more of the one-way satellite and then eventually the two-way satellite. And that was the time ... they shut down the [HF] radio phone system.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

The Telstra two-way satellite was highly congested by the mid to late 2000s due to over-subscription and increased Internet use. Alternative business-grade satellite services were very costly, with Government subsidy schemes introduced to address this. In response to demand for an affordable satellite Internet solution, the NBN Interim satellite solution was introduced in 2011, prior to the Sky Muster satellites being built and launched⁷:

- + “When I came here in 2010, the school had an internet connection, but there was no internet at houses. ... We were the first to get the NBN satellites installed [in about 2011-12]. That was a huge endeavour. The satellite [dishes] came out on the barge ... [with agencies] arguing about who was going to pay. ... We had about 10GB peak data a month and maybe another 40GB off-peak data.” (Fiona Greig, Principal, Kalumburu Remote Community School 2022)

The NBN Sky Muster services became available in 2016:

- + “[Then we got an NBN service with about] 60GB peak data [which is] just as well, because now there's things like Netflix, and there was no TV streaming services back in 2010 either, so you didn't really need so much data ... definitely leads you to feeling a bit more normal, I guess, less far away from civilisation.” (Fiona Greig, as above)

Mobile coverage introduced in 2018

Kalumburu did not have any mobile coverage until late 2018 when an 3G Optus satellite small cell mobile service was installed under the Mobile Black Spots Program⁸. Satellite small cell mobile has low powered transmitters with limited range. Being over 550km from the nearest fibre optic cable in Derby meant that there was not a funding program that would provide a larger mobile base station in Kalumburu⁹. These typically require fibre optic cable or microwave backhaul, and cost over a million dollars to install the tower and transmission equipment, and upgrade the exchange and battery backup.

- + “The rest of the world have been connected for years. So, Kalumburu is probably one of the last places on earth to actually get a mobile network coverage area.

⁶ The one-way satellite system used the satellite connection for downstream traffic and dialup telephone lines for upstream traffic. This provided faster download of data, but slow upload speeds over the phone line.

⁷ <https://www.nbnco.com.au/corporate-information/media-centre/media-statements/remote-australians-the-priority-for-new-nbn-interim-satellite-service>

⁸ See ABC story: <https://www.abc.net.au/news/2018-09-09/kalumburu-braces-for-mobile-phone-coverage-for-first-time/10208336>

⁹ The Mobile Black Spots Program covered up to 50% of capital costs of installing a mobile base station with telco co-investment, but did not fund backhaul. The Regional Connectivity Program has since funded some microwave or fibre backhaul, but still requires at least 50% co-investment from a telco, state government or other partners.

Considering the amount of people ... [and only about] 15 houses [had Sky Muster]." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

- + "[There was an Optus 3G tower here] when I came back in 2020 ...[but] I wouldn't try and do anything other than send a text message on it." (Fiona Greig, Principal, Kalumburu Remote Community School 2022)

Some people called for a Telstra mobile service, so they could use the same phone they use in regional centres. However, interviewees described the benefits of having mobile access:

- + "I can connect with all my brothers, sisters, my mum [now], it's a huge relief. [Before I had to] walk down to the phone booth and try to ring ... [I'd only get through] if they're sitting next to a phone ... [they were] the old coin phones and not everyone has silver ... They got jammed up a lot and sometimes Telstra technicians wouldn't come out until a month later." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)



Figure 4: Telstra payphones are still regularly used in Kalumburu.

With limited bandwidth and only 30 active users on the network at any time¹⁰, the 3G small cell service was quickly congested, leading to frustration of users unable to connect¹¹. Subsequently, the 3G service was upgraded to include 4G in 2020 through a WA Government co-investment program¹², allowing an additional 60 users on 4G¹³. However, with an ever-increasing number of users and demand on data, the Kalumburu service was also regularly congested, with calls for further upgrades:



"The Optus tower that's here is obviously not servicing community anywhere near like it needs to. So whether it's Optus or Telstra, we just need something a lot stronger. ... We're extremely isolated here, possibly the most isolated community in Australia."

- Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022

According to the WA Government, Optus are planning upgrades. There are also plans for a Telstra mobile service to be installed in Kalumburu. No dates have been provided by either service providers as yet.

It is likely that would use the OneWeb low-earth orbit satellite constellation¹⁴ service for backhaul based on recent announcements by Telstra¹⁵. OneWeb is planning to be available worldwide by late 2023.

¹⁰ Source: Email correspondence with Penny Griffin, WA Government

¹¹ See: <https://www.abc.net.au/kimberley/programs/breakfast/remote-mobiles/11909850>

¹² See: <https://www.arnnet.com.au/article/662150/optus-strikes-wa-govt-deal-regional-network-upgrade/>

¹³ Source: Email correspondence with Penny Griffin, WA Government

¹⁴ One web <https://oneweb.net/>

¹⁵ See: <https://www.telstra.com.au/aboutus/media/media-releases/Telstra-and-OneWeb-move-closer-to-delivering-new-satellite-solutions>

A Wi-Fi mesh network was established in 2021

WA Government gained Regional Connectivity Program funding to establish a community-wide Wi-Fi network¹⁶. This was rolled out in in late 2021 by APN/ Activ8me, based on a model piloted in Tjuntjuntjara community in south-east WA. This project is outlined in more detail in Section 6.

Other satellite and remote area solutions

There are several low earth orbit (LEO) satellite services entering the Australian market, including Starlink, which expanded its coverage to northern Australia in November 2022. OneWeb will soon be providing wholesale backhaul from 2023, and Amazon is currently launching its Project Kuiper network.

- + “[With] Starlink already up [and] OneWeb [coming] ... those two systems [have] very minimal lag [and] incredible speeds. ... Google [and] Amazon [are] putting up their own.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

Low earth orbit satellites, at around 550km above the Earth (compared with 37,000km for a geostationary satellite), have considerably lower latency, enabling improved use of applications such as videoconferencing, cloud-based services and gaming. They also provide faster speeds (above 100Mbps) and capacity to provide unlimited download services. While more expensive than NBN Sky Muster services, LEO services provide an high-speed low latency connectivity in remote Australia. Google are trialling using hot-air balloons for Internet backhaul, launched from Woomera in South Australia:

- + “So they launch them in Woomera, push them up into the upper atmosphere, and they drift across, equatorially, to Kenya. ... they finally come down, get packed up, sent back to Woomera, and re-launched.” (Dave Corstorphan, as above)

Satellite phones are becoming more accessible

Satellite phones have been available since the 1990s, however they have required an expensive dedicated handset and costly monthly billed services. While some agencies use satellite phones for emergency communications, they are often unaffordable for Kalumburu residents. However, satellite phone access no longer requires a separate handheld device. For example, Iridium Go SIM cards are now available to use in a standard iPhone, enabling phone calls outside of 3G/4G coverage via the satellite network:

- + “I have the Iridium Go ... I've got dual SIMs plus satellite built into my iPhone, which allows me communication all around.” (Dave Corstorphan, as above)

From 2023, new models of iPhone 14 will enable emergency communication via the Globalstar satellite constellation¹⁷. There are already relatively affordable emergency satellite communications systems, such as Zoleo, that enable users to send basic text messages to any mobile number from any location.

¹⁶ The project received RCP funding of \$888,140. Source: <https://www.abc.net.au/news/2022-10-25/kimberley-connectivity-boosted-in-budget/101570172>

¹⁷ See: <https://support.apple.com/en-us/HT213426> and <https://www.reuters.com/technology/apple-picks-globalstar-satellite-service-iphone-14-series-2022-09-07/>

4. MEDIA & COMMUNICATIONS IN KALUMBURU

Existing Telecommunications Services

Backhaul to community: Kalumburu’s backhaul for basic telephony is via the HCRC microwave network. Mobile and Internet backhaul is all via satellite (see below).

Mobile coverage: There is currently an Optus 3G / 4G satellite small cell service in Kalumburu. There are plans for a Telstra satellite-delivered 4G service to be installed (date to be confirmed).

Landlines: The copper network provides phone services only (no ADSL due to HCRC backhaul) to most agencies in the community, with limited residential access. None of the surveyed residents had home landlines.

NBN services: In 2022, Kalumburu only has access to Sky Muster satellite services under NBN zoning. An estimated 20 community residential houses have NBN Sky Muster, plus most staff houses and agency buildings.

Public Phones: There are two public phones outside the community office, one of which had the handset broken at the time of our visit in June 2022. There was one outside Kalumburu Mission (working) and one opposite the water tank (not working during visit). There is a public access phone within the Centrelink office. Public phones get regular use in Kalumburu with calls on Telstra phones now free of charge (since 2021).

Wi-Fi: There is an Activ8me community-wide Wi-Fi mesh network in Kalumburu, with 128 buildings with local Wi-Fi repeaters and a Wi-Fi hotspot near the community office and store (using pre-paid vouchers after free 1GB per user per month). See Section 5 for details. Free Wi-Fi is also available at the Centrelink office.

HF / UHF Radio: HF radio is used by the rangers and by local boat owners for sea travel. UHF radio is used extensively for staff and vehicle communications by the rangers, school staff, and KAC community staff.

Telemetry: WA Department of Communities currently manage power, water and wastewater services in 141 WA Aboriginal communities, with responsibility transferring to Horizon Power and Water Corporation. Telemetry is used for monitoring and operation of services, in conjunction with the on-site Essential Services Officer.

Media Services

Radio services: PAKAM Radio (106.1FM) is the regional First Nations radio service with hourly shows from Remote Indigenous Broadcasting Service (RIBS) communities across the Pilbara and Kimberley regions. There is also an ABC regional radio service (104.5FM). During our visit, we helped PAKAM re-activate both radio services after an extended period of not working. There was no local RIBS broadcaster at the time of our visit.



388

Population – ABS Census 2021



88.4%

Aboriginal and/or Torres Strait Islanders



279km

North-west of Kunurra



615km

North-east of Broome



120

Private dwellings



4.4

Average people per ATSI household (ABS 2021)

TV services: All houses in Kalumburu require Viewer Access Satellite Television (VAST) direct-to-home satellite for free-to-air TV services. Over 50% of these were not operational.

Regional and Local news: Being a small community, local news is shared via word of mouth and notices on the noticeboards outside the community office and store. This includes upcoming events, meetings, health updates and training and jobs information. Regional news is shared via PAKAM and ABC radio and Facebook.

Newspaper: There is little newspaper access, however Kimberley Echo is sent to the store occasionally.

Access and Support Facilities

Community Access facilities: There is a community access computer in the Centrelink office for government and banking services. There is also a computer available in the Community Resource Centre (CRC) for \$5/ hour.

IT Support: Support in accessing and using online government services is available at the CRC and Centrelink office.

Mobile phones and recharge sales: A basic range of smartphones and flip phones (calls only), as well as pre-paid Optus recharge vouchers, are available from the Kalumburu store. Activ8me Wi-Fi vouchers are also available.



Figure 5: Telemetry is being used to monitor water tank levels, pumps, generators and other municipal services in many communities, however this relies on 4G or satellite backhaul services working effectively.



5. KEY FINDINGS

This section provides key findings from the 10 interviews conducted with community leaders and stakeholders, as well as observational data and survey results.

See Appendix 1 for the full set of unprocessed survey results, based on initial analysis of 49 surveys conducted. As outlined in the Executive Summary, the finalised survey results may differ from those presented here once data cleaning and weighting has been completed. These will be available via the Australian Digital Inclusion Index website and data dashboards in mid 2023.

Communications Access

Effective communications are critical for service delivery

Interviewees described the various means of communications they use for their day-to-day work:

- + “We use the phone, a landline, mobile phone. We use the internet. We communicate verbally, face-to-face. We go find people, we drive in the car, we walk around ... [We’re] on the computer, we send emails ... We do FaceTime ... Telephone conference ... pretty much everything you could do within a workplace ... [and] the mail that we send by post.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

However, most interviewees and survey respondents described the issue of unreliable communications services in Kalumburu as impeding their ability to deliver or access services. Limited communications was seen as an inhibitor of community development, with calls for upgrades to existing services.

