March 2024

MAPPING THE DIGITAL GAP

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

Kalumburu, WA

2023 Community Update Report

Acknowledgement of Country

We respectfully acknowledge the Kwini and Kulari people, the traditional owners for Kalumburu, and pay our respect to their Ancestors and Elders, past and present. 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 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 a supplementary project to the Australian Digital inclusion Index, coordinated within the RMIT University node of the Centre of Excellence for Automated Decision Making and Society in partnership with Telstra.

Contact

Dr Daniel Featherstone
Project Lead

E: mtdg@rmit.edu.au
M: 0437 798 076
W: mappingthedigitalgap.com.au

The 'Mapping the Digital Gap' project received funding support from Telstra and the Australian Research Council Centre of Excellence for Automated Decision-Making and Society (CE200100005).

Suggested citation: Featherstone, D, Thomas, J, Ormond-Parker, L, Hawkins, L, Parkinson, S, Kennedy, J, Gore, K, Campbell, Mangolamara, K (2024) *Mapping the Digital Gap: Kalumburu WA Community Update Report 2023*. ARC Centre of Excellence for Automated Decision Making and Society: RMIT University, Melbourne. DOI: 10.60836/xz2e-2g30

Acknowledgements

We would like to thank the following key contributors to this research:

Community Research Partner
Kalumburu Aboriginal Corporation

Community Co-Researchers
Kelwyn Gore
Julia Campbell
Karen Mangolamara

Research Participants and Stakeholders:
Thank you to all the community residents and local agency staff who generously participated in the surveys and interviews, providing the personal experience to make this research meaningful. We conducted 71 surveys with First Nations community residents in 2023 (49 in 2022). During 2022 and 2023 research visits, we undertook 19 interviews with community leaders, residents and the following stakeholder agencies:

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

Kalumburu research trips dates:
24–28 April 2023; 8–13 June 2022

RMIT University researchers:
Dr Daniel Featherstone
Dr Julian Thomas

Design/Research support: Leah Hawkins
Photography: Daniel Featherstone
Copy editing: Lucy Valenta
Cover photo: Aerial photo of Kalumburu community

CONTENTS

01. EXECUTIVE SUMMARY

This report outlines updated findings from our second research visit to Kalumburu, a very remote community situated on the banks of the King Edward River in the Wyndham-East Kimberley Shire of Western Australia (WA). Kalumburu is 279 km north-west of the major town of Kununurra and 615 km north-east of the regional centre of Broome (886 km 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 home.[1] There are approximately 120 residential dwellings.

Our second research visit to Kalumburu was undertaken 24–28 April 2023. The RMIT University team worked with community research partner Kalumburu Aboriginal Corporation (KAC) and co-researchers Kelwyn Gore, Karen Mangolamara and Julia Campbell, with support from KAC CEO Madeline Gallagher-Dann and staff. The team had a very productive week, undertaking 71 surveys with residents and conducting 9 interviews with agencies and community leaders. We thank all residents and agency staff who participated in the research and made us feel very welcome.

Building on the 2022 Kalumburu Community Outcomes Report, this Update Report is intended to assist local and regional agencies agencies, leaders and residents to better understand the barriers to digital inclusion, develop local strategies to address these barriers, and support planning and partnerships with government and industry stakeholders.

This report presents research findings to date, comparing survey results from 2022 to 2023, outlining changes in communications and media services and usage, and renewing the analysis section with 2023 findings and quotes. The proposed Digital Inclusion Plan has been updated based on community input and progress to date, as well as planned activities.

The report also presents 2023 Australian Digital Inclusion Index scores for Kalumburu relative to national averages and key findings from our first round of visits to 10 remote towns, communities and homelands in 2022.

This report is part of our commitment to Indigenous data sovereignty, providing data and research findings to the participating communities to use for their own analysis, planning and advocacy. We will publish another update report following the final research visit in 2024.

279km
Nearest major regional centre (Kununurra)

388
Population (ABS 2021)

87.6%
Aboriginal and/or Torres Strait Islanders

71
surveys conducted in 2023 (49 in 2022)

8
interviews conducted 2023 (10 in 2022)

[1] An additional 5.7% did not state their identity.

Kalumburu at a Glance

Distance	**1384 km**	to nearest capital city (Darwin)
Dwellings	**120**	private dwellings
	4.4	people per ATSI household
Language	**14.9%**	ATSI people who speak an Aboriginal language
Income	**$296**	median ATSI personal income

Figure 1: Mouth of King Edward River

Key Survey Findings

The figure below provides a summary of 2023 survey results.

ACCESS

83% own or share a mobile phone

100% of mobile phone users have pre-paid services

66% via community Wi-Fi network

26% have no fixed home internet

28% use a fixed line phone at home

9% have an nbn Sky Muster service

AFFORDABILITY

$79 avg fortnightly prepaid household mobile expenditure

$51 avg monthly household expenditure for homes with fixed internet

59% compromise on internet speed or quality due to affordability

37% cut back on essential household costs to afford internet (34% sometimes, 3% often or always)

DIGITAL ABILITY

83% used Internet in the past 6 months (regular users); 16% never use internet

93% of regular users use online banking

62% of regular users use social media to connect with family/ friends

59% of regular users can send and receive emails (very or mostly true)

35% of regular users do online shopping

MEDIA USE

83% never listen to radio

49% access TV via VAST satellite

36% watch commercial TV daily; 31% YouTube

51% get daily news direct and in-person; commercial TV 37%

70% get emergency information direct and in-person, ABC TV 46%

Full 2023 survey results are available in Appendix 1, with comparison to 2022 results. An updated audit of demographics and communications and media services available in Kalumburu is provided in Appendix 2.

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) 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 level of digital inclusion. ADII scores are relative, enabling comparisons across demographic groups and geographic areas over time.

The Mapping the Digital Gap project uses an amended version of the ADII survey to collect digital inclusion data. This enables us to compare results for the participating remote communities, towns and homelands with the national results collected by the ADII, and track changes in digital inclusion between and within these sites.

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

Combined with ADII data collection, the Mapping the Digital Gap project is helping to track progress against Target 17 for remote, regional and urban First Nations people for the first time.

DIGITAL INCLUSION

ACCESS

- Reliable access to phone and internet
- Access to IT devices and/or facilities
- Access to trusted media, news and information

AFFORDABILITY

- Affordable phone and internet services
- Affordable devices

DIGITAL ABILITY

- Ability to use digital devices, software and online services
- Awareness of cybersafety, scams, and viruses

ADII First Nations Data Dashboard

The First Nations dashboard on the ADII website provides interactive charts and community-specific results for the ten research sites in 2022. The Mapping the Digital Gap 2023 Outcomes Report provides summary findings across all sites.

View dashboard using the QR code below:

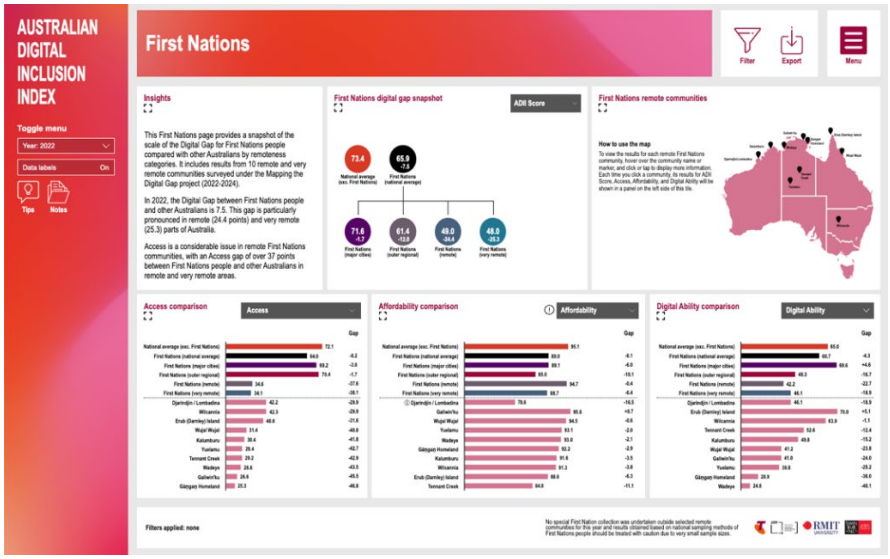

Figure 2: First Nations dashboard on ADII website: digitalinclusionindex.org.au/dashboard/firstnations.aspx

ADII 2023 Report Findings

The 2023 ADII found a digital gap of 7.5 points for First Nations people compared with other Australians. This gap widened substantially for people living in remote (24.4) and very remote Australia (25.3), where contributing factors include limited access to digital infrastructure and services, high internet costs relative to income, climate, geography and cultural context.

Based on our 2022 survey results, the average Australian Digital Inclusion Index (ADII) score for Kalumburu was 49.2, a gap of 24.2 points below the national average for non-First Nations Australians.

The key element of this gap was in the Access dimension score of 30.4, which was 41.6 points below the non-First Nations average, owing primarily to limited household internet access, patchy and slow mobile coverage, and high reliance on mobile devices. The Index scores (see Figure 3) show a small gap for Affordability (-3.3) and a larger gap for Digital Ability (-15.1). However these gaps vary widely for different demographic groups as detailed below.

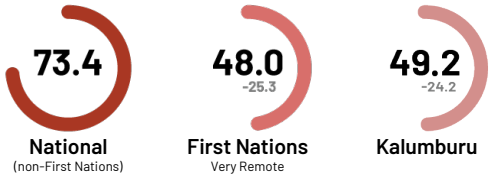

Figure 3: Kalumburu ADII scores compared to National Average (non-First Nations) and Very Remote First Nations scores, based on 2022 surveys

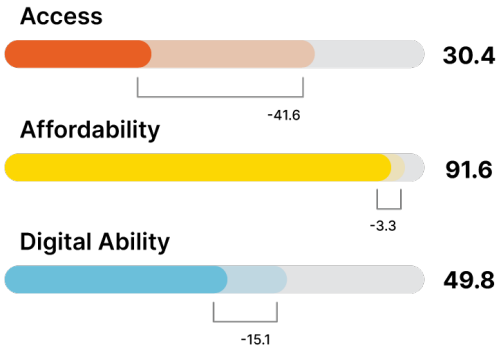

Figure 4: 2023 ADII scores for Kalumburu, with gap against national non-First Nations averages

Demographic gaps in Kalumburu:

The 2022 survey results found significant variations in digital inclusion between certain demographic groups. These results demonstrate that targeted digital support activities would benefit these demographic groups in Kalumburu.

Gender gap

17.5

Women had higher average digital inclusion scores than men (55.8 compared with 38.3). The gap was particularly high in Digital Ability with a gap of 36.2 (63.4 compared with 27.2), with a smaller gap for Access (35.4 compared with 25.7).

Disability gap

11.9

People who live with disability had average digital inclusion scores of 39.8 compared to 51.7 for those without disability. The gap was primarily in the areas of Digital Ability (37.3 compared with 53.0) and Access (21.3 compared with 32.7).

Employment gap

15.3

The average digital inclusion score for unemployed people was 43.5 compared to 58.8 for those employed (full-time or part-time). The gap was greatest in the areas of Digital Ability (39.6 compared with 66.7) and Access (25.6 compared with 35.7).

Education gap

32.7

Those who did not complete secondary school had an average digital inclusion score of 24.7 compared to those who completed secondary school (Year 12), who averaged 57.4. There was a very significant gap of over 60 in Digital Ability (3.6 compared with 64.5) and Access (14.3 compared with 35.9).