Reliable communications is a health and safety issue

Several interviewees referred to the need for reliable communications as a health and safety issue. Interviewees said that home phone access is needed to enable elderly or sick people to contact the clinic. There were calls for the Activ8me VoIP phones to be more reliable:

- + “Elderly people [need a good phone to] dial for the nurse and policeman or whatever. ... [If] they get sick [or] don’t get their medicine, they need to ring the clinic ... [even] through the rain and fog.” (Maggi Captain, Kalumburu CRC 2022)

An interviewee raised the need for easy access to call support services when feeling suicidal:

- + “If there’s ... a mental health emergency [or] suicide attempts [they need] to be able to call Lifeline [or] triple zero. ... But you can’t ring and you can’t text [on the mobile] ... What does it take to change the system? Does it take a death?” (Tamara Hancock, Facilitator, Community Focus National, 2022)

Being very remote, with tourists and staff travelling vast distances to and from the community, satellite communications can be the only means of connectivity in an emergency:

- + “Most people will travel round from here, they’ll head off into town ... but if they break down ... you sort of hope that someone will stumble across them ... [In] the old days you had the HF radio and you could crank that up and contact someone.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

The satellite mobile service is congested with poor audio quality

While research participants were pleased to finally have a mobile service in Kalumburu, most described the Optus 3G/4G satellite small cell service as being unreliable and slow, with regular dropouts. Being a satellite-delivered service there is a higher degree of latency (delay) than a terrestrial service. However, most interviewees described audio quality issues including echo and delays of up to 10 seconds:

- + “My parents try and call me on the mobile, and it’s cutting in and out, especially at certain times of the day, so the evening, there must be a lot more pressure on it. It’s hard to have a normal conversation ... [It’s echoey] ... You can often get a full feedback loop going. ... Zoom or Skype [via Wi-Fi] are far more reliable than telephone really.” (Fiona Greig, Principal, Kalumburu Remote Community School 2022)
- + “There’s [often] a bad line, it’s very tinny ... [sounds] like they’re in a metal building or something ... You just hear bits and pieces of words.” (Michael Harvey, Area Coordinator, East Kimberley Job Pathways, 2022)

Congestion is a critical issue, with numerous reports of not being able to connect to the network. This is due to the limited number of users (about 30 users on 3G and 60 on 4G) who can be on the network at any time. According to WA Government, this is made worse by some modem devices staying connected even when not in use, further limiting the number of users. Interviewees said that early morning is the best time to try to connect:



“The Optus network that we do have is very limited ... when everyone [is] trying to get on the internet or Facebook or TikTok, it crashes. ... If you wake up early enough, the kids will finally go to sleep and you might get it for a couple of hours, but other than that, it’s ... Kalumburu’s only traffic jam.”

- *Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022*

- + “When you’re using your Optus you have to like beat the rush hour, you know, certain times.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

When the network capacity is full, it appears as SOS mode only:

- + “Everything is SOS. It’ll stay like that for a week or two. ... everybody [is] walking round and searching, putting their hand out, looking for signal.” (Marinda French, Kalumburu CRC 2022)
- + “[Often it] will have multiple bars, but it won’t let you on the system [unless] you make an emergency call, in which case it will boot someone else off ... to make way for you as a priority.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

Interviewees expressed frustration at paying for a service that they can rarely use:



“We’re paying the same as everyone else but not getting that service, so that’s a bit frustrating.”

- *Maureen Clugston, Resident/Assistant schoolteacher 2022*

This impacted people's ability to keep in touch with family, especially during the COVID lockdown period:

- ✦ “My mum passed at the end of last year but in trying to call her, she couldn't hear me. It was really frustrating and upsetting for her ... I'd be like, 'Mum, it's me' but she couldn't hear ... so I stopped calling her. ... If I go into Kalumburu I'd call [to] explain that it was me trying to call. ... Some days [the service is] fine and other days we have drop-outs and the connection's bad.” (Maureen Clugston, as above)

Being a small cell service, transmission power is limited, with a range of about 3km radius. Interviewees were keen for a mobile service with greater range coverage.

- ✦ “[If] they could expand it to 20km ... that'll cover Barge Landing.” (Julia Campbell, Admin Assistant, Kalumburu AC, 2022)

There is also a lack of coverage for households in some parts of the community and inside buildings:

- ✦ “You got to walk down the road in order to get a signal ... if you're behind the hill it doesn't work at all ... [And technicians] kept saying the trees were interfering.” (Kelwyn Gore, Youth Coordinator, Kalumburu AC, 2022)
- ✦ “I can't use my Optus inside [my house] ... I have to sit in the very corner of the veranda and hold my phone [up high]. ... You should be able ... to make a call [inside], where it's privacy.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

Visiting service providers, or those without an office, rely on the mobile service for work communications. Tamara Hancock, who runs a pilot family support program, had been waiting three months for a Sky Muster service. She described the frustration of trying to use the mobile service for client services:

- ✦ “If I'm lucky first thing in the morning my dongle will work. ... [Beyond] the office [I've] got no chance ... It's very, very demotivating ... I can't [do my work], I can't coordinate those services [for] families ... people ring me on my mobile [but] they can't hear me.” (Tamara Hancock, Facilitator, Community Focus National, 2022)

The service can also be impacted by power outages in the community, with limited battery back-up. The Optus base station is located on the northern side of the community. However, the KAC CEO said that if there is a power outage in Kalumburu, the Optus mobile service also goes down.

There are numerous challenges with activating SIM cards

Residents described challenges in activating SIM cards for new phones, which requires ID and email address. Staff described having multiple phone numbers registered in their name due to helping people activate their SIMs. Further, if re-activating a SIM, the same email address cannot be used again, so people have had to set up a new email address or spend a considerable time on the phone to Optus helpline to do the activation.

An interviewee said that if an Optus SIM is not recharged promptly it gets cancelled and data deleted.

- ✦ “If you don't recharge in about two to three days [your] number's completely wiped and you [have to activate] another SIM. ... Whatever you had on your SIM [photos, numbers, everything is] gone, it's just blank.” (Kelwyn Gore, Youth Coordinator, Kalumburu AC, 2022)

We were advised that customers need to request a long expiry plan to avoid this issue and retain the number if there is a delay in re-charging. However, there is limited awareness of the need for this.

Interviewees described an issue with recharge vouchers not adding the credit:

- ✦ “When you’ve purchased a credit ... [sometimes] it does not work and you can’t get refunded for that \$30. ... that happened to plenty of people.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

A possible cause is that some apps accrue a daily fee even when not in use, and charge once activated¹⁸.

There are plans for a Telstra mobile service

Telstra is planning to install a satellite small-cell mobile service in Kalumburu but no installation date has been provided at this time. There is strong community support for a Telstra mobile service in the community (see Appendix 1 - Comments), to address the issues of congestion and coverage, and to reduce the need to have two different mobile phones for use in other regional centres such as Kununurra, and in the community.

- ✦ “They are in the process of putting a Telstra tower here, so Kalumburu will have Optus and Telstra, which is good. I’m sick on carrying two phones. It will free up Optus. Not so [many] people will be on Optus all the time.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)
- ✦ “[We] need more better reception. To change it to Telstra, then life might be a bit easy ... and no one would be cranky.” (Maggi Captain, Kalumburu CRC 2022)
- ✦ “Most people in the community ... we have to change from our Telstra to Optus [phones]. ... there’s not [a] strong signal in Kununurra or Wyndham to use your Optus. ... [so] we just keep changing from Telstra to Optus, getting new SIM card after SIM card.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

Some people use Wi-Fi Calling to get around this issue:

- ✦ “A lot of our medical people ... they come out and they’ve only got Telstra, but what we often do is ... set them up [to use] Wi-Fi calling. Telstra’s always had Wi-Fi calling available ... Optus has only just switched it on for prepaid customers ... [previously] you had to be a post-paid customer of Optus.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

It is anticipated that the Telstra mobile base station will have an independent power supply and battery backup with limited impact from power outages.¹⁹

Impact of network outages

There are regular mobile network outages as a result of power outages, monsoonal weather conditions or other causes. Power outages also impact satellite communications, which are used predominantly for online services. With limited backup communications options and very long distances to regional centres, outages can have a significant impact, with EFTPOS, ATM and cloud-based systems inoperable²⁰. During COVID, the community went entirely cashless to reduce handling of money, increasing reliance on EFTPOS and internet.

- ✦ “During wet season or COVID or when the community [had] no cash, [an outage] impacts us a lot. ... When there’s no internet, the EFTPOS down, the shop has to

¹⁸ This was an issue with subscription applications like AirG charging a daily rate even when the phone had no credit.

¹⁹ Source: Correspondence with Penny Griffin, WA Government.

²⁰ Telstra no longer supports use of EFTPOS or ATM over the HCRC network, and with limited mobile access, there is not a backup option to satellite.

close because we can't purchase any food [or] fuel. We can't do anything until the ... whole system's back up again. That happens here, like regularly ... a couple of times a month." (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

During wet season, the community had numerous Internet outages, some up to a week, impacting on delivery of health and emergency services as well as community operations:

- + "Yeah, the internet was down for at least a week, so when we've got clinical services, police service, whatever, we can't get that important information out to whoever it's intended for. ... [And] we have to catch up on [all our work]." (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)
- + "When the satellite signal dropped out ... there was a lot of angry people standing outside the store that couldn't buy food for their families. ... [and it gets] directed at Kalumburu Aboriginal Corporation ... we're trying to assist [but It's] very frustrating at times." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

During outages, food security can be a serious health issue. Daily food supply is needed due to limited access to fridges and unreliable household power supply due to reliance on power cards (vouchers).

- + "We've got elderlies here that need food ... kids that need food. Most of the people here in the community ... buy food every single day ... because most of them don't have fridges in their houses. So it impacts us a lot." (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

During power outages, the HCRC network can be the most reliable source of communications, as this has battery backup. However, this also has reliability issues, such as failure of batteries or repeater equipment on the microwave repeater network, rain fade issues, or if the copper network is water-affected or damaged.

The community sourced and distributed 'killer' (beef) locally to ensure households had food:

- + "Sometimes that went out for days ... so we had to take initiatives into our own hands ... [I asked some] local fellas [to] go out and get a couple of 'killers' [cattle] ... [and we] drove around and given it house to house just so everyone can have some food." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Several interviewees called for fibre optic connectivity to Kalumburu to improve speed and reliability.

- + "I understand that we're remote, but ... fibre-optic cabling with unlimited data would be ideal [because] when it's wet season, our emails barely work." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Telstra fixed landline phones considered essential

Some people described the Telstra land lines as the only reliable means of making phone calls, with the mobile service not reliable enough for work purposes.

- + "I have recently had installed a [Telstra] landline ... [for personal and] work purposes ... It's my only clear line. ... [but] I have to make an appointment to make sure that I'm home for that phone call. I can't just go 'ring me', because it's a landline." (Tamara Hancock, Facilitator, Community Focus National, 2022)

Fixed lines are delivered via the HCRC microwave network, a string of repeater towers from Derby, 550km south-east of Kalumburu.

- + “I counted 15 towers that it comes through. ... Some are closer, depending on the terrain, but generally 50km apart.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

Interviewees said that reliability of the fixed line network is critical, as these are often the only services working during wet season when satellite services can be out due to rain fade or power outages:

- + “If something happened [to the network] down the road ... we would be cut off and stranded ... We rely on connectivity for emergencies and things like that.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

The reliability depends on regular maintenance to ensure all repeater links and batteries are functioning:

- + “[Previously] Telstra would regularly change the batteries over on the repeaters [at least every] 24 months. ... it was running well ... [Now it seems they] maintain them on an as-it-breaks-down basis. ... We’ve had situations where the batteries have finally died ... and we’ve lost lines into here.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

If batteries are ageing, they may not retain charge overnight. Being charged by solar power, phone services may only work by day:

- + “[When batteries] die on one of the repeaters [you] have to wait until about 9:30-10:00am in the morning before the system came up.” (Dave Corstorphan, as above)

Moisture in the repeater equipment can also impact line quality, creating crackly or distorted audio. Dave Corstorphan said line quality gets so bad the clinic reverts to satellite phones to talk to doctors in town.

Local residents or staff can still apply for a Telstra fixed line connection, but interviewees reported long wait times, including a five month wait for a phone installation. When the technician arrived, “he said he could not do the install because there was no lead-in trench to the building”. Despite community staff offering to dig the trench that day, he said he would have to come back²¹.

Kira Kiro Art Centre have tried unsuccessfully to get a fixed line phone re-connected:

- + “[We did not know the] name that the previous connection was listed under, so Telstra wouldn’t reconnect the service.” (Sarah Vallentine, Arts Development Facilitator Kira Kiro Art Centre, Kalumburu 2022)

Mobile is the primary means of phone calls

Most adult residents use a mobile phone as their primary means of communications, online services and entertainment, either on the Optus mobile network or via public or home Wi-Fi.

80% (39 of 49 people) of respondents said they owned or shared a mobile phone. Of those with phones, 92% had smartphones as their main mobile phone, and 97% used pre-paid services. There is an average of 2.4 mobile phone services per household.

69% of respondents regularly used their own mobile phone for phone calls, with 24% using someone else’s mobile phone. 53% used the public phone, 35% use the phone at a community office or workplace, and 18% use the fixed line telephone in their home.

²¹ Source: Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022

While all houses had a VoIP phone installed under the Activ8me Wi-Fi network, the service was not working properly at the time of our visit, so many of these phones were not in use. Activ8me returned to upgrade the network in August 2022, so we will review their usage in our 2023 visit.

95% of survey respondents who had used the Internet within the last three months said they use their smartphone for Internet access. The majority of people surveyed (78%) do not have any form of fixed home Internet with 18% (nine respondents) having an NBN Sky Muster service at home. 4% used a form of mobile broadband other than phone data, such as a portable 4G modem.

Telstra made public phones in remote communities free during COVID lockdowns in 2021. This program was expanded in 2022 to make all public phones free nationally. Having access to free public phones has reduced community demand on community office phones:

- + “[Telstra public phones] moving to free has basically stopped a lot of humbug here [by people wanting] to ring this person ... calling lawyers, dealing with funeral directors and things like that. Whereas now they can do it at their own discretion.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

However, there are ongoing maintenance issues with the phones. Of the four public phones in Kalumburu, two were not working during our visit, one with a damaged handset.