Age gap

19.5

Those aged 55–64 had an average digital inclusion score of 40.8, compared with a score of 60.3 for those aged 18–34 years (19.5 gap). The gap was greatest for Digital Ability (30.9 for 55–64 compared to 74.2 for 18–34), with a smaller difference in Access (24.7 compared with 32.9).

Demographic gaps also exist for those living in group or shared households compared with couple with no children (46.2 compared to 60.6). Single parent families scored even lower at 38.5, with very low affordability (46.0 compared to 96.5 for a couple without children) despite having higher digital ability scores (75.0 compare with 61.1).

Note that low sample sizes may play a significant factor in some of these results.

02. INTRODUCTION

The Mapping the Digital Gap project tracks changes in digital inclusion and media and communications use in each research site over three years. This report provides an update from our second visit to Kalumburu in April 2023, comparing the survey and interview results to our findings from the first visit in June 2022. The project also tracks any progress on the suggested strategies for a local Digital Inclusion Plan and update the plan with any newly identified strategies or activities.

2022 Findings

Until six years ago, Kalumburu had very limited communications services, with primary reliance on the Telstra HCRC microwave network for telephony and costly satellite broadband services, primarily in agency buildings and staff houses. The range of communications options improved significantly with the introduction of nbn Sky Muster satellite broadband in 2016 and installation of an Optus 3G satellite small cell mobile service in 2018 and upgrade to 4G in 2020. Several agencies also used UHF radio.

Figure 5: KAC community office block

With low levels of household broadband due to affordability issues, an innovative community Wi-Fi mesh network was installed in November 2021 (See case study in Section 6). All 128 dwellings in Kalumburu were equipped with a Wi-Fi repeater and VoIP phone, enabling free local calls. The network enabled unmetered access to government services and provided 1 GB free monthly data per user, with additional data available via vouchers from the store or online at $3 per GB. This significantly improved access and affordability of household internet and phone access, with high initial usage. Unfortunately during our 2022 visit, the network was not working in many houses due to lightning damage to a repeater tower in May 2022. Repairs and a network upgrade were undertaken in August 2022, with regained usage.

During our first visit to Kalumburu in June 2022, we heard significant frustration by both residents and agencies with the quality and reliability of most services. The Optus small cell mobile service was highly congested with limited lines available, regular dropouts in cloudy weather, and audio quality issues. There were calls for a Telstra mobile service in Kalumburu to improve service quality and enable compatibility of devices with neighbouring communities and regional towns.

The nbn Sky Muster service was being used as the primary means of broadband access by agencies, staff houses and up to 20 First Nations households. While it met the needs of some, others described the service as slow, prone to dropouts in cloudy or wet conditions, and having high latency, which impacted usability of cloud-based services and record systems, and videoconferencing. Households described issues of affordability of post-paid Sky Muster and having insufficient data to meet shared households needs. Only the Telstra telephony service, delivered via a terrestrial microwave repeater network, was described as reliable, particularly during the six-month wet season when road access is closed.

> "[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

The issues of poor communications were exacerbated by COVID-19 restrictions, with online learning not an option for many households due to limited connectivity and only having mobile devices. Furthermore, an extended power outage during wet season led to the store being closed, resulting in food security issues. Interviewees called for more reliable, better-quality communications services for effective service delivery, health and safety, use of online and cloud-based services, and day-to-day communications. Long delays in maintenance visits and high cost of technical support were also raised as issues.

Kalumburu also had limited access to media services, with both PAKAM Radio, the regional First Nations radio network, and the ABC service not working for an extended period due to a lack of maintenance funding. We helped PAKAM to get both services operating during our visit. Free-to-air television access was also limited in Kalumburu households, with 51% of respondents saying they did not have the VAST satellite TV services working. This was mostly due to faults with satellite equipment or the VAST set-top box, which costs over $600 to replace at the local store.

Despite these challenges, our survey found moderately high levels of digital ability among Kalumburu residents, with 84% of respondents having used the internet in the last three months. However, usage was predominantly via mobile devices and apps, with limited computer and keyboard skills. While there was high use of online banking, MyGov, social media and streaming applications, some people had challenges with activating SIMs, setting up and using online services, and sourcing identification records.

There was demand for more digital skills training and support, particularly for elders, as well as workforce readiness digital training. KAC employees at the Centrelink office and CRC office provide some digital support, along with other agency staff, amidst busy workloads. There was broad support for the concept of a funded digital mentor position to provide peer support and reduce demand on service providers. We heard only a few reports of cyber-safety issues and scams, but e-safety awareness and locally targeted resources are needed.

Affordability of internet data and pre-paid mobile services was a limitation on usage, with personal incomes averaging only $296 per week (ABS 2021), and very high costs of food, fuel and other services. Measures to address affordability included free Centrelink Wi-Fi, Telstra public phone calls being free of charge since 2021, and the establishment of the Wi-Fi mesh network, enabling pre-paid household internet access. Heavy data use, such as media streaming was still costly at $3 per gigabyte, with this rate reduced to $2 per gigabyte following our visit. Nevertheless, there were calls for further measures to address affordability of data and devices as internet usage and cost of living increases.

2023 Findings

During our April 2023 visit, we heard many of the same issues and concerns as in 2022. Many people described the mobile and satellite communications services in Kalumburu as the worst in the region.

> "I think being remote and being a community of substantial size, we should be priority ... Connectivity in towns and cities is really good, whereas out here, a lot of the time we're struggling."
>
> - Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023

The Optus mobile service was still struggling to meet demand, with reports of ongoing service quality issues. This impacted both residents and service providers, with clinic staff saying they could not leave their homes when on call due to unreliability of the mobile service. Most agencies – school, rangers, police, shire, and KAC – reported using UHF radio for communications within the community due to the limited coverage and unreliability of the mobile service. Calls for a Telstra mobile service were louder in 2023, with funding for a Telstra satellite-delivered 4G micro-cell approved in December 2023. There is no

rollout timeframe as yet. The service will likely use backhaul from the Starlink low-earth orbit (LEO) satellite service, hopefully improving data speed and capacity and with reduced rain fade impact.

However, there were improvements in some areas. The Activ8me Wi-Fi mesh network had been repaired and upgraded following our 2022 visit, improving household internet and phone access. The usage data (included in the Wi-Fi network case study in Section 6) indicated a high level of use of both data and voice calls. In fact, we heard of several months where the data limit had been reached within two to three weeks, preventing use of the whole network until the next month. Houses in the south of the community were without access during our visit, with Activ8me (APN) waiting for road access to undertake repairs.

While there was general appreciation of the Wi-Fi network, we heard numerous complaints about dropouts during wet season, slow broadband speed, issues with pre-paid vouchers, and the high cost of data for streaming movies. Since our visit, APN upgraded the network backhaul service to the new nbn Sky Muster Plus Premium, which addressed the issues of speed and data limits, and enabled free data use and calls at all times. This change has resulted in a dramatic increase in usage since November 2023.

Even though all houses and agencies had the Activ8me Wi-Fi service connected, most staff houses and about 8–10 First Nations households (down from 2022) had their own nbn Sky Muster services. This was described as more reliable and faster than the shared Wi-Fi service, however shared households often reached data limits well before the monthly reset. Being a post-paid (billed) service meant that Sky Muster services were primarily in households where someone had a full-time job with reliable income.

Most agencies primarily relied on Sky Muster for broadband service, with no Starlink uptake at the time of our visit. Interviewees reported similar issues about speed, latency and dropouts as in 2022. However, Kalumburu School reported improvements in the applications used, NAPLAN results and ability to use online learning, since its satellite service was upgraded by the Education Department of WA.

Heavy cloud and rain have a significant impact on communications in Kalumburu, with all mobile, broadband and TV and radio services delivered via satellite. During the recent wet season, there had been regular periods of outages, especially following a cyclone crossing the coast nearby. Heavy rainfall blocked the road needed to truck supplies from Barge Landing, with a helicopter needed to deliver two fortnightly loads of supplies from the barge. Power outages also affect communications, with several reports of outages due to lightning strikes or fuel supply issues. Network and power outages impact on food security, with the store having to close whenever services are down and EFTPOS is disabled.

The Telstra HCRC service continued to be the most reliable service during wet season, however the phone service was reportedly down for two days in early 2023, possibly due to a technical issue with one of the 15 microwave repeater towers between Derby and Kalumburu. This coincided with other outages, leading to real concern in case of emergency, with satellite phones the only option. We also heard about the safety risks for residents, staff and tourists visiting the area due to lack of communications in most of the surrounding homelands and campsites. There are currently 4 homelands with Activ8me Wi-Fi enabled phones. Funding has been awarded for Activ8me to provide building-mounted or freestanding Wi-Fi and VoIP telephones at an additional 8 homelands under the Regional Connectivity Program Round 2. These should be installed by 31 August 2024.

Technical and IT support is restricted to air access only during the six-month wet season. Due to the remoteness and high cost of flights, technical support is often limited to responding to faults rather than routine maintenance, impacting on equipment life. With limited technical capacity within the community, this can result in communications services being inoperable for weeks or even months at a time, a common situation in remote communities. Having local staff and CDP participants provided with basic technical skills training and tickets would enable first-in maintenance, potentially with remote support,

and local skilled employment. Remote monitoring of equipment is enabling fault warnings and improved reliability of services through rapid response, where on-site support is available.

Our 2023 survey found lower levels of digital ability than we found in 2022, although we expect this reflected differences in the demographic group surveyed. Nonetheless, there were clear differences in digital ability based on education levels, disability status and age, with elderly people often not able to use the internet or mobile applications, or only using basic services. Young people were highly digitally engaged, although often with applications such as social media, games and content streaming rather than use of email, Office applications or online searching. We again heard of demand for more training and support, employment of a local digital mentor, and awareness about scams and cyber-safety risks.

Updates to Proposed Digital Inclusion Plan

Telecommunications in remote communities is typically a state or federal government responsibility, with decisions and timeframes often determined by funding programs and industry players. This can leave residents and agencies feeling disempowered, with limited input to ensure the technology and services are fit for purpose. The proposed digital inclusion plan in Section 6 is intended as a tool to assist communities to determine local needs and priorities.

This updated plan builds upon the proposed digital inclusion plan in the 2022 Outcomes report, including new strategies proposed by residents and stakeholders during our 2023 visit, as well as a summary of progress to date or planned activities for each item listed.

We recognise the challenges in implementing a local digital inclusion plan, with multiple agencies involved in delivering media, communications and digital support programs. However KAC, with strong support from WA Government, have been very successful in advocating for improved services over several years. We hope that this draft plan can assist in local planning and advocacy for improved media and communication services and digital inclusion activities for Kalumburu residents and service providers.

As part of our ongoing research work with the Kalumburu community in 2024, the Mapping the Digital Gap team can assist with further development of this plan.

> **"There's always the capacity to move forward [with] new ideas and suggestions. And for [the digital inclusion plan] to be implemented would be win, win for us."**
>
> - **Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023**

Figure 6: Photo of the research team

Left to right: Co-researcher Kelwyn Gore, Julian Thomas, CRC Coordinator Julia Campbell, Co-researcher Karen Mangolamara, Daniel Featherstone

03. MEDIA & COMMUNICATIONS IN KALUMBURU

Existing Telecommunications Services

Mobile coverage

There is currently an Optus 3G / 4G satellite small cell service in Kalumburu, located at the women's centre (Optus 3G is scheduled to be switched off in September 2024). The small cell has a range of approximately 3 km. A Telstra satellite-delivered 4G service is planned for Kalumburu, with Regional Connectivity Program funding announced in December 2023.