- + “[Sometimes] people get frustrated [waiting for Centrelink and damage the public phones and Telstra have to] come out and repair the phone ... you’ve [got to make equipment] almost bulletproof.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

While public phones are well used, there are concerns about privacy of calls due to the phone location:

- + “Privacy is a big thing here in the community too, especially with these pay phones ... Even though it’s a public phone, it’s very out in the open.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

Some surrounding homelands have Wi-Fi phones but other have no communications

While several larger homelands and tourist campsites surrounding Kalumburu have Activ8me Wi-Fi-enabled satellite public phones, interviewees raised safety concerns for sites without services:

- + “If there’s an emergency out [at] the barge landing at Marra Garra [16-17 kms away], there’s no way they could call for assistance if something happens out there. ... Why can’t we have [mobile coverage] round our airport area, round our gorge area ... the popular places.” (Julia Campbell, Admin Assistant, Kalumburu AC, 2022)
- + “They don’t see it as necessity until it is a necessity. [It would be good to have] mobile coverage [at] the beach [and homelands so] if you do get into strife, you’ve got assistance right there.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

With high levels of tourism in dry season, access to communications is important for public safety:

- + “We do deal with a lot of tourists that come in. The clinic deals with that and luckily, we have the police here ... out on the other homelands, they don’t [any] mobile service ... they’ve only got landlines. If there was a real emergency ... you’d need someone to get to the phone and someone to just react [to the situation].” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

The Rangers have established bases at two camps with Activ8me community phones, and have found these effective for Wi-Fi calling and basic Internet use (see Rangers section under service delivery). There are plans to install additional Activ8me phones in up to eight homelands currently without services:

- + “For all the Homelands ... around Kalumburu, we’re getting [a] phone booth type of thing ... that’s free for mobiles and landlines and it also has a Wi-Fi up [to] 15 or 20 metres.” (Madeline Gallagher-Dann)

NBN Sky Muster usage by agencies and residents

There are currently estimated to be 20 residential houses with Sky Muster services, as well as most staff houses and local agencies. However, with large households sharing the service, interviewees reported that the data allocation (50-150GB/month) often does not last for the month.

While some interviewees said that Sky Muster services work reasonably well for basic use, some agencies have found that the limited speed and data capacity is insufficient for offices with multiple users. Loss of service during wet weather was a commonly reported issue:

- + “We have an NBN satellite connection and Wi-Fi in the arts centre [and] manager house next door. Our connection is [good enough for] what we need, except when there are storms and we are cut off from all communications.” (Sarah Vallentine, Arts Development Facilitator Kira Kiro Art Centre, Kalumburu 2022)
- + “Dry season like this, it’s pretty reliable. We’re on restricted data, [no] unlimited plans [like] in the city. ... Wet season, every time it rains, we lose internet, we lose television, we lose everything. Just becomes a little bubble.” (Fiona Greig, Principal, Kalumburu Remote Community School 2022)

Kalumburu AC CEO Madeline Gallagher-Dann said the Sky Muster data limit was insufficient for the shared needs of several agency offices, impacting on her ability to do critical administrative work.

- + “Within this one building we have [our] administration, we have Youth, we have RSAS, we have Centrelink [all on] a shared network. Once the data gets chewed up ... we have to wait [to the end of the month before it] gets fast again. At times it takes me two to three days just for one email to clear. ... I’m having to ring up [funding agencies] and say ‘I’m so sorry [the report’s] not with you right now, but it’s actually in my outbox.’” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)
- + “It takes a whole month to do grant proposals ... [but if slow Internet makes us miss] the due date, we don’t get the funding.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

Madeline applied for an additional Sky Muster service but was told it was limited to one service per building. However, with recent changes in Sky Muster Plus to unmetered data between midnight and 4pm, an upgrade to Sky Muster Plus may address the data limit issue.

Ranger Coordinator Shane Clugston uses Wi-Fi Calling over Sky Muster:

- + “I prefer Wi-Fi calling but even that doesn’t work all that good sometimes. So, on the weekend, for example, we couldn’t make a decent phone call.” (Shane Clugston, Ranger Coordinator, Wunambal Gaambera AC, 2022)

Maureen Clugston said that their Sky Muster service had slowed down in the last year:

- + “[In] the last [six to] eight months ... it’s been really, really slow ... we do feel that drain [from] everyone getting onto Activ8Me [Wi-Fi] last year.” (Maureen Clugston, Resident/Assistant schoolteacher 2022)

While the cause is not clear, customers could conduct a series of speed tests over time using Ookla and send results to their retail service provider (RSP) if they do not meet advertised average speeds. If the issues are not resolved, complaints can be taken to the Telecommunications Industry Ombudsman²².

Interviewees described long delays in repairs to their Sky Muster services. Julia Campbell reported a four month wait for Activ8me to repair the NBN satellite service at her house. Another interviewee described a three month wait to have an NBN Sky Muster service installed to use for work:

- + “They were scheduled to come out [recently] and all we got was an email going we were in the area but we had to leave ... it’s scheduled for the end of this month, so that’s three months.” (Tamara Hancock, Facilitator, Community Focus National, 2022)

Cost and timeliness of technical support is a critical issue

Maintenance of communications infrastructure and IT equipment is a critical issue, being a recurring and costly factor for agencies and residents. However, with limited technicians available in the region, the lack of timely and affordable IT support is a critical issue. Most technical roles are outsourced by key agencies to technicians from Kununurra or Broome, resulting in high costs and delays in getting IT equipment or systems working.

The Kalumburu Clinic outlined the high cost of getting an IT technician out to do repairs:

- + “[If technicians] have to come out, they’ll have to charter a plane ... it’s \$4,000 for charter, plus their time and everything else.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

KAC CEO Madeline Gallagher-Dann said that ideally one technician from Kununurra could undertake repair jobs for all providers - Activ8me, Telstra, NBN Sky Muster, Optus - rather than different technicians for each, with local staff providing basic repairs with remote support where possible. The KAC Essential Services Officer currently does realignment of VAST satellite dishes and cabling repairs.

HF and UHF radio used by several agencies

UHF radio is used by teachers within the school and in vehicles and by community staff. UHF radio is used extensively for staff and vehicle communications by the rangers and KAC community staff.

- + “Yes. We do have [UHF radio] as back up and that’s going back to the dinosaur age but it’s practical and it’s there on an emergency basis.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

UHF can be more reliable than mobile phones, especially during power outages, however without a repeater tower the range is currently limited. KAC are getting quotes for a UHF repeater in Kalumburu.

VHF radio is used by the rangers for land and sea management work and emergency purposes, including in the Ranger boat and in some vehicles. Some private boat owners also use VHF for communications while at sea. Dave Corstorphan uses VHF radio for travelling remotely and said that has digital VHF now enables private one to one or small group communications from anywhere across the country.

²² Complaints can be lodged at: <https://www.tio.com.au/complaints>

Service Delivery and Use of Online Services

There are numerous obstacles for residents in using online services

Some online services do not work with poor connectivity:

- + “I was trying to go on one website for the police [to do an online application] and it just wouldn’t let me go ... I was trying to get it for over a month every day. And I went to the cops, can you guys get any good signal on yours? No. ... It’s terrible.” (Kelwyn Gore, Youth Coordinator, Kalumburu AC, 2022)

Accessing identification can be a major challenge in a remote community, with some services requiring an email address, mobile number, street address, date of birth. Centrelink and CRC staff assist help people to access ID documents where available. Department of Human Services (Services Australia) visit twice a year to assist with ID needs:

- + “[We help people] get the birth application online and print them out [and] send it off. ... [We] encourage everyone to [get ID documents when DHS visit].” (Julia Campbell, Admin Assistant, Kalumburu AC, 2022)
- + “[DHS help people] with their personal identifications ... [like] birth certificate, licence, whatever ... but they [only] come for two days. That’s not enough for an entire community of 500 people.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

Increased use of tele-health utilising MS Teams and FaceTime

Effective tele-health can save lives, enabling triage to be undertaken remotely and supporting on-site treatment or emergency procedures, and reducing the number and cost of RFDS flights required.

Tele-health use has increased at the Kalumburu Clinic in recent years, mostly using MSTeams or FaceTime as the most reliable systems over the satellite connection. While there has been a high-definition Scopia system in a dedicated room, MS Teams and Facetime enable tele-health on mobile devices or laptops in any location:

- + “Telehealth has been something that’s generally pretty good, although we’ve moved a lot more now to MS Teams [away from Scopia] ... [which] means we can have individual rooms, whereas before we would have to take the treatment room up the whole time. ... We’ve used FaceTime here, to communicate with doctors in emergencies.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

Kalumburu isn’t able to use the Emergency Telehealth System (ETS) used by other remote clinics:

- + “Most other clinics around Australia have ... ETS, emergency telehealth system. [If] you’re got someone [that] comes in with a major incident, you hit the button, and it connects you to an emergency room somewhere [with] a team [who] can watch you and advise ... almost as though you’re in the same room. The lag here means it’s too difficult at times.” (Dave Corstorphan, as above)

A whole-of-community approach on COVID-19 education led to high vaccination rates

The community worked proactively to overcome misinformation and get high vaccination rates prior to the COVID-19 pandemic reaching Kalumburu.

- + “The misinformation still comes through ... From time to time, someone will get on Facebook and say this or that ... [But] we thwarted that with community’s help [and] a

lot of education campaigns [and information] sessions ... We have achieved nearly 99% first jab, 98% second, and well over 80% third jab. ... The whole community worked towards putting that in place.” (Dave Corstorphan, as above)

The successful vaccination and information program helped reduce the impact of the eventual outbreak:

- + “When COVID finally did hit here, yes, there was a sudden spike in cases, but ... we only had one fly out ... a preemie baby ... and the rest of them were literally coming in, ‘Oh, I had a bit of a headache last night, but I’m over it this morning, I just thought I’d better get tested.’ ‘Oh yeah. You’re positive.’ ‘Oh, okay.’ So we were lucky.” (Dave Corstorphan, as above)

The cloud-based health records system can be problematic over satellite

Cloud-based and automated systems are increasingly used by service providers and software companies. While these systems can improve record-keeping and data management, especially for regional and State-wide agencies, they can have issues when the Internet is not reliable.

The Kalumburu Clinic use an online patient records system called Community Health Information System (CHIS), which requires low latency (signal delay time) and synchronisation for real-time data entry. The clinic uses NBN Sky Muster satellites, which has latency of about 600ms²³. Combined with other network latency, this can cause issues with remote connection to the server in Perth 3000km away.

- + “[Latency] certainly causes a lot of problems ... on the CHIS software. [When I type] in here ... [it’s being] electronically typed [at the other end].” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

While the system mostly works in good weather, poor weather increases the latency:

- + “[When] we get bad weather [the satellite connection can be] so slow ... [the server just] can’t deal with it. So that is a major issue.” (Dave Corstorphan, as above)

The lack of high-speed internet connections and reliable operating systems impact on productivity:

- + “The [Cisco network] system ... tends to slow things down. You get used to it [but] a lot of doctors hate [doing] scripts and things like that, because it is time-consuming. The lack of faster Internet connections means [about] a quarter of our time is wasted, waiting. And it’s very costly.” (Dave Corstorphan, as above)

Dave Corstorphan suggested use of low earth orbit satellite services (LEOs) with faster speeds and reduced latency:

- + “[We need] more reliable internet. ... [With] low earth orbits, there’s not the lag. Starlink [is] offering incredible speeds [and] Telstra’s bought a large chunk of OneWeb.” (Dave Corstorphan, as above)

Connectivity can be disrupted during storms or cyclones, with record-keeping returning to paper-based:

- + “When we have storms [or cyclones] we’re off air for several days ... we [return] to a paper-based system. ... [Without] our patient information, such as allergies ... previous histories, it makes it very difficult to operate.” (Dave Corstorphan, as above)

²³ The Sky Muster geo-stationary satellites are about 36,000kms above the earth, causing this latency. Source: <https://www.skymesh.net.au/blog/what-is-latency-in-satellite-internet>

With regular turnover or transfers of Remote Area Nurses, Dave Corstorphan said that they need basic IT training for nurses to use communications systems and keep them working. Without reliable connectivity and support, it can be difficult to attract and retain nurses in remote area clinics:

- ✦ “[Poor connectivity puts] us back into the old days, [so it’s hard to] attract a lot of younger nurses up here, because they’re fearful of [technical issues] without all that backup.” (Dave Corstorphan, as above)

Use of Centrelink services

KAC manage the local Centrelink office and assist clients to call Centrelink for signing up or reporting. However, with community offices sharing a Sky Muster service, the limited capacity can be challenging.

When clients call the Centrelink help line, they often have a lengthy wait time, sometimes up to an hour, to talk to a service agent. This can be highly frustrating for clients if the phone call drops out while waiting, due to the unreliable mobile network, and they have to start the call and wait period again.

- ✦ “When you dial the [Centrelink] number, sometimes it just cut outs. ... You dial it [again], and then when you’re talking they’ll just cut out. ... The people end up angry and they don’t get their money and that’s when they want to smash the shop and go crazy and blame everybody. That’s why we need to bring good reception to Kalumburu.” (Maggi Captain, Kalumburu CRC 2022)

Centrelink clients are becoming more familiar with using the online Centrelink and MyGov apps, however unreliable connectivity can make use challenging:

- ✦ “They download the apps and ... use it a lot in town [but] not here, it’s not strong enough the signal. ... So they come mostly here to get help from us. ... Because if you’re halfway through question 30 out of 50 and then it reloads and you have to do it again, you’d feel angry. ... I know I did.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

While Centrelink and MyGov access is free on the Activ8me Wi-Fi network, most people still prefer to have one-on-one help to access services.

- ✦ “With the Activ8me there is the free website thing and they could go on their phone, but they choose to come here to Centrelink or CRC and ask for help.” (Julia Campbell, Admin Assistant, Kalumburu AC, 2022)

Accessing online government services was an issue during the COVID-19 lockdown period:

- ✦ “[During] lockdowns, where people had to isolate in their homes. [Having] limited access to internet ... made it difficult for them to access services through Centrelink and the like.” (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

There are numerous challenges in using online banking services

With no face-to-face banking service available in Kalumburu, and a \$3 ATM transaction fee in the store, residents prefer to access banking services online. However poor connectivity can make this difficult:

- ✦ “A lot of people do have the apps now but it’s all about connectivity. So if they can’t get on to the Optus ... because that’s limited at times [and] don’t have Wi-Fi at home [they use the office Wi-Fi].” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Without email and ability to use online banking, postal delivery of bills can result in late payment:

- ✦ “A lot of people don’t have email addresses so [only get their bills by] the mail plane. Sometimes bills come late and people [can get late fees because they] didn’t know how to set up direct debit.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

If people forget bank details, passwords or security questions, they need to submit an application form:

- ✦ “[People often] lose [their passwords] or they can’t remember ... it’s illegal [for us] to hold anybody’s personal information ... so we [help them fill out] another form ... some people don’t know their date of birth [so] CRC has a folder with their birth certificates just to help them out.” (Julia Campbell, Admin Assistant, Kalumburu AC, 2022)

The proof of identification application must be signed by a Commonwealth employee, which can be a very cumbersome process:



“People [are always] asking for help to do banking [applications] ... some people don’t have identification [so] they have to go round to either the nurse, the school [or police to witness] ... That’s time consuming [because even after] they do sign ... the bank guys still have to call them to confirm whether that’s them or not ... [but they can’t wait around] because they’ve got a job. ... These guys could be hungry ... but [there is] all the crap they have to do [just] to get \$50 transferred for bread and tea and milk and all that.”

- *Julia Campbell, Admin Assistant, Kalumburu AC, 2022*

There were calls for support and training in online banking use to reduce pressure on community staff:

- ✦ “We need a person [from the bank] to come and help with those technical difficulties, whether it’s online or the paperwork or anything. Yeah, and maybe more training to teach this mob here in the community how to do it because it’s an everyday thing for us, whether it’s identification and all that.” (Kelwyn Gore, Youth Coordinator, Kalumburu AC, 2022)

The poor quality of the mobile service has resulted in the bank locking people’s accounts:

- ✦ “When they ring up with the [Optus] mobile phone, because of the reception, the [bank] cannot hear them ... thinks someone else is talking ... [so they] put a lock on their card. ... So they have to [apply] to let their card be open again.” (Maggi Captain, Kalumburu CRC 2022)

Sometimes people have to fly to Kununurra or Broome to re-activate their account:

- ✦ “[The bank] say they have to go into the branch. ... [but the nearest branch is] in Kununurra [so they have to] fly in. ... Bankwest and Westpac [customers] have to travel far as Broome now because [the Kununurra branch closed].” (Maggi Captain, Kalumburu CRC 2022)

Flights to Kununurra cost \$190 on Mondays or \$390 on Wednesdays and Fridays, which is a large proportion of fortnightly Centrelink payments.

- ✦ “Most people here get paid \$500 or \$600 a fortnight [from Centrelink]. So when you get in town you only [have] \$100 or \$200 and you have to wait another month [to] come back. And [you need] \$50 for the birth certificate ... That’s everything gone right there.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

Kalumburu School uses various communications modes, but poor connectivity impacts education opportunities and outcomes

The Kalumburu Remote Community School use various modes of communications internally and externally, including MS Teams for external meetings and staff development, email, phone and face-to-face communications:

- + “Obviously, communication with my staff is really important. [They need to] know ... if something arises [like] meetings ... teachers requesting support ... a student’s arrived late ... [basic] communications to keep the school running.” (Fiona Greig, Principal, Kalumburu Remote Community School 2022)

With unreliable mobile connectivity in Kalumburu, the School use UHF radio for staff communications:

- + “Internally, our main communication is a walkie talkie system. Teachers all have a two-way radio, and so does everyone in the front office, so that’s our main talking point.” (Fiona Greig, as above)

External communications require a range of modes, including face-to-face, posters and email:

- + “To communicate to parents, it’s usually either a home visit or a sign on the wall at the shop. ... [we use email to communicate] with other schools and head offices [and] staff ... [mostly] for future-reference information.” (Fiona Greig, Principal, as above)

It can be challenging contacting parents by mobile phone:

- + “Most people have a [mobile] phone [but not] a consistent phone number. ... [people often] replace [a SIM] instead of topping it up, or phones change hands ... a number you’re given one week doesn’t work a month later ... so to contact parents [is] pretty difficult.” (Fiona Greig, Principal, as above)

The school’s IT systems are managed by WA Government’s education department, with the current Clear Networks satellite service to be replaced by a Telstra Riverbed service. At the time of our visit, the School was struggling with low connectivity speeds, with some digital applications used in the classrooms constrained by speed and data limits:

- + “The teacher has the main computer connected to the internet with a digital projector. ... We have iPads that are available for the younger classes [with educational apps]. ... The older years [have online] laptops in the classrooms [but we] struggle if people are doing a lot of bandwidth-heavy things at once. [Also] managing our data, we can’t just let kids have free rein.” (Fiona Greig, as above)

Children tend to be digitally literate on mobile devices:

- + “The kids are very handy with touchscreen technology. Most of them have phones [or tablets] ... but when it comes to actual data processing on a computer, they fall behind.” (Fiona Greig, as above)

The limited computer and keyboard skills impacted on student’s ability to do NAPLAN tests online:

- + “[When] we have something like NAPLAN online come up and go, ‘Oh my goodness, they can’t even navigate the cursor. ... We definitely need to work on their word processing skills.” (Fiona Greig, as above)

The 2022 NAPLAN tests were also impacted by power outages and local network issues:

- + “[It] was horrendous. ... Our Wi-Fi ... would just stop connecting, especially if there’s a power outage. At the time, the power mob were doing testing so there were a few

power outages. ... Last year was a lot smoother, so it's not a permanent problem. This year was definitely challenging." (Fiona Greig, as above)

The closure of schools during COVID-19 lockdowns, and the shift to home-based online learning had a detrimental impact on education outcomes. Many children had limited home Internet access and devices:

- + "Two of my kids come back [from boarding school] during COVID and had to do remote learning [but] they couldn't log on [to] download the content that they needed. ... They fell behind, [not] because of lack of effort, it was just the lack of services." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Education and training opportunities are seen as a key reason for needing improved communications:

- + "[We need] the infrastructure to get all ... the education and training. That would definitely be a big changer for Kalumburu." (Madeline Gallagher-Dann, as above)

The Kalumburu CRC provides digital services, post office and computer access

The Community Resource Centre (CRC), run by Kalumburu AC, provides post office and digital services.

- + "At the CRC ... we do mails, photo copying, laminating, and binding. People ... use the [phone or] computer to access online banking or MyGov ... people [can book the meeting room for] meetings. ... [We] give out mail here, like a post office." (Maggi Captain, Kalumburu CRC 2022)

They also provide digital support by helping people with computer use²⁴, printing, laminating and binding, internet banking, and SIM activation for phones. Elderly people in particular need this support.

- + "They [help] fill out the forms ... set up bank accounts, [get] tax file numbers ... everything that you need." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Only one of three community access computers was working in the CRC during our visit. This costs \$5 per hour for residents to use. The phone was also not working.

Impact of COVID-19 on schooling and access to services

When COVID-19 spread through the community in early 2022, there was about a four-week lockdown period, with school and services closed. With a lot of misinformation on social media, the limited access to services, communications and reliable news impacted on people's mental health and wellbeing:

- + "We were all scared because of the news we kept hearing ... You couldn't communicate properly. ... [My parents] wanted to [talk to my kids but] it was quite hard with the signal. ... It took a toll [on] my mental health [and] everyone else in the community." (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

Without TV or Internet at home, the children were leaving the house to keep themselves occupied:

- + "It was hard and scary, [we] couldn't do anything, just had to isolate and ... use the phone to get in contact with someone. ... [The kids would] walk around ... [It was hard to] keep them indoors." (Kelwyn Gore, Youth Coordinator, Kalumburu AC, 2022)

²⁴ Only one of three community access computers was working in the CRC. This costs \$5 per hour to use.

The CDP provider finds connectivity a challenge for contacting clients and Centrelink

The East Kimberley Job Pathways coordinates the community development program in Kalumburu, to provide a job-like activity for 20 hours a week for Centrelink recipients. This includes coordinating local work crews to do municipal work such as community beautification, gardening and mowing, or working in the art centre or women's centre.

Area Coordinator Michael Harvey outlined the communications challenges in contacting people prior to their monthly appointments and reporting needs:

- + "There's more people walking around with mobiles [now but] it's really hard to contact people [because the service is so] slow or weak. ... [Some people] have to be outside to make a call or receive calls ... [if it's cloudy] my system doesn't work once it slows down." (Michael Harvey, Area Coordinator, East Kimberley Job Pathways, 2022)

Michael has regular MS Teams meetings with the Kununurra office via the shared Sky Muster service. He said this works reasonably well during clear skies but not cloudy weather.

Rangers use a range of communications technologies to do land management work

The Rangers undertake land management, including burning, as well as managing tourism sites. They often work remotely from the community where there is no 4G coverage, with two work camps set up at Munurru at King Edward River, and Garmbemirri Camp at Truscott.

The Rangers use an iPad application known as Fulcrum for their land management work:

- + "We use that for recording whatever activity we may be doing, whether it's rock art recording, whether it's burning, whether it's weed control, feral animal control, that sort of thing... it had GPS on it so, we can actually mark the location and then put in details." (Shane Clugston, Ranger Coordinator, Wunambal Gaambera AC, 2022)

They use a range of mobile, radio and satellite technologies for team communications:

- + "We use our landlines or Wi-Fi calling [via the Activ8me Wi-Fi phones in the two camps] ... We have UHF radios [and satphones] in the vehicles and we have VHF in [the] ranger boat. ... [We] have a [VHF] repeater station [to] communicate from Kalumburu to Truscott [as] a safety type communication. [In the camps] we generally use." (Shane Clugston, Ranger Coordinator, Wunambal Gaambera AC, 2022)

However, they have found the satellite delivered Internet services to be unreliable in town:

- + "We seem to have difficulties with internet all around. Whether it's here in Kalumburu or at the camps ... it's not the best." (Shane Clugston, as above)

Shane said better communications would enable Geographic Information Systems (GIS) use for mapping:

- + "That would help in all areas of land management ... to have better GIS capabilities and keep better track of what's going on in all areas. It would make everything more efficient." (Shane Clugston, as above)

They are keen to provide more training for rangers in use of digital technologies and apps:

- + "We'd like [to] get rangers more familiar with using these different apps and technologies ... starting with the basics and working your way up with all areas of GIS ... but at this stage we haven't got the facilities." (Shane Clugston, as above)

The Arts Centre is unable to do EFTPOS sales due to poor connectivity

Kira Kiro Arts Centre have an NBN satellite connection and Wi-Fi in the arts centre. They use the SAM (Stories Arts Money) database for cataloguing artworks and managing art sales and records. This links to point of sale facilities and online sales.

With regular tourist traffic, they are needing to do sales directly from the art centre. They have purchased a smart reader but had not been able to get it connected (as at July 2022). They currently have to ring Waringarri Arts in Kununurra to do credit card sales over the phone.

Access to media and news services

Many households are without TV services

The VAST direct-to-home satellite TV service was installed on all premises in remote communities by the Australian Government in about 2014, with ongoing maintenance made a householder responsibility.

However, KAC estimate that 60% of houses no longer have VAST services working, with no formal maintenance program for the VAST television services since they were installed in 2014. Following a cyclone earlier in the year several houses need satellite dishes realigned, with others needing or replacement LNB, connections or cables. A satellite technician is needed to undertake this work, however the cost of technician fees and travel is prohibitive for households.

- + “If their dish was broken [or shifted by strong wind or cyclone] ... You have to pay for your own repairs ... unless you’ve got a spare \$3000 to charter a plane [for a technician] to come in and out, plus his time and then the repairs, then [you go without TV].” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Our survey found that 51% of respondents did not have VAST satellite services. 31% said it was no longer working and 20% said their house had no VAST equipment. Of those with VAST not working, 87% said the set-top box was not working, and 27% said the dish or cabling was damaged (multi-choice question).