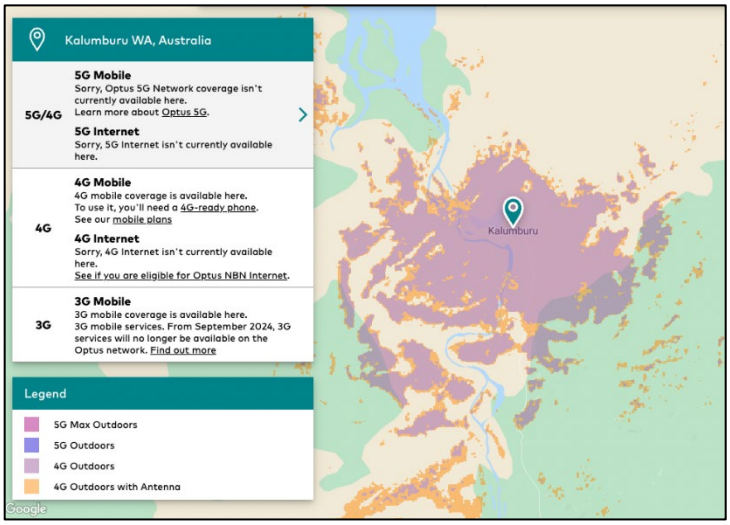

Figure 7: Optus coverage map for Kalumburu. Source: https://www.optus.com.au/living-network/coverage

Mobile phones and recharge sales

A basic range of smartphones and flip phones (calls only), as well as Optus recharge vouchers, are available from the Uraro store. Activ8me Wi-Fi vouchers were also available.

Backhaul to community

Kalumburu's backhaul for basic telephony is via the HCRC microwave repeater network. Mobile and internet backhaul is all via satellite (see below).

Landlines

The copper network provides phone services to most agencies and staff houses in the community, however no residents surveyed had landlines. VoIP phones are installed in all houses on the Wi-Fi mesh network.

Public Phones

There are two public phones outside the community office (one had a broken handset in April 2023) as well as one within the Centrelink agency. Two other Telstra phone boxes are outside Kalumburu Mission and opposite the water tank, but neither were working during our 2023 visit. When working, public phones get regular use in Kalumburu with calls free of charge since 2021.

Activ8me Wi-Fi Mesh network

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 1 GB per user per month). See Section 5 for details. Free Wi-Fi is also available at the Centrelink office.

nbn services
Kalumburu is designated as a satellite delivery zone under nbn planning. An estimated 10 community residential houses have nbn Sky Muster, plus most agencies and staff houses.

ADSL access
There are no ADSL services in Kalumburu due to backhaul being via the HCRC microwave network.

Telemetry
Horizon Power manage power and Water Corporation manage water and wastewater services in WA Aboriginal communities. Telemetry is used for remote monitoring of services, in conjunction with Kimberley Regional Service Providers' on-site Municipal Services Manager.

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.

Media Services

Radio services
PAKAM Radio (106.1FM) is the regional First Nations radio service, with hourly shows from Pilbara and Kimberley Remote Indigenous Broadcasting Service (RIBS) sites. While Kalumburu previously had active radio services, both PAKAM and ABC services were not working during our visits and there was no RIBS broadcaster.

TV services
All houses in Kalumburu require Viewer Access Satellite Television (VAST) direct-to-home satellite for free-to-air TV services. However, our survey found that over 53% of households did not have TV services working, mostly due to dish / cabling maintenance needs or set top boxes not working.

Newspaper
There is limited newspaper access, however regional newspaper Kimberley Echo is occasionally available at the store.

Local and regional news
Local news is shared via word of mouth and community noticeboards promoting events, meetings, health updates, training and jobs information. Regional news is shared via PAKAM radio and Facebook.

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.

04. HISTORY OF COMMUNICATIONS TECHNOLOGY IN KALUMBURU

Kalumburu's remote location has resulted in 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.

Figure 8: Kalumburu Mission

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)

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 550 km from Derby to Kalumburu. Telstra public phones were installed alongside 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 repeaters[2] in the early 2000s. Fax was a primary means of conveying messages or records between agencies and communities.


Figure 9:Telstra payphones are still regularly used in Kalumburu

- "When I first came here [in the early 2000s] there was only payphones and [some] people with home phones or business phones. And even that was very limited … No one had Wi-Fi, [it] was all plugged in. If you needed to do internet banking or anything you had to go to the local office [or] clinic [to send] 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)

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

Since 1999, Telstra has delivered the Universal Service Obligation (USO) contract to make public and residential phones available throughout remote Australia. This contract, which currently extends to 2032, relies on the HCRC network and local copper networks in sites without fibre optic connectivity.[3]

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 one-way satellite internet, a more affordable service which enabled faster download speeds.[4] 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 Service was introduced in 2011, prior to the Sky Muster satellites being built and launched.[5]

- "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 10 GB peak data a month and maybe another 40 GB off-peak data." (Fionna Greig, Principal, Kalumburu Remote Community School 2022)

Figure 10: An old satellite dish at the school

The nbn Sky Muster services became available in 2016.

- "[Then we got an nbn service with] 60 GB 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." (Fionna Greig, as above, 2022)

Mobile coverage introduced in 2018

Kalumburu did not have any mobile coverage until late 2018 when a 3G Optus satellite small cell mobile service was installed under the Mobile Black Spots Program.[6] Optus was the first carrier to offer a small cell product, designed to provide targeted mobile coverage via satellite to remote communities and campgrounds in areas where alternative connectivity options were unavailable or unaffordable. The

[3] A Universal Services Review is underway in 2024: https://www.infrastructure.gov.au/have-your-say/better-delivery-universal-services
[4] 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.
[5] https://www.nbnco.com.au/corporate-information/media-centre/media-statements/remote-australians-the-priority-for-new-nbn-interim-satellite-service
[6] See ABC story: https://www.abc.net.au/news/2018-09-09/kalumburu-braces-for-mobile-phone-coverage-for-first-time/10208336

logical terrestrial link to Kalumburu would have been via microwave from Wyndham. This would have required construction of 8 solar-powered repeater towers at a total cost of around $12 million at that time, beyond the limit of funding programs.[7]

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

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, as above, 2022)

With limited bandwidth and only 30 active users on the network at any time,[8] the 3G small cell service quickly became congested, leading to the frustration of being unable to connect.[9] In 2020, the 3G service was upgraded to include 4G through a WA Government co-investment program,[10] allowing an additional 60 users on 4G.[11] However, with an ever-increasing number of users and demand on data, the Kalumburu service was regularly congested. During our 2022 visit, there were calls for further upgrades and for a Telstra mobile service, so they could use the same phone as in regional centres.

> **"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**

There are plans for a Telstra mobile service to be installed in Kalumburu, with funding announced in December 2023, but no dates for installation as yet.[12] This will use a low-earth orbit satellite constellation service (probably Starlink) for backhaul based on recent announcements by Telstra.[13]

A Wi-Fi mesh network was established in 2021

WA Government gained Regional Connectivity Program funding to establish a community-wide Wi-Fi network.[14] 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.

---

[7] Source: Email correspondence with Penny Griffin, WA Government, 16/2/24.
[8] Source: Email correspondence with Penny Griffin, WA Government.
[9] See: https://www.abc.net.au/kimberley/programs/breakfast/remote-mobiles/11909850
[10] See: https://www.arnnet.com.au/article/662150/optus-strikes-wa-govt-deal-regional-network-upgrade/
[11] Source: Email correspondence with Penny Griffin, WA Government.
[12] The completion deadline for all Regional Connectivity Program Round 3 projects is of 30 June 2026.
[13] See: https://www.theguardian.com/business/2023/jul/05/telstra-signs-starlink-deal-agreement-elon-musk. The new service will use LEO backhaul and is expected to provide around 15x more capacity than Optus' current service.
[14] The project received RCP funding of $888,140. Source: https://www.abc.net.au/news/2022-10-25/kimberley-connectivity-boosted-in-budget/101570172

- "[With] Starlink already up [and] OneWeb [coming, they have] very minimal lag [and] incredible speeds." (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)

Low earth orbit satellite constellations are below 2,000 km above the Earth compared with 36,000 km for geo-stationery satellites. The lower latency enables better performance for applications such as videoconferencing, cloud-based services and gaming. While more expensive than nbn Sky Muster services,[15] Starlink typically provided higher speeds than nbn Sky Muster, and unlimited downloads. nbn has sought to compete with its new Sky Muster Plus Premium 100 Mbps, unlimited data product.

Starlink now has over 120,000 customers in Australia, with nbn Sky Muster at about 93,000.[16] With this shift by many heavy data users to Starlink, nbn has since established the Sky Muster Plus Premium product with unlimited downloads and speeds exceeding 100 Mbps, priced from about $99/ month. While rain fade is still an issue, this product may benefit households or agencies in Kalumburu who are struggling with the speed and data caps on Sky Muster or Sky Muster plus products.

Additionally, both Telstra and Optus announced agreements with Starlink in 2023 to provide backhaul for small cell mobile and other telephony and broadband services to remote households. The low latency makes this a viable alternative to delivery of services over the copper network, although rain fade remains an issue for any satellite service affecting service reliability, particularly during the wet season.

Satellite phones are becoming more accessible

For tourists and staff travelling long distances on unsealed roads during dry season, and for homelands without Activ8me phones, mobile satellite phones can be the only means of connectivity in an emergency. While satellite phones have been available since the 1990s, they have previously required an expensive dedicated handset and costly monthly billed services, something unaffordable for most Kalumburu residents. While several agencies have satellite phones, there was mixed feedback on their reliability.

- "[Satellite phones are] expensive to use [and] not always that reliable. If I'm on camp [in a homeland] and I [have] a sick kid or something, [office staff] may not be even be able to hear me [and] can't message you back. [I] need to be able to contact someone if I've got a kid who's injured or something." (Simon Duncan, Deputy Principal, Kalumburu School, 2023)

However, satellite phone access no longer requires a separate handheld device. For example, Iridium Go SIM cards are now available to use in an iPhone, enabling phone calls via the satellite network.

Since 2023, iPhone 14 and 15 models enable emergency (000) calls via the Globalstar satellite constellation.[17] It is likely that text messaging via satellite will be possible from some mobile phones by 2025, with voice calls to follow. There are currently relatively affordable emergency satellite communications systems, such as Zoleo, that enable users to send basic text messages to any mobile number from any location, and include location tracking and emergency beacon functions.

[15] Monthly residential Starlink rate is $139/month, plus $599 up-front cost of satellite equipment or $19/month.
[16] Customer figures as at 23/7/23. See: https://www.smh.com.au/technology/telstra-s-starlink-deal-could-signal-a-new-era-of-connectivity-in-hard-to-reach-places-20230705-p5dlve.html
[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/

05. KEY FINDINGS FROM DATA ANALYSIS

This section provides key findings from the 8 interviews conducted with community leaders and stakeholders, as well as observational data and survey results. The analysis builds upon the findings in the 2022 Community Outcomes Report, with new topics labelled with 2023 after the heading.

See Appendix 1 for the full set of unprocessed survey results from 2022 and 2023. As outlined in the Executive Summary, the finalised results published in the 2023 Outcomes Report and on the First Nations dashboard of the Australian Digital Inclusion Index website can differ slightly from raw survey results following data cleaning and weighting against ABS data.

Communications Access

Reliable communications are essential for health and safety due to remoteness and monsoon

Kalumburu is very remote, located at the top of the Kimberley region, about 280 km by air (560 km by road) from regional centre Kununurra, with road access closed throughout the annual wet season.

- "Generally the road will open around the second week of May, and it will close again by mid-November ... so pretty much six months you're closed, and so it's only air access for that period." (Kevin Hall, Officer In Charge, Kalumburu Police, 2023)

Figure 11: Creek crossings near Kalumburu can be impassable during wet season

Reliable communications services are critical to ensure access to services, emergency support and connection with family and friends. Most communications in Kalumburu are delivered via satellite, with services often dropping out during rain or cloud cover, especially in wet season. The poor reliability impacts significantly on service delivery within the community.

> "During our wet season ... no one can buy anything because the store relies on [satellite for] the EFTPOS machines and the ATM ... The simplest of things like getting onto MyGov [or] checking bank balances [or emails] does not happen because the rain [blocks the signal]. So communication is definitely critical and is a necessity. [It] needs to be re-evaluated and looked at here at Kalumburu."
>
> - Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023

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.

- "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)

A 2022 interviewee raised the need for reliable 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)

Cyclone warnings are communicated by the police using a range of methods, mostly word of mouth with police driving around the community to update residents, notices with updates at the store noticeboard, and a warning light system (blue, yellow and red alerts) on the water tower. A category three tropical cyclone (Ellie) crossed the coast near Kalumburu in December 2022, inundating the Fitzroy Valley and West Kimberley. Fortunately Kalumburu had only minor flooding of some buildings near the river and a power outage, but limited damage.

Voice calls are primarily via mobile phones, with VoIP home phones and public phones also used

83% of survey respondents regularly used a mobile phone for making phone calls. This is mostly via the Optus mobile network but also via public or home Wi-Fi services using Wi-Fi calling or an app such as WhatsApp or Messenger. 75% of respondents said they owned or shared a mobile phone (down from 80% in 2022). Of those with phones, 98% had smartphones as their main mobile phone, and 100% used pre-paid services. There is an average of 2.5 mobile phone services per household.

Figure 12: Activ8me VoIP phones are now installed in 128 dwellings

However, use of fixed line home phones has increased in 2023 with 48% using a fixed line telephone. This is a significant increased from 18% in 2022 now that Activ8me VoIP phones are working in homes. Since 2019, all residential dwellings have had a VoIP[18] phone installed under the Activ8me Wi-Fi network. While the Wi-Fi mesh network was not fully operational during our 2022 visits and one section was not working during our 2023 visit, the reported use of the phones for both external calls (outside of community) and internal (free within community) rose significantly in 2023 (see usage patterns in Case Study, Section 6).

28% of respondents use the phone at a community office or workplace (down from 35%) and 20% used the public phone (down from 53% in 2022). Having access to home phones will be a major factor in the reduced public phone use, however we found that several of the public phones were not working during our 2023 visit, which is also a factor. 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 contact family, friends or services]. Whereas now they can do it at their own discretion." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

However, we also heard 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)

Reliability of the Telstra fixed landline phone network is essential for emergency communications

Some interviewees described the Telstra land lines as the only reliable means of making phone calls in Kalumburu, with the satellite-delivered mobile service impacted by cloudy weather and congestion in

[18] Voice over Internet protocol service, connected to the SkyMuster delivered Wi-Fi mesh network.

peak use periods. Fixed line services have terrestrial backhaul via the HCRC microwave network, a string of 15 repeater towers from Derby, 550 km south-east of Kalumburu, and are distributed via the local copper network. Interviewees said the phone lines are often the only services working during wet season when satellite services can be out for hours or days due to rain fade or power outages.

However, we heard about a recent outage of the fixed line phone services impacting all Kalumburu agencies, public phones and other communities and mine sites in the area.

- "We had a dropout [of fixed lines] for over a week, so very scary stuff … considering how remote we are and the need for Flying Doctors and Police emergencies and that type of thing when required … Telstra hasn't given us an explanation as to why that happened. [It] seems to go down quite a bit during the wet [which is] just not acceptable. (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023)

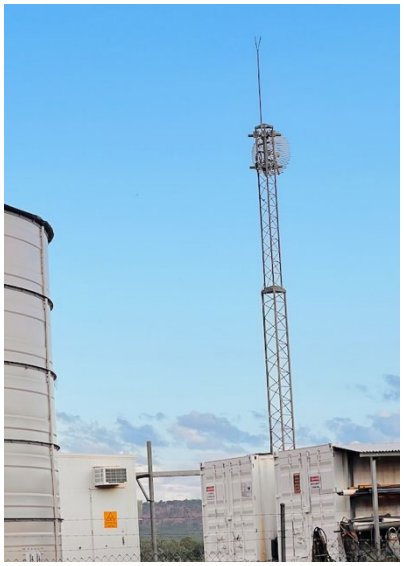

Figure 13: The HCRC repeater tower located at the water plant

The fixed line network requires regular maintenance to HCRC repeater links. Ageing batteries may not retain charge or only work during the day when the solar power is charging them.

- "[Previously] Telstra would regularly change the batteries over on the repeaters [at least every] 24 months [so] 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)

Moisture in the repeater equipment can also impact line quality, creating crackly or distorted audio. The clinic sometimes has to revert to satellite phones to talk to doctors due to poor line quality.

Local residents or staff can still apply for a Telstra fixed line connection under the Universal Service Obligation. However, we heard reports of wait times of up to five months for a phone installation and further delays due to lack of a lead-in trench to the building.[19]

With high staff turnover, ordering a phone service can also be challenging. The Coordinator of Kira Kiro Art Centre tried unsuccessfully to get a fixed line phone re-connected.

- "[We didn't 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)

The Optus satellite mobile service is congested with poor audio quality and regular dropouts

The Optus 3G small cell satellite service was introduced in Kalumburu on 16/10/2018 and was upgraded to include 4G services on 2/8/2020. Being a satellite-delivered service there is a higher degree of latency (delay) than a terrestrial service, with reports of audio issues such as echo, delays of up to 10 seconds, digital distortion, or one-sided calls. While upgrades were planned for 2022, we heard that little had changed in 2023.

[19] Source: Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022

We heard a high level of frustration at the quality and reliability of the service. Most respondents described the Optus 3G/4G satellite small cell service as being unreliable and slow with regular dropouts, especially during wet season.

- "[In wet season it's] terrible … It just doesn't work." (Julia Campbell, CRC Coordinator / Co-researcher, 2023)

> "You hear the first patter of rain in the wet season, and you go, "Got to go! It's going to cut out in a second!" … You just got to stop talking, because you know the phone's just going to go blank."
>
> - Dana Middleton, Remote Area Nurse, Kalumburu Clinic, 2023

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 who can be on the network at any time (about 30 on 3G and 60 on 4G). According to the WA Government, limited line availability is made worse by some devices remaining connected when not in use. 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

Others expressed their frustration with the service more bluntly.

- "Optus is shit … It is really not good here. It just doesn't work." (Colin Bacon, Kimberley Regional Service Providers, Kalumburu, 2023)
- "I don't even bother using the phone. Honestly, I'll walk out there and get them quicker than calling them." (Service provider, 2023)

When the network capacity is full, it appears as SOS mode, allowing only emergency calls.

- "Everything is SOS. It'll stay like that for a week or two [so everybody is] walking round and searching, putting their hand out, looking for signal." (Marinda French, Kalumburu CRC, 2022)

The unreliability of the service was described as a safety risk, with inability to make calls when needed and messages coming through hours later. The service's unreliability also restricts nurses from leaving their house when on call.

- "When we're on call [over the weekend] we have to have a phone on us at all times. [So] you're locked into your house, because … there's no reception out in the community. You cannot go anywhere in case you miss a phone call." (Tim Hollis, Remote Area Nurse, Kalumburu Clinic, 2023)
- "[You] can't even put your phone in your pocket and mow the lawn [or go for] a walk around the community … It's a bit of a quality of life killer, actually." (Dana Middleton, Remote Area Nurse, Kalumburu Clinic, 2023)

Most interviewers described audio quality issues when they were able to make mobile calls.

- "My parents try and call me on the mobile, and it's cutting in and out, especially [in] the evening … It's hard to have a normal conversation [with echo or] a full feedback loop going … Zoom or Skype [via Wi-Fi] are far more reliable than telephone really." (Fionna Greig, Principal, Kalumburu Remote Community School, 2022)
- "[When you call mobile to mobile] sometimes it can be quite clear on one end [but the other person] can't hear me at all, or the other way around. [If] I call family outside of here [I] can usually hear them very clearly and they're saying "I can't hear you." And I'm saying "I can hear you." It's not very productive." (Simon Duncan, Deputy Principal, Kalumburu School, 2023)

Several interviewees similarly described the use of Wi-Fi Calling or Messenger over the Sky Muster satellite service as more reliable and better quality than the Optus service.

- "The only way I can communicate with my relatives while I'm here is with SnapChat [or] Messenger [via Wi-Fi]. I cannot hear anything on the [mobile] whether I'm inside or outside [which is] a real obstacle to communicating with your family … I'm having to teach my Mum how to get onto Messenger [so] that we can actually speak." (Dana Middleton, as above, 2023)

Several people described digital audio distortion, or "robot voice", occurring while talking on the mobile.

- "That noise … sounds like a robot … it's horrible. [My voice] start sounding like a robot. it's so unreliable [because of] the satellite. [And we] walk around 'Can you hear me? Can you hear me?'" (Kelwyn Gore, KAC / Co-researcher, 2023)

Interviewees also called for greater mobile range beyond the current 3 km radius coverage. However, this is the limit of most small cell service due to low transmission power and the transmission being from a roof mounted pole. As a result, some parts of the community have low signal strength and there is limited penetration 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 … [Technicians] kept saying the trees were interfering." (Kelwyn Gore, Youth Coordinator, Kalumburu AC, 2022)
- "[It's] very slow the mobile. Even on a clear day … you have to walk around to get a good signal." (Karen Mangolamara, KAC / Co-researcher, 2023)
- "I have to sit in the very corner of the veranda and hold my phone [up high to make a call at home]. You should be able [to] make a call [inside for] privacy." (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

The service can also be impacted by power outages in the community, with limited battery back-up. The Optus base station is located by the women's centre on the northern side of the community. The KAC CEO told us 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 an 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. [Any photos or contacts] on your SIM [are] 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 a lack of information about the need for this.

There are plans for a Telstra mobile service

There has been demand for a Telstra mobile service in the community for several years (see Appendix 1 – Comments), to address the issues of congestion and coverage on the Optus mobile service.

- "[Lots of people] want Telstra … they just want a reliable [service] … They don't want Optus anymore. [Most] communities close by [have] got Telstra and it works fine, [it] has got a good name." (Julia Campbell, CRC Coordinator / Co-researcher, 2023)

Interviewees also talked about the need to have a separate Telstra mobile phone for use in other communities and regional centres such as Kununurra, Wyndham and Halls Creek.