There are a number of reasons set-top boxes may not work, including blown power units due to surges in local power supply, removal of smart card, smart card activation issues or faulty connections. Set-top box replacement is costly, about \$570 in the store, so most household TV usage is offline via DVD or USB.

- + “Most people share the set top boxes, it goes from house to house. ... Most people don’t have TVs, can’t afford them [so up to] 20 people [can be] under the same roof watching the TV.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

Interviewees described difficulty in activating set top box smart cards. This requires having the set top box connected to the satellite dish, with an email address and phone number to register online. It can take several attempts to activate all services, with assistance often required.

- + “I’ve activated a lot [of smart cards] and it’s time consuming for me ... for someone that hasn’t done it before, it’s intimidating. ... Email address, contact details ... not everyone out here [can do it].” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

As a result of VAST free-to-air services not working, some households have set up subscription satellite TV services such as Foxtel. However, interviewees said that about half of the households that previously subscribed to Foxtel are not connected now due to affordability challenges with monthly payments.

The local radio service is important but there is limited access

Radio is a primary source of news and information, especially in wet season when home VAST TV services are unreliable:

- + “[The radio] broadcasts weather, any emergencies or [even to] just listen to some music or someone else talking is an escape in itself, being so remote.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Kalumburu normally has both PAKAM and ABC radio services, however neither service had been working for some time. Our team helped PAKAM get the PAKAM and ABC services working during our visit, with residents pleased to have radio services working again. Some people also listen to radio via VAST:

- + “We [listen to radio] on a channel [through the VAST set-top box], my dad listens to it all the time.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

PAKAM supports the local RIBS service in Kalumburu, although there was not a RIBS operator working at the time of our visit. There was enthusiasm for the local RIBS broadcasting to begin again:

- + “We had a radio [studio], but we don’t have workers. ... it’d be good [to have it working again]. Some people like it. Old people, like my pop ... they grow up with radio, they never have TV. Every football and everything on radio, listen. They’re the weirdest thing.” (Maggi Captain, Kalumburu CRC 2022)
- + “It will be good ... because we can listen [and] make requests as well. It could build up ... [the broadcaster’s confidence and have Kalumburu shows on the PAKAM network again so] anyone can just flick on that channel and listen to us.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

PAKAM are in the process of installing a remote monitoring system to quickly identify and rectify issues with the studio or transmission equipment from their office in Broome. They were waiting on installation of a Sky Muster service so they could activate the system in the Kalumburu RIBS.

Affordability

Affordability of mobile data and devices is a significant concern

Affordability of Internet access is a key issue due to low incomes and high pre-paid data costs. Being one of the most isolated communities in Australia, with very high costs for food, fuel, transport and goods, and an average personal income of about \$200 a week, communications is a significant cost burden.

- + “Everything’s dear [out here] so most people can’t afford to pay for the recharge [vouchers].” (Kelwyn Gore, Youth Coordinator, Kalumburu AC, 2022)
- + “[Food and goods here] are extraordinarily priced. ... [Families] can’t afford their food so I’m not sure how they’re expected to afford a phone. ... [People are] begging support from other families for food, for power [cards], basic survival needs.” (Tamara Hancock, Facilitator, Community Focus National, 2022)

In our survey, 46% of regular Internet users (those who had used Internet in the last three months) said they don’t use the Internet more often because “The Internet is too expensive for me”. Also 41% of respondents said that they have cut back on essential household costs in order to afford personal or household Internet within the past six months. For those who rarely or never used the internet, 50% cited cost as a reason for not using the Internet more often.

Despite pre-paid data costing significantly more per Gigabyte for pre-paid mobile services compared to most post-paid plans, 97% of Kalumburu residents who own or share a mobile phone use pre-paid services. Pre-paid enables flexibility for people to pay what they can afford and when they have the funds, rather than commit to a monthly billed service that they may not be able to pay when it is due.

Increased data use for media streaming services and online games has increased expenditure.

- + “People shouldn't have to pay a premium to watch a movie or use the Internet. They already have to pay for power cards [so] if they don't have money or it's the weekend their fridges go off and they can lose all their food.” (Sarah Vallentine, Arts Development Facilitator Kira Kiro Art Centre, Kalumburu 2022)

There is currently limited information available in the community on how to choose affordable communications devices and services or reduce data costs.

Digital Ability

Digital literacy levels

There is a relatively high level of use of online services and applications by most Kalumburu residents. Of the 84% of respondents who had used the Internet within the last three months, 90% reported being able to connect to a Wi-Fi network (responded ‘very true’ or ‘mostly true’), 78% were able to send and receive emails, 85% could find and install apps or software, 88% could open an Internet browser tab, and 83% could complete online forms.

With services increasingly moving online, digital literacy is becoming a necessary skill for work and daily life. There is demand for more training and support opportunities, however with reliance on mobile devices and limited bandwidth, there are limited opportunities to develop keyboard or online skills or learn workplace applications using a desktop computer or laptop.

Need for ICT access and support

The most common reason regular Internet users gave for not using the Internet more often were “I do not have convenient access to the Internet” (63%). Most people don't have computers at home due to cost and unavailability, making community access computers necessary for digital skills learning such as keyboard skills, MS Word and other Office applications, and to use some online services.

There is currently limited community access to computers in Kalumburu, with a Centrelink computer available to access online services and one working computer for hire in the CRC for \$5/ hour. The CRC computers were the primary means of Internet access prior to the Wi-Fi mesh network. There was demand for free computer access for building digital skills and doing online learning and digital projects.

Kalumburu AC staff in the Centrelink office and CRC provide basic IT support as needed. Many people require assistance to use online services such as Internet banking, Centrelink or completing online forms. The provision of mentor support by KAC staff, where and when support is needed, is an effective model.

- + “Our staff [are] basically pretty hands on and assist with that. We have a local CRC [with] computers in there that people can log on and we have basic computer skills training every now and then.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Digital skills training required

There was demand for more training and support, particularly to support people with limited digital ability including the elderly, people with disabilities, and those with low English literacy.

The CRC has a meeting room which is regularly used for meetings and small group training, including courses for KAC staff delivered by Kimberley TAFE, including a community services course which includes digital skills. KAC wants to train local staff to provide digital support for the community and their families:

- ✦ “[Digital skills training is] a necessity. ... [Our staff having] these skills will be a big game changer because these people will be able to go back to their families and basically show them first-hand what they’d learnt.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

The CDP provider East Kimberley Job Pathways has previously arranged work readiness digital training:

- ✦ “We try to bring in some training regarding being computer literate, obviously, to put on their resumes [and help] get a job down the track. ... [But since 2018 we’ve] only had two lots of training for literacy, numeracy and introduction to computer.” (Michael Harvey, Area Coordinator, East Kimberley Job Pathways, 2022)

Due to reliance on mobile devices, Michael Harvey suggested training in use of mobile applications:

- ✦ “We’d like [to build people’s] ability to use phones and tablets [to] receive emails ... do Word documents, Excel documents ... scan and create PDFs ... all that sort of stuff. ... [For] people who just want to do a labour job ... [they still need to] do their own text messages and phone calls, and receive some emails.” (Michael Harvey, as above)

Cyber-safety

While local agencies identified some instances of cyber-safety issues and inappropriate use of social media, these were not as disruptive as in some other sites visited by our team:

- ✦ “I honestly thought that it was going to create more problems once we had the Activ8me service done, but it’s been pretty good. I mean, you have cyber-bullying anywhere. Not really here in Kalumburu. ... [Kids] get into trouble ... for swearing at someone down the road [more] than online. They’re conscious of what they say ... which is pretty good.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)
- ✦ “Ever since we got [Internet and social media], it was good. There was some [initial] troubles out of it that led to family disputes [but it’s mostly been good]. Facebook, Snapchat is really big [with] young teens ... everyone does that a lot.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

The School delivers cyber-safety training. With increasing online access and use of social media, the Principal suggested that more training and awareness is needed:

- ✦ “The social media [has] certainly got them more connected and more exposed to what other teenagers are doing ... either Snapchat or [TikTok] ... [kids are] doing their little TikTok dances constantly. ... we haven’t really had any incidents of cyber bullying or anything [here like] in other larger centres [but] it doesn’t mean it won’t come.” (Fiona Greig, Principal, Kalumburu Remote Community School 2022)

6. CASE STUDY – KALUMBURU WI-FI MESH NETWORK

Overview

The Kalumburu Wi-Fi Mesh Network was installed November 2021. It is an innovative community-wide communications solution, coordinated by WA Government and installed by Australian Private Networks (APN/Activ8me), with co-funding through round one of the Australian Government’s Regional Connectivity Program (RCP)²⁵. It builds upon a successful WA Government trial of a similar Wi-Fi mesh network in Tjuntjuntjara community, installed in 2018 in partnership with APN and nbn co. Similar solutions have also been installed in Jigalong in the Pilbara (May 2022) and Mowanjum community near Derby (October 2022).

The Wi-Fi mesh network model is intended to provide an accessible, affordable, and sustainable model of community-wide communications in remote areas. The project involved:

- + A Wi-Fi mesh network providing external hotspot coverage around the community with 13 external Wi-Fi access points (WAPs) and indoor coverage for 128 dwellings and community buildings²⁶ with a Wi-Fi repeater and Voice over Internet Protocol (VoIP) phone installed in each;
- + 7 repeater towers to provide community wide connectivity and 13 Wi-Fi Access Points to provide community wide external coverage, with backhaul by 4 NBN Sky Muster services (on 3 satellite dishes) located on the community office. In September 2022 the number of services increased to 6 NBN Sky Muster services due to demand.
- + A private voice network that provides free extension to extension calling, calls to Australian Standard Numbers and Australian Mobile Numbers;
- + 1200GB of NBN Sky Muster data per month across four 25/5Mbps services and, since September 2022, 1800GB of NBN Sky Muster data per month across six 25/5Mbps services (Note: The six services will be upgraded to Sky Muster Plus by April 2023, allowing unmetered data use from midnight to 4pm daily, with only video streamlining services such as Netflix YouTube etc and Virtual Private Network (VPN) traffic metered from 4pm to midnight);
- + Merchant facilities for purchase of data vouchers from the community store office by cash or EFTPOS (only 1GB vouchers were initially available at \$3 each to avoid excess demand on the limited backhaul, with the cost reduced to \$2/GB in May 2022. There are plans to provide additional voucher limits up to 10GB after the planned Sky Muster Plus upgrade);

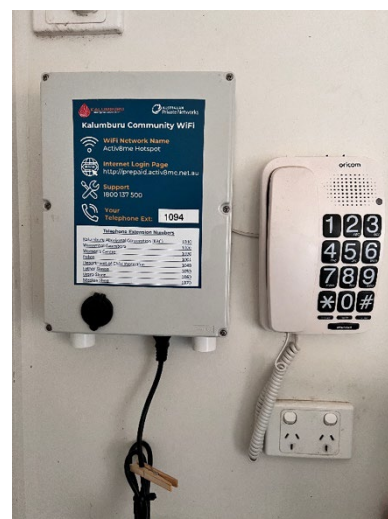


Figure 6: Activ8me Wi-Fi routers and VoIP phones installed in all premises in the community.

²⁵ The project received RCP funding of \$888,140. Source: <https://www.abc.net.au/news/2022-10-25/kimberley-connectivity-boosted-in-budget/101570172>

²⁶ Installation at 128 buildings – mainly households plus the Police station, health clinic, mission, women’s refuge, art gallery, pool, basketball court, airport, Community Resource Centre and the KAC office where Youth services and Housing etc are co-located. School not included. (Source, Email correspondence, Penny Watson, DPIRD, WA Government. 16 March 2022.)

- + Unlimited free access to government websites such as Centrelink and MyGov websites;
- + Supports voice over Wi-Fi (e.g., Wi-Fi Calling) depending on the device and carrier functionality;
- + Content filtering to support both safe list and blocked list options at the community's discretion, including to prevent access to pornography and gambling sites;
- + Hardware for all internal and external WiFi access points, the central communications hub, and telephone ports and USB charging ports on internal WiFi access points;
- + Spare equipment for hardware replacement;
- + A seven-year service and maintenance agreement;
- + Monitoring of network usage and performance by APN daily;
- + Annual performance and data reports;
- + Training for nominated KAC staff to liaise with community members and assist with APN with basic fault rectification;
- + Revenue sharing, whereby Uraro Store receives an agreed commission from the sale of all merchant based data PINs for reinvestment by the community.²⁷

Installation and challenges

Following an extensive planning and community consultation period in 2020-21, the network was installed in October 2021, with final completion in early November 2021.

Some of the technical challenges that APN encountered were²⁸:

- No reliable building power supply to power access points or repeaters, due to having a power card system on most dwellings. This required all public access points to have dedicated batteries and solar panels to prevent reliance on local power supply;
- Large number of mango trees in community, with towers requiring line of sight around the trees;
- A recurring issue of people switching mains power off at the basketball court, de-powering a critical access point and impacting coverage to houses in the vicinity.