- "We have to change from our Telstra to Optus [phones when we go to town]. 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)
- "[If you drive] down Kalumburu road [there's] stations or campsites … one might be Optus and then this one's Telstra, and then that's Telstra, and then that's Optus. [It's] just ridiculous and [a] bit dangerous too. I take kids on camps out into the middle of nowhere and you can't use your mobile [or be] able to call back so you're relying on the satellite phone which can be pretty hit and miss too." (Simon Duncan, Deputy Principal, Kalumburu School, 2023)

Many service providers and visitors arrive in Kalumburu with only a Telstra mobile (including ourselves). Some people connect to Wi-Fi using Wi-Fi Calling or a voice call app on 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." (Dave Corstorphan, Remote Area Nurse, Kalumburu Clinic, 2022)
- "I prefer Wi-Fi calling [to the Optus mobile] 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)

There have been plans for a Telstra mobile service in Kalumburu for several years.

- "They are in the process of putting a Telstra tower here, so Kalumburu will have Optus and Telstra, which is good … It will free up Optus [with] not so [many people] on Optus all the time." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

When we re-visited in 2023, the community were still waiting on an update about the Telstra tower.

- "We signed a deal [with Telstra nearly a year ago] and we're just waiting on Telstra to confirm when [it's coming]. It's just a waiting game … We're just coming into our dry season now [so by November] we're back into our wet and then we're cut off again from the rest of Australia." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023)

Funding for the Telstra microcell was finally announced under Round 7 of the Mobile Black Spots Program in December 2023. No installation date has been provided at this time. It is likely that the satellite small

cell service will use a low earth orbit satellite backhaul, most likely Starlink (Telstra has agreements in place with both OneWeb and Starlink, but OneWeb is yet to begin operating in Australia).

It is anticipated that the Telstra mobile base station will have an independent power supply and battery backup with limited impact from power outages.[20]

Impact of network and power 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 inoperable.[21]

- "During wet season [an outage] impacts us a lot … there's no internet, the EFTPOS [goes] down, the shop has to close because we can't purchase any food [or] fuel. We can't do anything until [the] system's back up again. That happens here regularly … a couple of times a month." (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

During the 2022 wet season, the community had numerous internet outages, some up to a week in duration, 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." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

During an extended power outage in early 2022, the store could not operate so food security became a serious health risk. 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)

To mitigate these issues, KAC sourced and distributed 'killer' (beef) locally to ensure households had food.

During power outages, the Wi-Fi network stops, followed by the mobile service which has about two hours of battery backup.

- "[During power outages] the Activ8 Me phone goes off [and the mobile] goes off [after] 2 hours … It's just terrible." (Julia Campbell, CRC Coordinator / Co-researcher, 2023)

At these times the HCRC network can be the most reliable source of communications, with longer battery backup, however this has also had extended outages as outlined above.

[20] Source: Correspondence with Penny Griffin, WA Government.
[21] 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.

A solar farm has been established near the airport to improve power reliability and reduce the cost of barge transport of diesel for the generator. The solar farm was switched on in late 2022, however the battery power was reportedly not keeping up with community needs, requiring the diesel generator to continue running full-time.

- "During the wet we used about 2,000 litres of diesel per day … because the Tesla batteries just weren't keeping up." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023)

While there are calls for fibre optic connectivity to Kalumburu to improve speed and reliability, the high cost and low customer base makes funding for fibre optic rollout highly unlikely. Microwave or satellite delivery are the most feasible options, with both options needing further exploration to ensure reliability of services during wet season.

Figure 14: Elder Clarrie Djanghara with his painting on the solar farm signage

Some surrounding homelands have Wi-Fi phones with plans to provide phones in other sites

Several larger homelands and tourist campsites surrounding Kalumburu have Activ8me Wi-Fi-enabled satellite public phones, including Honeymoon Beach and Pago. These are some of the 296 community phones installed in small homelands of under 50 people under a funding program by National Indigenous Australians Agency (NIAA). The Rangers have established bases at two homelands with Activ8me community phones, and have found these effective for Wi-Fi calling and basic internet use (see Rangers section under Service Delivery).

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. [We have mobile here but] on the other homelands [they've] only got landlines [or no service]. If there was a real emergency … you'd need someone to get to the phone [to contact emergency services]." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

With numerous well-used sites without phones, interviewees raised safety concerns for these sites.

- "If there's an emergency out [at] Barge Landing or at Marra Garra [16–17 kms away], there's no way they could call for assistance if something happens out there. [We need phone services at] the popular places." (Julia Campbell, Admin Assistant, Kalumburu AC, 2022)

Figure 15: All supplies arrive at Barge Landing and need to be trucked 12 km to Kalumburu

Barge Landing, about 12 km from Kalumburu, is where supplies arrive by barge before being trucked to Kalumburu. Apart from satellite phones, there is no direct means of communication for the barge workers or the store staff while at the landing or on the dirt road back to Kalumburu.

- "If Richard gets bogged [in the truck] on the way back [to town I won't know]. We've got a satellite phone, but they're not [reliable in wet season]. Being able to get better reception would be great." (Chris Nolen, Uraro Store Manager, Kalumburu, 2023)

During the 2023 wet season, flooding from a cyclone blocked this road, with two fortnightly barge loads of groceries and fuel having to be delivered from Barge Landing to the air strip by helicopter.

We heard about National Indigenous Australians Agency (NIAA) plans to fund the expanded rollout of Activ8me phones with Wi-Fi capability to nearby homelands and tourist sites, including Barge Landing.

- "Activ8me is coming [in] the next couple of months [to install] the phone service and Wi-Fi [in] nine or ten [sites] on all the beaches and homelands within Kalumburu area." (Madeline Gallagher-Dann, as above, 2023)

In addition, APN advised that the Activ8me phones in 296 homelands across Australia were in the process being switched to Sky Muster Plus Premium backhaul, making data access free, and that batteries were being upgraded at the same time.[22]

The Wi-Fi network has increased household internet, but most access is still via mobile devices

83% of survey respondents had used the internet in the last three months (84% in 2022). Of these, 95% said they use their smartphone for internet access. Since 2022, the percentage using a portable laptop computer had increased from 12% to 16%, but tablet use had decreased from 10% to 5%.

In 2022, 78% of respondents said they did not have any form of home internet, while 18% said they had a nbn Sky Muster service. This changed significantly in 2023, with the number of respondents saying they did not have any form of household internet dropping from 78% to 26% and respondents with an nbn Sky Muster service dropping to 9%. With the Activ8me Wi-Fi mesh network now working, 66% of people surveyed reported having another form of fixed home internet (i.e. household Wi-Fi). Previously, 4% had used a mobile broadband device, such as a portable 4G modem, but this dropped to 0% in 2023.

nbn Sky Muster is the primary broadband service used but is impacted by rain fade

Most staff houses and agencies have dedicated nbn Sky Muster services (i.e. not shared via the Wi-Fi Mesh network), as well as an estimated 8–10 First Nations households that have capacity to pay the monthly bill. Post-paid billed services can be an affordability a risk for those on Jobseeker payments.

Most of the existing services are standard Sky Muster services, with large shared households using up monthly data (50–150 GB/month) within days or weeks, then waiting for the monthly reset. Similarly, Kalumburu AC CEO Madeline Gallagher-Dann said the Sky Muster speed and data limit was insufficient for the shared needs of several agency offices, impacting on critical administrative work.

- "Within this one building we have [our] administration, we have Youth [and] 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 have] 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)

- "[When we] do grant proposals [slow internet can make us miss] the due date, [and then] we don't get the funding." (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

The recent introduction of the Sky Muster Plus Premium broadband product with unlimited data may help address these issues. Alternately, Starlink could be considered for the shared office needs.

Loss of service during wet weather was a commonly reported issue.

[22] Source: Personal communication, Scott Cogley, APN 25/10/23.

> "Wet season, big drama. [For] important stuff [I] send that at night [when it's] nice and clear. [But] next morning, cloudy, people start moving around, everything slows down."
>
> - Kevin Hall, Officer In Charge, Kalumburu Police, 2023

- "[In] dry season [it's] pretty reliable. [But] in wet season, every time it rains, we lose internet, we lose television, we lose everything. [Kalumburu] just becomes a little bubble." (Fionna Greig, Principal, Kalumburu Remote Community School, 2022)

Interviewees described long delays in repairs to their Sky Muster services, with one resident reporting a four month wait for Activ8me to repair the nbn satellite service at her house. Another 2022 interviewee described a three month wait to have an nbn Sky Muster service installed for work use.

There was no Starlink uptake at the time of our visit (2023)

Starlink low earth orbit (LEO) satellite services have been available in Kalumburu since late 2022, providing an option of high-speed, low latency broadband with unlimited data caps. While nbn Sky Muster Premium now also offers speeds of around 100 Mbps and unlimited monthly data at a lower rate (roughly $100/month compared to $139/month), the primary difference is that LEO satellites have low latency (approximately 40 ms compared with 600 ms). This can improve the use of cloud-based systems, voice and videoconferencing services and real-time applications such as gaming. Anecdotally, we heard that Starlink performs better than Sky Muster in heavy cloud and rain conditions, which is an important factor for northern Australian communities where monsoonal weather can last many months.

While none of the agencies or interviewees we spoke to had Starlink services at the time of our visit, we received some questions about the cost and setup of Starlink.

- "I know a couple of people have [Starlink. We] definitely [need a better service for our office]. If it gives us connectivity all year round and it's something that we can utilise a lot, then why not?" (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023)

Since our visit, PAKAM has set up a Starlink service on the RIBS facility in July 2023, which is used for transmission of live radio shows from the Kalumburu RIBS to the PAKAM hub in Broome as well as remote monitoring of the broadcast equipment.

Cost and timeliness of technical support is a critical issue

Maintenance of communications infrastructure and IT equipment is 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.

Like other agencies, IT support is very costly for the Kalumburu Clinic.

- "[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 some realignment of VAST satellite dishes and cabling repairs, but there is no funding to cover this work.

HF and UHF radio used by several agencies

UHF radio is used by teachers within the school and in vehicles, and by police, rangers, CDP and KAC staff. While UHF channels are often shared with other users, it is an effective means of communication between agency staff when mobile services are congested or unusable, or when travelling outside the small mobile coverage area. The CDP workers use UHF radio when working around the community.

- 'We use handheld radios to communicate when we're out and about. Mobile phones are just not reliable … If I want to talk [to] them I'll just call them up on the radio. [Our radios are] rated at five watt [so] you can get up to 10 kilometres [range]." (Ray Taylor, Activity Supervisor, East Kimberley Job Pathways, Kalumburu, 2023)

UHF can also be used during network or power outages, however the range could be extended further with a public repeater tower.[23] KAC are keen to have a UHF repeater installed in Kalumburu, however do not have the resources to self-fund this infrastructure, with a need for more flexible funding programs for bespoke communications solutions.

- "You really can't rely on [the Optus mobile] with 100% certainty and to have a UHF radio tower and repeater in the community [would enable better communication with] my staff [at] the CRC, my youth team, my Centrelink team, my maintenance team, even the school, the Police, the clinic and everyone like that. If we were all on that same frequency, if there was any such emergencies [that need] attention straight away, you've got everyone basically on the one channel." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023)

In 2023, we heard of a recent incident of new agency staff members getting bogged a few kilometres out of town beyond the mobile coverage. With no UHF radio in the vehicle, they called 000 from a satellite phone to get help. While they got police assistance, KAC referred to this incident as an example of how a UHF tower would improve local emergency communications.

- "If someone had been bitten by a snake [or] had a heart attack or something like that, then [having UHF radio] would have played a huge impact … it should be mandatory [to have] radios in [all work] cars." (Madeline Gallagher-Dann, as above)

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. Digital VHF now enables private encrypted communications from anywhere in the country.

Service delivery and Use of Online Services

Effective communications are critical for service delivery and store operations

Service providers described the various means of communications they use in their day-to-day work:

- "We use the landline [and] mobile phone. We use the internet. We communicate verbally, face-to-face … We drive in the car, we walk around [to] find people. [We're] on the computer, we send emails … We do FaceTime [and video]conference. [We] send by post [on the plane]. Pretty much everything you could do within a workplace." (Ashlyn Hassett, Resource Mentor, Kalumburu AC, 2022)

Just as in 2022, when we returned in 2023 limited and unreliable communications services was still being described by most agencies as a significant inhibitor to service delivery, with calls for upgrades to satellite broadband and mobile services.

[23] The Kalumburu Multi-Function Police Facility has a UHF antenna with a range of about 5km but this is restricted to police and emergency use.

> "[A lot of the service] providers that come out to communities, just because of the lack of the communications, [aren't] able to deliver proper services. That would range [from] the clinic [to] the school to the police, we're all pretty much in the same boat."
>
> - Natalie Perry, resident, Kalumburu 2023

The storekeepers described the impact of internet outages on store operations.

- "When the internet goes down, we can't do anything. We're lifeless because everything runs on computer. Without our nbn, Wi-Fi [or] Optus, our hands are tied. … Everything goes down … the EFTPOS machine will stop working, the ATM will stop working. We would have to [close the store]." (Chris Nolen, Uraro Store Manager, Kalumburu, 2023)

Figure 16: The EFTPOS and ATM in Uraro Store rely on satellite connectivity

They said that during wet season they lost internet at least two to three times a week.

- "We might have been halfway through a sale [and suddenly] the EFTPOS is not working [so we can't do the sale]. When it does come back on it's a matter of restarting the computers [and] connecting back into the EFTPOS and resetting everything." (Chris Nolen, as above, 2023)

There are numerous obstacles for residents in using online services

Signing up for online services typically requires an email address, mobile number, street address and date of birth, as well as multiple forms of identification. However, accessing identification can be a major challenge in a remote community, particularly for older people who do not have a birth certificate. Centrelink and CRC staff assist people to access ID documents where available, and Department of Human Services (Services Australia) visit twice a year to assist with ID needs.

- "[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)

Other agency staff also raised issues with sourcing identification documents for clients.

- "We're finding the issues [when people] print you off a birth certificate [but they've] got a different name on their bank card … or have had three emails come through, [but] their births are not registered. But Centrelink are handing them a Centrelink card and transport department are handing them a learner's permit, but they don't have a birth certificate because they're not even registered at birth … it ends up a headache." (Natalie Perry, resident, Kalumburu 2023)

We heard about some online services that do not work properly with poor connectivity.

- "I was trying to go on one website for the police [to do an online licence application] and it just wouldn't let me … 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)

Similarly, unreliable connectivity can make completion of online forms challenging.

- "They download the apps and [use it but sometimes the mobile or Wi-Fi signal is] not strong enough [or drops out]. 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)

In early 2023, an Australian Justice Open Day was held in Kalumburu, with staff from WA Government agencies flying in to assist people address outstanding licensing, fine payments or other needs. However, they struggled with the poor connectivity.

- "We [had] these services come up all at the one time and we couldn't get any connectivity … It just took so long and it was very, very frustrating … not being able to fulfil their job at the request of locals here. [But] for those guys to come out here and experience that, they were like, 'how the hell do you guys do it on a day to day basis?'" (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023)

Increased use of telehealth utilising MS Teams and FaceTime

Effective telehealth can save lives, enabling triage to be undertaken remotely and supporting on-site treatment or emergency procedures, and reducing the number and cost of Royal Flying Doctor Service flights required.

Telehealth use has increased at Kalumburu Clinic in recent years, mostly using Microsoft Teams or FaceTime as the most reliable systems via satellite. While a high-definition Scopia system is set up in a dedicated room, MS Teams and Facetime enable telehealth on mobile devices or laptops in any location.

- "Telehealth has been something that's generally pretty good, although we've moved [away from using Scopia] to MS Teams [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)

Figure 17: Kalumburu health clinic

Kalumburu isn't able to use the Emergency Telehealth System (ETS) used by other remote clinics due to latency on the satellite service.

- "Most other clinics around Australia have [access to an] 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, 2022)

Instead, in an emergency situation, the clinic uses Facetime with a doctor on a mobile phone.

- "We can put [the doctor] on video call, in the resuscitation room. We can get the doctors in Kalumburu ED up, so that they can see what's happening and visualise the patient." (Dana Middleton, Remote Area Nurse, Kalumburu Clinic, 2023)

While clinic staff felt that telehealth would not replace travel for emergency treatment or surgery, they felt that it could reduce travel for some consultations and post-surgery reviews.

- I think [telehealth is] completely underutilised. [Health agencies in town] do not give much consideration to the effort it takes to send people [into town. It costs thousands] of dollars [plus] hours [spent] making appointments and doing patient assistance … I just saw a lady today who had a post-surgical review [in] Kununurra [when] It could have been done by telehealth." (Dana Middleton, as above, 2023)

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 600 ms.[24] Combined with router latency, this can cause issues with remote connection to the server in Perth 3,000 km away.

- "[Previously I worked in] Derby, Halls Creek, and even Warmun [but] this is the slowest that I've ever seen it … Even logging into HealthPoint, [it's] very much lagging … Even looking at online, it takes about 10 minutes just to get to the bottom of the page, you know, the internet's just really lagging." (Nurse, Kalumburu Clinic, 2023)

While the CHIS system mostly works in good weather, poor weather causes the internet to drop out, preventing access to online patient records.

> **"It could be potentially quite dangerous, though, when it drops out. You can't see people's previous history. If you wanted to give a vaccination, you can't look up the vaccinations, you don't know what [medications are] due … it's a dangerous thing to not have it for 4 hours when you're seeing patients."**
>
> **- Dana Middleton, Remote Area Nurse, Kalumburu Clinic, 2023**

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

- "A lot of doctors hate [doing scripts] 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, Remote Area Nurse, Kalumburu Clinic, 2022)

To to improve the use of telehealth and the CHIS record system, Dave Corstorphan suggested the clinic move to a low earth orbit (LEO) satellite service such as Starlink to provide faster speeds, reduced latency and less impact from rain fade. However, with decisions about communications in health clinics determined by WA Country Health Service, there was no progress on this when we visited in 2023.

With regular turnover or transfers of Remote Area Nurses, there is a need for basic IT training for nurses to use communications systems and keep them working. The lack of reliable connectivity and support also makes attracting and retaining nurses difficult for Kalumburu.

- "No-one wants to come out here, because [they] come out with Telstra [but] there's only Optus available … they want to use the internet, they don't have it, or they can't use it, so they quit and they go somewhere else … The main thing is communications. Yeah. That's all they complain about." (Nurse, Kalumburu Clinic, 2023)

[24] The Sky Muster geo-stationery satellites are about 36,000 km above the earth, causing this latency. Source: https://www.skymesh.net.au/blog/what-is-latency-in-satellite-internet

Use of Centrelink services

KAC manage the local Centrelink office and assist clients to call Centrelink for signing up or reporting. There is an access computer and phone available for clients' use. Centrelink support worker Sally-Anne helps people to contact Centrelink, access records or use online services.

Figure 18: Sally-Anne in the Centrelink office

However, 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 due to the unreliable mobile network, and they have to start the call and wait period again.

- "When you [call Centrelink], sometimes it just cut outs … You dial it [again], and then when you're talking they'll just cut out … People end up angry and they don't get their money and [sometimes] 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, which are free to use on the Wi-Fi network. However some people still require help to access services.

- "There is the free [Centrelink access] on their phone, but they choose to come here to Centrelink or CRC and ask for help." (Julia Campbell, as above, 2022)

There are numerous challenges in using online banking services

With no face-to-face banking service available in Kalumburu, and a $2 ATM transaction fee in the store, residents prefer to access banking services online. While most residents are now familiar with using online banking, some still require help to use online banking. Centrelink and CRC staff provide assistance, but it can be time consuming to set up online banking or deal with any issues. There were calls for more support from banks 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 … And maybe more training [for staff] in the community how to do it because it's an everyday thing [to find] identification and all that." (Kelwyn Gore, Youth Coordinator, Kalumburu AC, 2022)

If people forget bank details, passwords or security questions, they need to submit an application form. The CRC stores copies of residents' birth certificates for identification purposes, however proof of identification applications must be signed by a government employee, which can be time consuming.

- "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 their forms]. That's time consuming [because the] bank guys still have to call them to confirm whether that's them or not. [That person] could be hungry [but there is] all the crap they have to do [just] to get $50 transferred for bread and tea and milk." (Julia Campbell, KAC Admin Assistant, 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. [The distorted sound makes them] think someone else is talking [so they] put a lock on their card. [Then] they have to [apply] to let their card be open again." (Maggi Captain, Kalumburu CRC, 2022)

The bank requires people to go into the nearest bank branch to re-activate their account. However with Westpac and ANZ having recently closed branches in Kununurra, only Commonwealth bank remains.

- "[The nearest Commonwealth bank branch is] in Kununurra [so they have to] fly in [to town]. Bankwest and Westpac [and ANZ customers] have to travel far as Broome now because [the Kununurra branch closed]." (Maggi Captain, as above, 2022)

Flights to Kununurra cost $190 on Mondays or $390 on Wednesdays and Fridays, 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)

The slow postal delivery of bills can result in late payments, sometimes incurring fees.

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

Kalumburu School uses various communications modes, with improved connectivity in 2023

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. In 2022, we heard that the school relied largely on UHF radio for communications with staff due to poor mobile services and a lack of phones in classrooms. Phone services had been recently upgraded when we visited in 2023.

- "[The] phone system [has] recently been upgraded within the school so I could now pick up this phone and dial one of the other classes, which sounds pretty basic, but we couldn't do that only a month or two [back. Previously] we'd rely a lot on our walkie talkies [for teachers] contacting us [or] us contacting them." (Simon Duncan, Deputy Principal, Kalumburu School, 2023)

Figure 19: Kalumburu School office

For communication with parents, the school mostly uses non-digital modes such as in-person or posters.

- "To contact parents [is] pretty difficult … it's usually either a home visit or a sign on the wall at the shop … Most people have a [mobile] phone [but not] a consistent phone number [so] a number you're given one week doesn't work a month later." (Fionna Greig, Principal, Kalumburu School, 2022)

The school's IT systems are managed by the WA Government's Department of Education, which had upgraded the previous Clear Networks satellite service with a Telstra Riverbed solution since our 2022 visit. Previously the school had struggled with low connectivity speeds and rain fade, constraining use of some digital applications used in the classrooms. The new service was described as an improvement.

- "It has improved, for sure, on what it was a few years back … It doesn't drop out as much. In the first few years I was here [if] it started raining, it was basically gone. You couldn't access anything. [Now] it will drop out [in] a heavy storm [but not] at the first drop of rain." (Simon Duncan, as above, 2023)

Children tend to be digitally literate on mobile devices, with limited access to computers at home.

- "The kids know phones more than computers … There are a few tablets or laptops [in homes but they're mostly used for] accessing games or downloading movies or social media or sport videos … They don't really know much about Microsoft Word [or email] or how to have a video conference." (Simon Duncan, as above, 2023)

The school is working on upskilling students in use of digital technologies.