In May 2022, tower number seven was struck by lightning which disabled a large part of the network. Activ8me reconfigured the network as a temporary fix, with towers four, five and six all connecting back via the central tower. While this may have rectified the issues for some households, we heard multiple reports of the service not working at households at the time of our visit.



Figure 7: Four Sky Muster satellite dishes on the community office provide backhaul for the Wi-Fi mesh network.

²⁷ Source: Email correspondence, Penny Griffin, DPIRD, WA Government. 16 March 2022; Some aspects adapted from 'Tjuntjuntjara Community Wi-Fi Project Summary' report, DPIRD 2019 in 'Remote Indigenous Communications Review' (Featherstone 2020:26)

²⁸ Source: Scott Cogley, APN, from meeting with WA Government and APN/ Activ8me held via MSTeams 14 July 2022.

Network usage since installation

APN provided the attached table of network data usage from October 2021 to 17 March 2022. This shows an initial uptake in usage following installation, with a decline over the summer wet season period. It is not clear if rain fade or technical issues were also factors in reduced network usage.

In a meeting in July 2022, APN explained that the network damage from the lightning strike resulted in a significant drop in data usage in May and June (see Table 1)²⁹.

Upgrades since June 2022

Unfortunately, our visit in June 2022 coincided with the period of least data usage, mostly likely due to sections of the network not being operational. As a result, we heard about a lot of community frustration and disappointment with use of the network. We also experienced difficulties connecting to the central Wi-Fi hotspot at times. We reported this back to APN and WA Government following our visit.

An Activ8me team returned to Kalumburu in August 2022 to re-build tower seven and rectify other network issues, including connecting the basketball court tower to a separate power circuit being a solar/battery solution to remove reliance on the AC power remaining switched on.

Since APN visited the site to rectify the issues data usage has significantly increased. APN provided the following data in Table 1, showing network usage from installation in October 2021 to 13th January 2023. This shows the impact of the lightning strike in May 2022 on network usage and the high uptake for data and voice calls since the repairs in August 2022.

Table 1: Data usage (GB) on Kalumburu Wi-Fi network from October 2021 to January 2023.

Month	Data		Telephone			
	Date Used (GB)	No of Devices Connected	Calls Made		Calls Received	
			Externally	Internally		
Oct-21	364.11	170	2246	1102	7	Service started to become available during the month, whilst our team continued with the deployment.
Nov-21	641.17	241	7057	3990	916	Service fully operational start of the month
Dec-21	393.76	114	4269	1900	1335	
Jan-22	281.71	79	1399	224	267	
Feb-22	483.59	92	1091	87	284	
Mar-22	751.05	131	2013	458	487	
Apr-22	741.52	128	3909	1754	638	
May-22	370.06	76	1099	164	340	Access Points impacted by hardware fault caused by a weather event, refer section 5 Issues and Challenges
Jun-22	165.58	57	219	24	60	
Jul-22	254.46	85	159	6	60	
Aug-22	1096.3	159	1610	573	272	Site visit week of 8/8/2022
Sep-22	1518.3	189	3749	1029	761	
Oct-22	1514.4	201	5333	1328	1226	
Nov-22	1490.3	212	6133	1292	1281	
Dec-22	1486.2	196	5084	984	1454	
Jan-23	874.4	137	2472	404	440	as at 13/1/23

We look forward seeing how network usage and sentiment has changed when we return in mid 2023.

Initial Community Response

Initial community feedback was positive. There was good use of data and phones and improved privacy.

- + “It will allow community members to take initiative for their own needs, whereas before it was everyone’s business. ... Not everyone wants their business to be aired out in public [or] how much they’ve got in their bank account. Whereas now they can do it at home.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

²⁹ Information provided in meeting outlined above.

Damage to the network impacted on usage and community sentiment

The whole network was impacted by the lightning strike on tower seven in about May 2022, which led to significant community frustration at no longer having household access to the service for several months:

- + “There was a lightning strike that knocked out the service and it hasn't worked properly since then. I really wanted to use it so it's very frustrating that it hardly works now. I don't even try to connect to the Activ8me Wi-Fi.” (Sarah Vallentine, Arts Development Facilitator Kira Kiro Art Centre, Kalumburu 2022)

As outlined, the network was not operating properly at the time of our visit. Residents were frustrated at not being able to use the service, as well as KAC staff who did community liaison for the rollout.

- + “It was okay [for] that first month. But then after that, no. We went through the training [and] promoted that Activ8me. But I felt shamed [for] false advertisement. [The signal] wasn't strong, you have to keep buying [PINs]. ... [And] when the towers go down [we] had to wait almost six months [before Activ8me] came and fixed it.” (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

Activ8me sent a team to Kalumburu in August 2022 to undertake network repairs and upgrade. We will review community use and sentiment during our next visit in mid 2023.

Cost of data use

The service is subsidised by the WA Government for a period of seven years. Users get 1GB of free data per month with vouchers for additional data costing \$3/GB (reduced to \$2/GB in May 2022), comparable to pre-paid mobile data rates. Access to MyGov and Centrelink websites is free at any time.

- + “They've been fine with [paying for vouchers]. They see it as a necessity ... so they're good with that.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Data costs should reduce substantially once the service is transferred to Sky Muster Plus, with all data use unmetered from midnight until 4pm daily and only video and VPN traffic metered 4pm to midnight.

Concerns were raised about only having 1GB vouchers available. Use of video streaming and other data-hungry applications require users to regularly enter PIN numbers on the Activ8me dashboard to continue use. An option of 5GB and 10GB vouchers may be needed to accommodate current usage requirements.

Our experience was that voucher purchase at the store was time consuming for the busy store-keepers. They had to connect to the merchant facility in the office and, due to slow connectivity, had to wait several minutes to individually issue each three dollar voucher.

Network capacity

The shared Wi-Fi capacity across the network does not currently allow sufficient broadband speed for households to stream movies. To reduce expense, the community youth program runs movie nights:

- + “Live streaming and all of that type of stuff. The kids are so into it but yet they can't do it. Even the adults. There's a lot of programs that we want to deliver ... but we're unable to do it majority of the time. We're having to [download movies] so that our youth can have a movie night [because] DVDs are sort of a thing of the past.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

It is difficult to assess the normal capacity of the central Wi-Fi hotspot, which appeared to be congested and difficult to log onto during our visit. Some interviewees reported hunting around for a working Wi-Fi to make a call, send a text or do time-critical work such as submitting funding applications or reporting to Centrelink. It is hoped that these issues have since been resolved.

VoIP Phones

The VoIP phones in households, enabling free calls within the community, are a good concept. However, these were not getting much use at the time of our visit due to the network issues.

The VoIP phones were not reliable at the time of our visit:

- + “We’ve got the Activ8me box [but] we find that both the landline and the Wi-Fi calling [are] very intermittent [with] gaps in the conversations. [It’s] not worth worrying about.” (Shane Clugston, Ranger Coordinator, Wunambal Gaambera AC, 2022)

With Wi-Fi Calling option now available on most smartphones, including with pre-paid services, the need for fixed phones is now reduced. Our initial assessment is that an updated cost-benefit analysis, including ongoing maintenance costs, should be undertaken before installing VoIP phones in all dwellings.

Ongoing Operations

Beyond the period of the WA Government subsidy, the community will need to find other funding to continue operating the network and subsidise usage costs to keep the access affordable:

- + “It was subsidised by WA Government which we’re very grateful for. ... We [want to keep finding funding so the network] stays free, because there are no jobs up here. There’s a lot of services that we lack ... that people in town take for granted.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Maintenance costs will need to be factored into operational costings, as delays in repairs can significantly impact on the viability of the service and potentially increase costs due to damage by frustrated users.

Learnings for other communities

There will be useful learnings from the Kalumburu project to inform these and other future Wi-Fi mesh network projects. WA Government have expanded the Wi-Fi mesh network model to other communities, including Mowanjum near Derby and Jigalong in the Pilbara. NBN have also installed pilot Wi-Fi mesh networks in four remote communities across Australia: Warakurna in WA, Indulkana and Koonibba in South Australia, and Aurukun in Cape York, Queensland.

Madeline’s advice to other communities considering getting a Wi-Fi Mesh network:

- + “Instead of just getting them to just come and put it in, get them to do [more] training, go into more detail, ask more questions. ... get a plan that works for you [for an extended period]. ... [So once it’s] ready to go, you’ve got back up, you know that there’s spare parts, you know that there’s someone on hand that can help. ... Being remote up here, it’s not always smooth sailing ... and I’m on the phone a lot.” (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)



Figure 8: Access points are located on community buildings to enable line of sight connection to all houses.

7. CONSIDERATIONS FOR LOCAL DIGITAL INCLUSION PLAN

Developing a local Digital Inclusion Plan would enable a coordinated whole-of-community approach to address some of the challenges outlined in this report. It would also provide a useful tool for advocacy to government, industry, and fundraising efforts.

Strategies proposed during community and agency consultations are outlined below to assist community stakeholders in planning efforts to improve communications services and digital inclusion in Kalumburu. These are not intended to be prescriptive, nor are they listed in order of priority. Note that some actions have already been completed since the research visit but have been included to show the scope of works discussed.

Identified Issue	Possible Actions	Potential Stakeholders
Access		
Upgrade of Kalumburu Wi-Fi Mesh network to rectify damage from lightning strike, upgrade to Sky Muster Plus backhaul, address voucher data limit; ongoing monitoring of network functionality, including Wi-Fi and VoIP phone at all houses.	<p>A team from APN went to Kalumburu in August 2022 to address the issues outlined. Ongoing monitoring is being undertaken by APN with reporting to Kalumburu AC and WA Government.</p> <p>APN have trained a Kalumburu AC staff member to undertake minor repairs, with remote support, if needed.</p> <p>Our research team will review resident use and sentiment relating to the Wi-Fi network upon our return in mid 2022.</p>	<p>WA Government, Australian Private Networks (APN)/ Activ8me, Kalumburu Aboriginal Corporation</p> <p><i>Status: Completed</i></p>
Optus mobile service upgrade needed to provide more backhaul data, increase user capacity, address audio quality and reliability issues, including longer backup power.	<p>Seek timeline for upgrade of Optus 4G service.</p> <p>Outline user experience issues to WA Government and Optus to ensure these are issues addressed within the upgrade.</p>	<p>WA Government, Optus, Kalumburu Aboriginal Corporation</p> <p><i>Status: Completed</i></p>
Telstra mobile service for Kalumburu.	<p>Seek timeline for installation of Telstra 4G service, as well as characteristics (range, number of users, speed).</p> <p>Outline community requirements to WA Government and Telstra.</p>	<p>WA Government, Optus, Kalumburu Aboriginal Corporation</p> <p><i>Status: In progress</i></p>
Need fast, low latency broadband with increased data capacity for community office, as well meeting/training room for videoconferencing.	<p>Additional Sky Muster Plus satellite service for Kalumburu AC office block, including Centrelink, CDP, youth program and meeting room for videoconferencing.</p> <p>Undertake trial of Starlink low earth orbit satellite service as an alternative to Sky Muster.</p>	<p>Kalumburu Aboriginal Corporation</p> <p><i>Status: Two additional Sky Muster services added by APN</i></p>

Identified Issue	Possible Actions	Potential Stakeholders
Limited range of UHF radio, used by community agencies	Set up UHF repeater tower/s in community to enable communications by agencies, vehicles, residents and tourists in vicinity of Kalumburu, airport and nearby homelands	Kalumburu Aboriginal Corporation. Rangers, School, Kalumburu Clinic
Demand for online computers for community access, virtual meetings/ training, workplace skills development and creative and cultural use; currently one computer available in Centrelink office and One in Community Resource Centre (CRC) for \$5 per 30minutes.	<p>Review use of existing community access facilities/computers/ printer (Centrelink, CRC) to identify community needs, access times and usage, especially by elders, students/ trainees, creative/ cultural producers and workforce training.</p> <p>Replace or repair two CRC computers that are not working.</p> <p>Review computer use cost in CRC (currently) to enable people to develop digital skills and access services.</p>	Kalumburu Aboriginal Corporation/ Centrelink/ CRC
Affordability		
Primary use of pre-paid data (on Optus mobile and Activ8me Wi-Fi), making data cost a high proportion of household expense.	Provide easy-to-read materials (posters, brochures) on options for affordable mobile and broadband services, as well as data usage of key applications (e.g., video/ audio streaming) and ways to reduce data use.	Kalumburu A.C., Kalumburu store, Optus, NBN (and Telstra once mobile service is established)
Digital Ability		
Limited digital skills, use of online services and cyber-safety awareness	<p>Delivery of informal digital skills workshops, possibly at Gāngan School.</p> <p>Ongoing support in using online services by a local digital mentor, possibly located at the Gāngan shop.</p> <p>Discuss options for delivery of digital skills workshops with NBN Community Engagement team and/or inDigiMOB.</p>	Laynhapuy Health, Laynhapuy Homelands School, nbn co, inDigiMOB
Demand for workforce readiness IT skills	Incorporate digital skills training into workforce readiness training and on-the-job training by local agencies as needed	Laynhapuy Health, Laynhapuy Homelands School, Yirralka Rangers, ALPA, Yolŋu Business Enterprises