- "It's basic stuff but it's stuff you're going to need if you want to go out and get a job outside of Kalumburu … We've shown them email and Word and even PowerPoint … That's the level of technology that's being used." (Simon Duncan, as above, 2023)

In 2022, we heard that the limited computer and keyboard skills impacted on students' ability to do NAPLAN tests online. The 2022 NAPLAN tests were also impacted by power outages and local network issues. Fortunately this had improved in 2023, with better results.

- "We did do NAPLAN online [this year, as well as] online literacy and numeracy assessment [which is] a high school equivalent of NAPLAN … That wasn't too bad this year. Their reports were pretty good from the people running that … It was just a pain [last year]." (Simon Duncan, as above, 2023)

There is limited use of online learning in Kalumburu

While the school previously struggled to do online learning, it is now used for students doing certificate courses through the School of Isolated and Distance Education (SIDE), based in Perth.

- In the high school [certificate course students are] doing an online course through SIDE … We do a particular course through them once a week [by] video conference, [and] then they are being asked to do stuff on their laptops and learn some basic skills in terms of that." (Simon Duncan, Deputy Principal, Kalumburu School, 2023)

During COVID-19 lockdowns, the closure of schools and shift to home-based online learning detrimentally impacted education outcomes in Kalumburu, with many children without home internet access and devices. Education and training opportunities are a key driver for needing improved communications.

- "[We need] the infrastructure [for] education and training. That would definitely be a big changer for Kalumburu." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Agency staff described the need to do online learning as part of ongoing professional development, including annual registration as nurses for clinic staff. While there is satellite broadband provided in staff houses, unreliable connectivity affects online course content and testing, especially during wet season.

- "There was a nurse that was working here that had to get an assignment in by a certain time, and she failed to get that assignment in [so] failed the unit. So [connectivity] is an obstacle." (Nurse, Kalumburu Clinic, 2023)

We heard of another nurse who dropped out of post-graduate studies due to connectivity issues.

- "[Doing] further education out here, it would be pretty difficult to get assignments done and stuff in the wet season [with] the internet crashing [for] hours at a time … It's an obstacle." (Dana Middleton, Remote Area Nurse, Kalumburu Clinic, 2023)

The Kalumburu Multi-Function Police Facility needs reliable connectivity to service a vast region (2023)

The Kalumburu Multi-Function Police Facility (MFPF) provide policing and emergency support to the vast Kalumburu sub-district, encompassing homelands, stations, mining and tourism facilities across the region. Reliable communications is critical to this work, with a range of technologies used, including satellite broadband, mobile, fixed line phone and UHF radio while in Kalumburu, and satellite phone and HF radio while travelling.

Figure 20: Kevin Hall showing the footprint of the Kalumburu Sub-district

Kalumburu MFPF's Officer-in-Charge Kevin Hall described the fixed line telephone as the most reliable of these technologies, particularly in wet season. However, he said his home phone was not working at the time of our visit.

Several cloud-based systems are used at the MFPF, however the latency and speeds over the satellite broadband make them very slow to use.

- "Some of our computer programs are quite complex. So [if] we've got to do an arrest and we wanted to process someone, we open up a custody system [to deal] with the offence, [plus an] incident management system, and then [the] computer dispatch [system. With three systems going we really] get a lag … I put your name in and I walk away for five minutes, because that's how slow it is. [Our IT] support is based in Perth [and they] can't believe how slow it is [here]." (Kevin Hall, Officer in Charge, Kalumburu Police, 2023)

While the courtroom has videoconferencing equipment, it does not work reliably via satellite broadband.

- "[The videoconferencing has] never worked here [so we] use a Teams meeting [or occasionally Webex]. Sometimes courts aren't happy to do that for various reasons, but that's one option to us. [If video is not working], we have reverted back to the phone. I talk to the magistrate on the end of the phone, the person will talk to the magistrate, but [usually the hearing is postponed] to an appropriate date, time, place." (Kevin Hall, as above, 2023)

Police are now required to record bodycam footage when dealing with any domestic incidents. However, it can take significant time to upload the footage if needed for external review.

- "Should my boss want to see it in town, [uploading three minutes footage] might take an hour and a half for him to view [it]. It is horrendous." (Kevin Hall, as above, 2023)

The MFPF is scheduled to have a Starlink service installed to address the latency and speed issues, as well as in the new police vehicle.

- "They're [currently trialling Starlink] in a couple of police cars in the lands … out at Burringurrah they had five police officers using laptops from the one [Starlink service]." (Kevin Hall, as above, 2023)

As with health staff, communications quality is a factor in attracting and retaining police in Kalumburu.

- "We don't get many applicants for a place like this based on workload [and] remoteness … Poor communications would be [a factor]." (Kevin Hall, as above, 2023)

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)

Figure 21: The CRC provides the post office service among other roles

They also provide digital support by helping people with computer use, 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.

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

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.

Staff experienced significant challenges with using cloud-based systems, including Centrelink and myGov ID digital identity platforms, over their Sky Muster connection.

> "[We struggle with our internet to use the various] government systems [for Centrelink] employment services [and] MyGov ID … this morning alone, it took me probably an hour and a half just to get into the system. Last week, couldn't get into the system whatsoever … The minute you drop out … you have to go back through your MyGov. A code is sent through to your email [and] your phone [so you need good internet and mobile coverage] at the one time. Which makes it really hard when you're in the middle of a case management and it drops out and you've got to go completely back and start again." (Natalie Perry, resident, Kalumburu, 2023)

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

The Wunambal Gaambera 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." (Shane Clugston, Ranger Coordinator, Wunambal Gaambera AC, 2022)

Like others, they have found the satellite delivered internet services to be unreliable.

- "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, 2022)

Figure 22: Wunambal Gaambera Rangers logo

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, 2022)

They are keen to provide more training for rangers in the 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, 2022)

Remote monitoring of municipal services is transmitted via the Telstra HCRC network (2023)

The Kimberley Regional Service Providers (KRSP) manage the municipal services in Kalumburu for the Wyndham–East Kimberley Shire. This includes water and sewerage treatment plants, waste disposal, pipes and roads. All systems are monitored 24 hours a day with data transmitted from the water tank compound to Perth via the Telstra HCRC repeater network.

- "We run computers and everything at the plant, so everything is monitored. Every last bit of it, settings, pressures, [bores, pumps, chlorine levels for town water], it covers every last thing ... I run an iPad [which] sends warnings and messages to me. So [I know straight away] if anything's concerning or anything's wrong." (Colin Bacon, Kimberley Regional Service Providers, Kalumburu 2023)

Figure 23: Telemetry is used to monitor the water treatment plant

Even during wet season when the mobile and satellite broadband regularly drops out, the HCRC is relatively reliable due to being a terrestrial microwave repeater network.

Horizon Power manage the power supply, including the generator, solar farm and electricity grid. This also uses telemetry for remote monitoring, however we do not have details of the means of connectivity.

Access to media and news services

Figure 24: Most houses have VAST satellite dishes

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 around 2013, 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 more than ten years ago. Following a cyclone in early 2022 several houses need satellite dishes realigned, with others needing a replacement low-noise block downconverter (LNB), connections or cables. Cockatoos and crows also damage cabling and satellite dish LNBs. A satellite technician is needed to undertake this work, however the cost of technician fees and travel is prohibitive for households with no central funding for VAST repairs.

- "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 2023 survey found that 53% of respondents did not have VAST satellite services (up from 51% in 2022), with 39% reporting VAST was no longer working and 14% did not have VAST equipment at their house. Of those with VAST not working, 46% said the set-top box was not working (72% in 2022), 18% said the dish or cabling was damaged and 26% did not know the cause of failure (multi-choice question).

There are many reasons set-top boxes may not work, including blown power units due to surges in local power supply, removal of smart cards, smart card activation issues or faulty connections. Set-top box replacement is costly in the local store.

- "[A friend] just bought one [for $608]. Everyone thinks that community life is so easy and cheap and people got money. No, it's not. People are paying for the set top box." (Julia Campbell, CRC Coordinator / Co-researcher, 2023)

"They're very expensive … $600 plus just for a little set top box. And in a community like this where there's limited jobs and everyone's pretty much welfare dependent, and the cost of living is so high, that's a big chunk of money that you really, really just can't afford because that's someone's fortnightly pay. That pays for their rent, their food and whatever."

- **Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023**

As a result, television viewing is limited among households.

- "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.

Figure 25: A VAST set-top box is needed to watch satellite-delivered television

- "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, as above, 2022)

Madeline described the issue of needing to regularly re-activate the smart card.

- "We've registered the device and then come back maybe a week or two later or even a month later, we're having to reboot it all over again and we've done it numerous times … over and over practically every month we're doing it. [And residents often] come to the office [for help with activation] which is very time consuming and a bit frustrating." (Madeline Gallagher-Dann, as above, 2023)

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

There was strong interest in a return to local television broadcasting to remove the reliance on individual household satellite dishes and set-top boxes.

- "That's how it was before and back then it actually did work perfectly but then all of a sudden, we had to go digital and get the VAST boxes and for someone that's not tech savvy … it's very frustrating. [If we return] to the original system of having … one transmitter, that would save a lot of hassle [and] a lot of money." (Madeline Gallagher-Dann, as above, 2023)

The local radio service is important but it has not been working reliably

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 [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)

Unfortunately radio services have not been reliable in the community for several years, in part due to power and technical issues in the RIBS facility. Our team helped restore the PAKAM and ABC services during our 2022 visit, with residents pleased to have radio working again. However, due to electrical faults in the building when we returned in 2023, neither service was working and the key was not available to access the facility.


Figure 26: Radio broadcast tower by KAC office

Consequently our survey found low levels of radio listenership. While there are few radio receivers in homes, some people listen in the car (6%) when the service is working. When there is no local broadcast, some residents still access PAKAM or ABC radio through online streaming, via VAST, or through PAKAM's live Android and iPhone apps, with 7% of respondents saying they listen online on their phone (7%).

- "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, especially if there is a local RIBS broadcaster again.

- "It'd be good [to have radio working again]. Some people like it. Old people, like my pop [grew] up with radio, they never have TV. Every football and everything on radio, listen." (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)

We heard that a local young person had begun doing training in radio, video and journalism and was keen to begin working as a broadcaster with support from PAKAM. Since out visit, PAKAM have reinstated the radio service and installed a Starlink service and remote monitoring equipment to quickly identify and rectify issues with the studio or transmission equipment from their office in Broome.

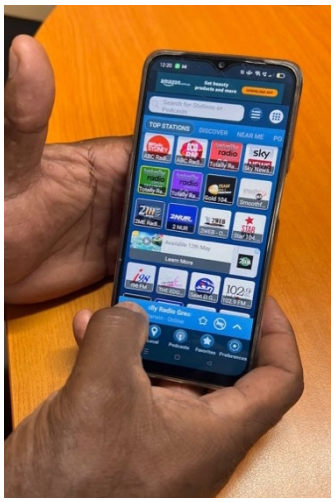

Figure 27: Radio streaming apps enable access via a mobile phone

Affordability

Affordability of mobile data is a significant concern

Affordability of mobile data is a key issue due to low incomes and high pre-paid data costs compared to the cost of post-paid services. Being one of the most isolated communities in Australia with very high costs for food, fuel, and other essentials, and personal incomes averaging under $300 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)

Nevertheless, our survey found that internet affordability was less of an issue in 2023 than it had been in 2022, presumably because the Wi-Fi service was working better. 36% of regular internet users (those who had used the internet in the last three months) said they don't use the internet more often because "The internet is too expensive for me." This was down 10% from 46% in 2022. 37% of respondents said that they had cut back on essential household costs to afford personal or household internet within the past six months, down from 47% in 2022.