Identified Issue	Possible Actions	Potential Stakeholders
Media Services and Production		
VAST direct-to-home satellite TV services not working in up to 60% of homes; high cost for households to repair equipment and replace set-top boxes; VAST services don't work during rain or heavy cloud.	<p>Advocate for funding to upgrade or install VAST satellite services in all residences, replace VAST set-top boxes where not working, and provide shelf unit and power surge protectors for all set-top boxes.</p> <p>Consider cost-benefit of switching to local TV broadcasting to improve reliability and reduce ongoing maintenance costs; Consider use of large satellite dish to reduce rain fade effect.</p>	Kalumburu AC, PAKAM, WA Government, Australian Government (DITRDC)
No funding to maintain ABC radio service in Kalumburu.	Advocate for funding to upgrade ABC transmission equipment (currently old PAKAM transmitter) and provide annual maintenance.	Kalumburu A.C., NIAA, ABC, PAKAM
RIBS studio not active/ no RIBS broadcaster at time of visit	Recruit a RIBS broadcaster; arrange training with PAKAM to do local and regional radio shows, as well as other media production.	Kalumburu A.C., PAKAM
Residents find it difficult to activate smart cards for set-top boxes (due to need for working VAST service, internet and phone).	Set up a space in RIBS studio for RIBS broadcaster (or KAC staff) to help people to activate smart cards. Install a TV in the RIBS to monitor when cards are activated.	Kalumburu A.C., PAKAM

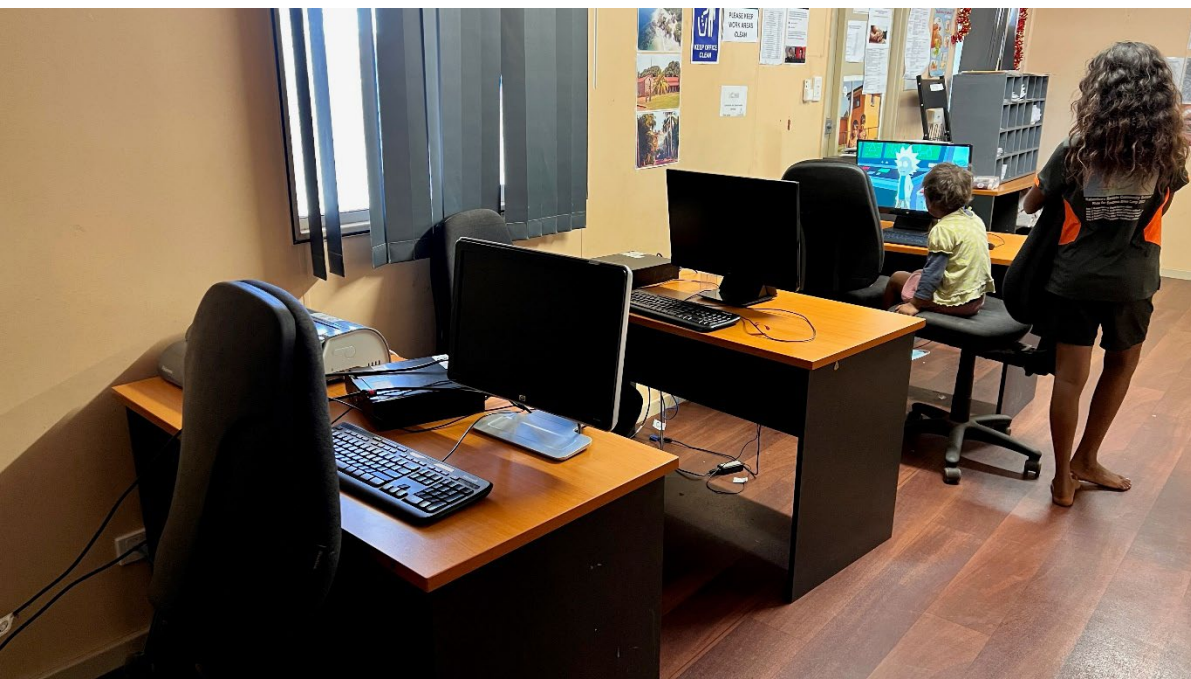


Figure 9: Kalumburu Community Resource Centre (CRC)

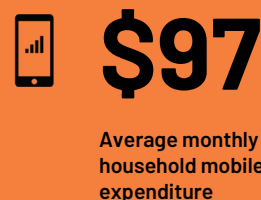


Appendix 1: Summary of Survey results

The following results are based on the initial analysis of surveys with 49 residents, of which 98% identified as Aboriginal. As outlined in the Executive Summary the final results, after data cleaning and weighing against ABS statistics, may differ slightly from these results. These authoritative results will be available via the Australian Digital Inclusion Index website and data dashboards in mid 2023.

Demographics

- + **Gender:** 71% of respondents were female and 29% male.
- + **Identity:** 98% of respondents identified as Aboriginal, with one non-Indigenous.
- + **Education:** 22% have completed up to year 12, 10% had completed a Certificate 3-4 course. 2% had completed a Certificate 1-2 course 35% attained year 10 or lower.
- + **Employment:** 65% of respondents were employed or engaged in CDP activities (44% of these were full-time and 15% were on CDP), 8% were unemployed, 12% were doing home duties, and 8% were not able to work due to a disability. 29% had been looking for work in the last month.
- + **Welfare:** 69% received some form of government pension or benefit, primarily Family Tax Benefit Part A or Part B, JobSeeker / Youth Allowance, and Parenting Payment (Single or Partnered).
- + **Housing:** 61% live in multi-generational or shared households, with an average of 4.7 people per house. 73% of respondents pay rent to the public housing authority, with 24% boarding or living at home.
- + **Health:** 18% (nine people) had a long-term disability or health condition.
- + **Language:** 82% indicated they spoke a language other than English at home. 20% of respondents speak Wunambal, 22% speak Kwini (Gunin), 8% speak both Wunambal and Gaambera, 4% speak Bardi (4%), and 20% speak Kriol, with 10 other languages spoken. 16% (eight people) did not speak any First Nations languages. Most respondents indicated they understand written English (88%) and spoken English (100%) very or quite well.
- + **Income:** The average weekly household income was about \$855. 8% of respondents' household income was between \$1 to \$300 per week, 22% between \$500 to \$800 per week, 47% between \$800-1250 per week, and 18% above \$1250 per week (up to \$3000).



Phone use

- ✦ **Phone Use:** 69% of respondents regularly used their mobile phone for phone calls, with 24% using someone else's mobile phone. 53% used the public phone, 35% use the phone at a community office or workplace, and 18% use the fixed line telephone in their home.
- ✦ **Public Phone:** 39% said the public phone was reliable, 31% said that it was sometimes reliable, and 8% (four people) said it was not reliable. 22% of respondents do not use the public phone.
- ✦ **Phone ownership:** 80% (39 of 49 people) of respondents said they owned a mobile phone (15% of these shared with others). Of those with phones, 92% had smartphones as their main phone, and 97% used pre-paid services. There is an average of 2.4 mobile phones per household.
- ✦ **Data use:** Of the 39 responses, average monthly data use was: 80% used up to 10GB/month, 15% used 11-40GB/ month, and 5% (two people) used 61-100GB/ month. However, 64% reported exceeding their monthly data limit up to eleven times over the past year, and 18% reported exceeding their limit every month, suggesting monthly higher data use.
- ✦ **Household Expenditure:** Of the 46 responses on household mobile expenditure, the total expenditure was \$4465/month, an average household cost of \$97/month. 59% of respondents indicated their household paid up to \$100/month, 37% paid \$101 - \$200/month, and 4% (two people) paid between \$201-\$300/month.

Media use

- ✦ **Radio Listening:** The most popular radio station was ABC Radio, with 12% listening daily or weekly and 10% listening to it occasionally. 25% listened to PAKAM Radio occasionally (Note: PAKAM radio had not been working for about a year). 43% said they never listen to radio.
- ✦ **Radio Access** (multi-choice question): The most common way to listen to radio was through car radio (37%), with 27% listening through their TV via VAST satellite, and 14% via a radio at home.
- ✦ **TV Access** (multi-choice question): 65% of respondents reported watching TV via VAST satellite, 20% via streaming on their phones, and 20% only watch DVDs. 10% reported never watching TV.
- ✦ **VAST TV Access:** 49% of respondents reported having VAST satellite TV working, with 31% saying VAST wasn't working and 20% without VAST. 87% of those without VAST working said the set-top box was not working and 27% had damaged dish or cabling (multi-choice question).
- ✦ **TV and Online Content:** Commercial television stations (7,9,10) were most popular (29% watch daily, 22% weekly), followed by YouTube (24% daily, 18% weekly), and streaming services (e.g. Netflix, Stan, etc. - 22% daily, 4% weekly). Popular occasional watches were SBS TV (29%), ABC TV (27%), NITV (27%), and ICTV (22%).
- ✦ **News and Information Services:** The most popular source of news and information was direct and in person (76% daily), followed by community noticeboards (27%), online news services (24%) social media (Facebook - 22%, other social media - 22%), and commercial TV (22%). Community noticeboards were a more popular source of weekly news (43%) and TV a popular source of occasional news (ABC TV - 41%, NITV - 39%, SBS TV - 39%).

- + **Emergency Information:** The most common sources of emergency information were direct and in-person (88%), followed by ABC TV (29%), Facebook (27%), commercial TV (20%), ABC Radio (18%) and online emergency services (18%).

Internet use

- + **Latest Internet Use:** 73% (36 of 49 people) had used the Internet in the last week, with an additional five people (10%) having used it within the previous 1-3 months, one (2%) more than six months ago and seven respondents (14%) having never used the Internet.
- + **Regular Internet Users:** Of the 84% (41 people) who had used the Internet within the last three months:
 - o 20% said they used the Internet almost constantly, another 39% several times a day, 12% once a day, and 17% using it at least once a week.
 - o The most common online device used is the smartphone (95%), followed by desktop computer (39%) and smart TV (27%).
 - o Some people use Internet provided by others, with 59% reporting using the Internet in a public space with free Wi-Fi, 27% at a community access centre, and 22% at the house of friends or family.
 - o The main reasons people gave for not using the Internet more often were 'I do not have convenient access to the Internet' (54%) and 'the internet is too expensive for me' (46%), followed by 'I am concerned about privacy or scams' (32%) and 'I am concerned about inappropriate content and causing conflict' (27%)
 - o 66% of respondents said they were not concerned about the time they spent online, with 17% slightly concerned about how it affected their wellbeing and relationships, and 7% (three people) extremely to moderately concerned.
- + **Low Internet Users:** The 8 people who never or rarely used the Internet cited not having access (75%), low confidence (63%), cost (50%), and concerns around privacy, scams, inappropriate content and/or causing conflict (50%) as their main reasons for not using the Internet. Only one respondent had considered using the Internet due to COVID social and physical distancing restrictions.
- + **Impact of COVID-19 on Use:** Lockdowns (31% slight to significant increase), border closures (27%), and social/physical distancing restrictions (27%) were cited as the main reasons for increased Internet use during COVID-19 restrictions.



73%

Of survey respondents used the Internet in the past week



14%

Never use the Internet



54%

Of regular users gave the reason "I do not have convenient access to the Internet" for not using the Internet more



43%

Of regular users gave the reason "the internet is too expensive for me"



78%

Of households do not have any form of fixed home Internet



78%

Can send and receive emails



90%

Use online banking

- ✦ **Fixed Broadband Services:** The majority of respondents (78%, 38 of 49) do not have any form of fixed home Internet (other than the Activ8me Wi-Fi), with nine respondents (18%) having an NBN Sky Muster service at home (10% have 12/1 Mbps and 8% have 25/5Mbps). 4% said they have a wired service (most likely the Activ8me Wi-Fi service). Of the 11 respondents with fixed broadband, three said they had a data allowance of less than 10GB data per month, five had 10 to 50GB per month, two had 50 to 200GB per month, and one had unlimited data. 63% reported exceeding their limit in the last year. Average cost was \$42 a month.
- ✦ **Mobile Broadband Service:** 2% (one respondent) reported using a pre-paid portable modem or Wi-Fi device, with another 6% using a form of mobile broadband other than phone data (most likely the Activ8me Wi-Fi service).
- **Affordability of Internet:** 41% of respondents said that they sometimes have had to cut back on essential household costs (and 6% sometimes or often) in order to afford personal or household Internet within the past six months, with 73% compromising on speed and/or quality on their connection to prioritise affordability.

Digital Ability

- ✦ **Overall Digital Ability:** Digital literacy is at a high level in the community.
- ✦ **Regular Internet Users:** Of the 84% of respondents who had used the Internet within the last three months:
 - Most people reported being able to send and receive emails (78% said 'very true' or 'mostly true'), find and install apps/software (85%), open a new Internet browser tab (88%), connect to a Wi-Fi network (90%), download and then open a file (80%), use a mobile phone or device as a Wi-Fi hotspot (89%), and complete online forms (83%).
 - For online security and cyber-safety awareness, most people know how to set and manage secure passwords (90%), identify which apps/software are safe to download (85%), adjust privacy settings (83%), add or remove friends or followers on social media (73%) and manage and decide what personal information to share online (66%), though there was lower confidence in checking if information was trustworthy (56%) and managing how personal information was collected (54%).
 - For content creation – about half are confident in posting videos (56%) and producing online content (54%), and 32% know how to create a website. There is low awareness of online copyright law (41%).
 - Most people know how to connect smart devices (e.g. smart TV) to the Internet (73%) and adjust privacy and security settings (71%).
 - The main online activities include online banking (90%), accessing government services (85%), comparing prices (70%), online shopping (59%), online buying or selling (46%), online learning or study (41%), and job searching (39%).
 - Social media is popular for keeping in touch with family or friends (76%), engaging with community (66%), and meeting new friends or reconnecting with old friends (66%).
 - 85% of respondents had used online entertainment services in the past six months (e.g. streaming video/music, playing online games) and 34% had attended a music, arts, or cultural event online.
 - In the past 6 months, 49% had navigated a route via maps on a smartphone.

Comments

Survey respondents added the following comments at the end of the survey with some key themes:

Access to mobile and Internet services

- + [I want] Telstra [mobile] phone in town.
- + Optus is slow. [We need] faster internet. When cloudy, no internet.
- + [We want] stronger network connection. Optus is good but half the time we don't have network connection. [We need] better connection when cloudy day.
- + Wi-Fi unreliable and signal is too slow, and sometimes Activ8me doesn't work.
- + [We need] better Wi-Fi, faster internet, more reliable.
- + We need Optus fixed up, it doesn't work properly. If cloudy, it stops. Everyone complains about it. The Activ8me phone used to work but now it doesn't work.
- + We need better mobile and internet, need faster service and more download. Too many people are online all the time. Should be Telstra here.
- + Optus is not good signal and hard to hear when you're talking, drops out a lot, have to keep repeating ourselves. The data is really slow on Optus too. The Activ8me is not working near me, they switch it off at the basketball court. When COVID was here it was hard to communicate. Every wet season my landline plays up, no ring tone. We have to call Telstra to come out to fix the problem.
- + Hard to get signal - when it rains doesn't get signal - system plays up in morning.
- + Telstra better. Optus slow.
- + Telstra is better.
- + [We need] Better Wi-Fi signal [and] Telstra tower for Kalumburu.
- + The Wi-Fi is good but 1gb is not enough data. We need better speed and more data. I use 5 or more vouchers per week. I would like Sky Muster on my house
- + [We need] faster internet.
- + [We need] stronger signal for Optus phone.
- + Telstra is better.
- + Telstra service is better
- + [We want] community upgrade on Internet with Optus, and install Internet in some people's houses that have missed out on the Optus box for Wi-Fi.
- + It's better having the mobile here to find out what's happening in the rest of the world.
- + Mobile is good but not enough signal, goes very slow for internet. I'm waiting for a [NBN] satellite dish for my house.
- + The Telstra phone works in my house but the Activ8me phone not working. The Wi-Fi not working.
- + They should have Telstra mobile here as well as Optus. The Actv8me Wi-Fi was working but then it stopped. They need to get it working better. The little phone doesn't work either.

- + Telstra is better than Optus.
- + The internet hardly works.
- + Internet for the community.
- + [We want a] Telstra mobile 4G tower - faster internet.
- + Telstra mobile - better internet.
- + Better Wi-Fi, Telstra, 5G.
- + The new Wi-Fi has been really good. I use it every day.
- + I use the Wi-Fi network but We need better speed and more reliable access.

Access to television and radio services

- + [I need a] new black box for VAST.
- + [I need a] new VAST box [and] better internet, cheaper rates.
- + I like hearing the radio again, I like that country music and Mary G show.
- + We need the VAST TV fixed. Can't get TV at the moment. The mobile is a good thing but makes kids stay up late.

Training and support

- + [I] don't access internet, get kids to access my banking and MyGov. [We need] better services for phone.
- + The CRC internet was not working for us one month. I need some training to learn to use internet. We have some next month.
- + I need someone to help me get all the channels on my VAST TV- I only get a few channels.
- + [I want some] computer training- laptops for Internet access to services.
- + I don't use internet because people can get my money from the bank. Nowadays the kids know about internet and listen to it all the time but don't listen to elders or learn our culture, they think they are from America.



Figure 10: Radio broadcast tower adjacent to community office.

Appendix 2: Audit of demographics and communications services in Kalumburu

About the Community	
Community Name:	Kalumburu
Alternate name	N/A
Traditional owners/ Language group	Traditionally this has been home to two distinct Aboriginal language groups, the Kwini (Kuini) and Kulari. In recent years other groups have moved into the area' (from http://www.kalumburu.org/about.html)
Location (Coords)	14.2917° S, 126.6462° E
Region	Kimberley
LGA/Shire/ Regional Council	Wyndham-East Kimberley
Land Council	Kimberley Land Council
Regional Service Centre, distance	Kununurra - 279km (1hr 10mins) by plane, 558km by road; Broome - 615km direct (charter flight), 888km by road
Remoteness (ABS / ARIA+)	Very remote
Demographic Data - ABS 2021	
ABS link - All persons QuickStats	https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC50711?opendocument
ABS link - Aboriginal and/or Torres Strait Islander people QuickStats	https://www.abs.gov.au/census/find-census-data/quickstats/2021/IARE504005
Total population	388
Aboriginal and/or Torres Strait Islander (ATSI) population	343 (88.4%) - all identified as Aboriginal; Identity not stated for an additional 22 (5.7%)
Gender breakdown	48.2% male; 51.8% female
Total population	The median age of people in Kalumburu was 27 years (23 for ATSI population). Children aged 0 - 14 years made up 25.9% of the population and people aged 65 years and over made up 4.4% of the population.
Families	93 (91 ATSI families); avg children - 1.9 for families with children; 1.2 overall
Language group- number of first language speakers	The main Aboriginal languages spoken are Kimberley Area Languages (22, 6.4%) and Kriol (21, 6.1%).
% ATSI people who speak an ATSI language	51 people (14.9%) speak an Australian Indigenous language at home.
% who speak only English at home	79% (271)
Employment levels	There were 49 people who reported being in the labour force in the week before Census night in Kalumburu and 193 not in

	the labour force. Of these 34.7% were employed full time, 26.5% were employed part-time, 14.3% were away from work and and 32.7% were unemployed.
Education levels	Of people aged 15 and over, 11.9% had completed Year 12 as their highest level of educational attainment, 24.6% had attained Year 11, 36.9% had attained Year 10, 2.9% had completed a Certificate III or IV and 1.0% had completed an Advanced Diploma or Diploma. 22.5% had attained Year 9 or below or were unstated.
Number of buildings	120 private dwellings (128 buildings including agencies set up with Activ8me Wi-Fi)
Housing suitability	The average number of bedrooms per occupied private dwelling was 3.1. The average household size was 4.0 people, 4.4 for ATSI households.
Median ATSI household income	\$1031/week -All; \$918/week for ATSI households; 29% of households had weekly income under \$650 and 6.3% had weekly income over \$3000.
Median personal income - over 15 year	\$296/week for ATSI population.
Average weekly rent	\$75
Average motor vehicles per dwelling	0.3
Community Services and Plans	
Community Layout Plan	https://www.wa.gov.au/system/files/2021-07/LOP_Kalumburu-LP2-Amendment-12-Report.pdf
Agencies in community	Kalumburu Aboriginal Corporation (runs essential services, youth development, Centrelink, Kalumburu Community Resource Centre, Coconut Lodge, remote school attendance strategy, home and community care/respite, Kimberley Aged Care Services), Kalumburu Remote Community School, Kalumburu Remote Area Health Service, Kira Kiro Art Centre, , East Kimberley Job Pathways, Uraro Store/ Takeaway, Women's Safe House, Kalumburu Mission, Kalumburu multi-function Police Facility, Wunambal Gaambera Aboriginal Corporation/Ranger program, Community Focus National, Kimberley Remote Services Provider (Shire)
Visiting agencies	Contractors, Horizon Power, WA Alternative Energy (solar farm), Boab Health, Anglicare, Activ8me, Telstra, Optus, Garnduwa sports, Kimberley Mental Health, Kimberley Population Health Unit
Community Development Plan	Not updated
Power supply/type in community	Diesel generator + solar farm near airstrip
Use of power cards in households- monthly expenditure	Yes - \$150-\$200/month

Basics card site?	Yes (80% on basics card, 20% on debit card). During COVID there was no cash in community to reduce handling risk. When satellite services were down, this led to periods where the store had to close due to EFTPOS not working.
Types of Communications Available	
Public phones- number/ location	2 outside community office (handset broken); 1 inside Centrelink office (working); 1 Opposite water tank (no dial tone); 1 outside Kalumburu Mission (working). Activ8me VOIP phones installed in 128 premises (free for internal communications).
Home phones- number	Not known
Mobile - 3G, 4G, 5G, small cell (satellite backhaul), provider, location of base station	Optus satellite small cell - 3G (established about 2019) and 4G (established 2021); Telstra satellite small cell to be established in late 2022 or 2023.
Coverage description	Limited coverage (approx. 3km diameter, reaches airstrip); low power transmitter requires access outside of most premises, mostly line of sight.
ADSL- number of connections	No ADSL services due to HCRC telephony network not supporting ADSL.
Business grade services - number of connections	None - all internet by satellite only.
Fibre to community	No
Satellite services - number, locations, provider	6 Sky Muster services used for Activ8me Wi-Fi mesh network backhaul (on community office); Most agencies, staff houses and some resident houses have Sky Muster; School and clinic use different business grade satellite services.
UHF or HF Radio	Kalumburu AC and rangers uses HF radio for internal comms; School use UHF radio for internal staff communications.
Status of services- faults, issues, speeds during peak use time etc	Regular outages on HCRC microwave telephony and copper network, especially in wet season; Optus mobile network unreliable with dropouts, high latency/echo issues, one way signal loss, and outages; regular outages on Sky Muster and VAST services due to cloud cover especially in wet season.
Communications Programs - Mobile Black Spots, Regional Connectivity Program, ICP, etc	Mobile Black Spots Program funding for Optus small cell; Regional Connectivity Program funding 50/50 with WA Government co-investment (total \$1.3million) for Activ8me Wi-Fi Mesh and VoIP telephony network (7year project).
Any planned upgrades?	Optus planning upgrades to satellite backhaul capacity of small cell mobile; Activ8me planning to return to community

	to fix some network problems (TBC), and are advocating for increased NBN Sky Muster data and speed increases.
Emergency information system	Kalumburu office have a satellite phone, otherwise no emergency communications system known; police inform people of emergency.
Telemetry network	Water tank, pumps and generator have telemetry (KRSP manage this); A remote monitoring system was installed in Kalumburu RIBS in June 2022, awaiting satellite connection.
Media Services Available	
Radio services broadcast- AM or FM	PAKAM Radio 106.1 and ABC regional radio 104.5 (re-activated during visit 11/6/22 after 2-year outage).
TV services -local broadcast, number of DTH services, number working	All TV services via VAST; VAST not working in approximately 50% of residents' households.
RIBS radio station- location, staff, roles	RIBS radio station operational but no current RIBS operator (was Tamara Waina).
RIMO- regional provider	PAKAM - Neil Turner, Manager.
Other media services- newspaper etc	Kimberley Echo gets sent to store occasionally.
Community Access Facilities	
Internet access facility- where located, number of computers, server, printers, other facilities, videoconferencing	Community Resource Centre has access computers, printing services, laminating; coordinators provide assistance with activating mobile phone SIMS, doing online banking and services, ID support etc.
Public Wi-Fi availability, free or voucher system, agency, RSP, monthly download limit	Activ8me community Wi-Fi network (installed November 2021) allows 1GB free data per month, then vouchers at store at \$3/GB. However Wi-Fi is very congested and slow and hard to connect in many parts of community.
Access computers available in other facilities - art centres, store, community office, youth centre etc	One in Centrelink office for Centrelink use only.
Any programs running to support community access- provider	Ongoing support by CRC staff and community office staff, and other agencies where required.
Digital Training/ Support	
Training options available- school, TAFE, CDP other	CDP provide some basic training, Kimberley TAFE do basic business skills training.
Any workplace digital skills training - rangers, art centre, media, store etc	East Kimberley Jobs Pathways have organised two workplace readiness digital skills workshop in last 2-3 years.
Any staff/ resources to support digital skills or access to online or digital services	Community Resource Centre staff (Matilda, Maggi, Marinda) and Kalumburu AC staff.

Appendix 3: Photos of Research Activities



Figures 11 and 12: Lyndon and co-researcher Leanne Kelly doing survey with resident Martha Djanghara; Daniel with Maggi Captain, Matilda Oxtoby and Marinda French at the Kalumburu CRC.



Figures 13 and 14: Entrance to Kalumburu School; Uraro Community Store.



Figures 15 and 16: Kalumburu Community Resource Centre provides post office, printing, computer access and meeting room facilities.



Figures 17 and 18: Phone box in residential area; Kalumburu Health clinic.