Despite pre-paid data costing significantly more per gigabyte compared to most post-paid plans, pre-paid services were being used by all survey respondents who own or share a mobile phone. Pre-paid enables flexibility for people on low incomes, reducing the risk of being unable to pay monthly bills when they come due. However, there is limited information available in Kalumburu on communications service options or ways to reduce data costs.

Our survey found that average household expenditure on pre-paid mobile vouchers had increased since 2022, from $97 per month to over $156 per month ($79 per fortnight). This is likely due to the increased number of devices being used in households, particularly by children.

Cost of devices is also an affordability issue (2023)

The cost of smart phones was raised as an issue, particularly due to regular need for replacement of phones and limited local options. At the Uraro store, smartphone models range from $99 flip phones to $420 Oppos and $800 refurbished iPhones. The dual-SIM Nokia phones ($249) are also popular for those who need a Telstra SIM when travelling outside of Kalumburu. There had been high sales of iPads and tablets recently for media streaming via Wi-Fi.

Figure 28: Mobile phone options in Uraro store

- "We sell quite a few phones, [maybe] 10 a fortnight, sometimes more … They like the iPads [here] so I sell a lot of them … maybe 10 [in the last two months]." (Chris Nolen, Uraro Store Manager, Kalumburu, 2023)

The cost of most popular smartphone models equates to between one and three weeks of average weekly income. The high turnover of devices due to damage or sharing means some residents are paying this for up to four phones a year, making device affordability a significant issue.

Digital Ability

Digital literacy levels

Our 2023 survey found decreased levels of digital ability levels and use of online services and applications by Kalumburu residents compared with our 2022 survey, likely due to demographic differences in those surveyed, as well as, possibly, time of year (reduced access during wet season). Of the 83% of respondents who had used the internet within the last three months, 76% reported 'very true' or 'mostly true' to being able to connect to a Wi-Fi network (down from 90% in 2022), 59% were able to send and receive emails (down from 78%), 67% could find and install apps or software (down from 85%), 60% could open an internet browser tab (down from 88%), and 62% could complete online forms (down from 83%).

However, the use of internet banking had increased slightly (93%, up from 90%) and use of government services was similar (83%, down from 85%). Use of some online services had decreased, such as online shopping (35%, down from 59%) and comparing prices of products and services (31%, down from 71%).

Need for more ICT access and support

Despite the possible survey factors, the reduction in ability to use basic digital applications is concerning and points to the need for more digital training and mentor support in Kalumburu. With services increasingly moving online, digital literacy is becoming a necessary skill for work and daily life.

With most residents reliant on mobile devices for internet use and very few home computers or laptops, there are limited opportunities to develop keyboard or computer-based skills or learn workplace applications (MS Office, email, videoconferencing etc). This could be addressed by having more free computer access for learning at the CRC or another suitable location.

Currently the only public-access computers available in Kalumburu are a Centrelink computer, for accessing government and banking services, and one access computer for hire in the CRC for $5/ hour. Two other computers previously in the CRC were no longer working, with no funding to replace them.

- "Maybe the CRC [support centre in Perth] can help with that." (Julia Campbell, CRC Coordinator / Co-researcher, 2023)

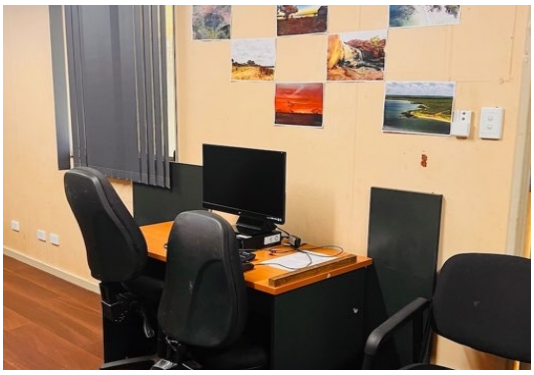

Figure 29: There is one access computer available in the CRC

The most common reason regular internet users gave for not using the internet more often was "I do not have convenient access to the internet" (59%, up from 54% in 2022). This is despite the improved Wi-Fi service, suggesting the slow broadband speeds are still seen as a limitation on access.

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.

There was demand for more training and support, particularly to support people with limited digital ability including the elderly, people with disability, and those with low English literacy. Elder Clarrie Djanghara said that elders need help to use new technologies and online services.

- "[We] Aboriginal people throughout the Kimberley [need help to] need to learn about [using computers and online services]." (Clarrie Djanghara, Senior cultural advisor / tourist guide / artist, 2023)

Clarrie wants to promote his tour guide business but needs help to set up a Facebook page or website.

- "I'm a bit frightened of [going online]. I've got to try and understand [about] security [and] how to use it before going into that sort of thing." (Clarrie Djanghara, as above, 2023)

The CRC has a meeting room which is regularly used for meetings and small group training. This includes courses for KAC staff delivered by Kimberley TAFE, such as 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 [they] will be able to go back to their families and show them first-hand what they'd learnt." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2022)

Digital mentor support would reduce pressure on service providers

KAC staff in the CRC and Centrelink and other service providers regularly assist clients with using online services and other digital needs, however often don't have the time available amidst busy schedules.

- "[Most service providers here] get humbugged [for support], whether it's internet banking or paying rego [or licensing, with] people coming up here saying 'How do I do this?', 'How do I do that?' So that's where [remote] communities really struggle … the government hasn't made the effort to [provide the training] each time there's been a development." (Kevin Hall, Officer In Charge, Kalumburu Police, 2023)

There is demand for one-on-one peer support by a local digital mentor, particularly from elderly people, to assist with tasks such as activating mobile SIMs, use of MyGov and banking apps, awareness raising of around scams and cyber-safety issues and VAST smart card activation.

- "That sounds so good. [I'd definitely] put my hand up for that because we're doing the job now and not getting paid for it. [It takes] time away from my staff fulfilling the roles that they need to do. [A digital mentor could] help with time consuming [tasks and] training. [It would give] someone in the community a job that has a purpose, and that's assisting where we're lacking." (Madeline Gallagher-Dann, as above, 2023)

The CRC Coordinator Julia Campbell said that she already helps people with using online services and digital technologies but would like to work more hours as a digital mentor.

- "I'd be happy to do [that job]. I can train [people] because I know what they want and what they come to do. They want to go on MyGov, banking [and help people who are] thinking of getting [Sky Muster, find] the cheapest [plan and get] the right information [for] people." (Julia Campbell, CRC Coordinator / Co-researcher, 2023)

The CDP Site Coordinator agreed that a digital mentor role could be a full-time job in Kalumburu.

- "It would be pretty much a full time job for somebody [because] the same people [are] repeatedly [seeking help and IT skills are] not something that they would learn very quickly … it would be a service that's there that's needed all the time." (Natalie Perry, resident, Kalumburu 2023)

With a new model of CDEP being trialled, there may be an opportunity for the salary for a digital mentor role to be made up of CDEP payments with top-up from a funding program through a local organisation.

Scam and cyber-safety concerns

As with other aspects of digital ability, our survey found reduced levels of online security and cyber-safety awareness since 2022. 66% of people responded 'very true' or 'mostly true' to knowing how to set or manage secure passwords (down from 90%), 62% to knowing how to set or adjust privacy settings (down from 83%), and 55% to identifying which apps or software are safe to download (down from 85%). Again, this points to the need for more local training and support, as well as access to appropriately designed cyber-safety resources.

Local agencies identified some instances of cyber-safety issues and inappropriate use of social media, but these were not as disruptive as in most other sites visited by our team.

- "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)

While the school has continued to see low incidence of cyber-safety issues among students, they still deliver cyber-safety training to build awareness as online access and use of social media increases. They also limit phone use at school to reduce risks.

- "We have a no phone policy at school [but kids] sometimes bring them or do things with them … There must be some cyber bullying that goes on, but there's nothing that's reported. [Occasionally a kid will] smash something or do something silly and film it and upload it, so [we're] pretty quick to get a hold of that phone and delete that sort of thing." (Simon Duncan, Deputy Principal, Kalumburu School, 2023)

We heard about concern among elders about scams and other cyber-security risks.

- "We're seeing [daily news] about scams and hackers sort of thing, you know, people might have personal stuff [on the computer]. And Aboriginal corporations like [ours] could be hacked [to get our funding]. That's the thing I'm worried about." (Clarrie Djanghara, Senior cultural advisor / tourist guide/ artist, 2023)

Our survey found that 45% of regular internet users gave the reason 'I am concerned about privacy and scams' as a reason for not using internet more, up from 32% in 2022. This rate was higher among low or non-internet users, with 58% citing this reason in 2023, up from 50% in 2022. This points to the need for more cyber-safety training and awareness for all age groups in Kalumburu. With rapidly changing scams and risks, up-to-date and appropriately designed information needs to be readily available. Sharing this information could be one of the roles of a local digital mentor.

Figure 30: King Edward river at sunset

06. CASE STUDY UPDATE – KALUMBURU WI-FI MESH NETWORK

Overview

The Kalumburu Wi-Fi Mesh Network is an innovative community-wide network designed to provide an accessible, affordable, and sustainable model of household communications in remote communities. The service was designed and installed by Australian Private Networks (APN, branded as Activ8me) in November 2021, building upon a WA Government trial in Tjuntjuntjara community, with co-funding by WA Government and Australian Government's Regional Connectivity Program (RCP). The funding covers data costs, service, network management and maintenance for 7 years from the date of installation.

Figure 31: VoIP phones and Wi-Fi repeaters were installed in 128 dwellings and agency offices

A case study about the project was included in the 2022 Kalumburu report, outlining the network design, installation and upgrades, usage and community sentiment at the time. This update outlines the status of the network and community sentiment during our April 2023 visit. We have included analysis of usage data to December 2023, showing the dramatic increase in data usage since the switch to Sky Muster Plus Premium in early November 2023, with all usage free from that time.

The network has been upgraded since the 2022 outage

As outlined in our 2022 report, parts of the community did not have access to the Wi-network for several months following a lightning strike on a tower in May 2022. As a result, there was community dissatisfaction with the network at the time of our first visit. An Activ8me team returned to Kalumburu in August 2022 to make repairs and address network issues, including connecting the basketball court tower to a solar/battery solution to remove reliance on the AC power.

Figure 32: Four nbn Sky Muster dishes on the Kalumburu community office provide backhaul for the Wi-Fi mesh network

Since APN visited the site to rectify the issues, data usage increased significantly (see Table 1 below). In our second visit, we found community sentiment had improved, with most residents appreciative of having internet and phone access at home. However, numerous survey respondents (see Appendix 1 - Comments) reported that the data service was very slow, making video streaming and other use difficult, and the service was not working in some households due to failure of an access point (see below).

Further upgrades to the network were undertaken following our 2023 visit. While the network initially relied on 4 Sky Muster services providing a total of 1.2 TB of data per month, an extra two services were added, increasing the data cap to 1.8 TB per month. In addition, APN switched from standard Sky Muster to Sky Muster Plus, with daytime data use to 4 pm unmetered, and only video and VPN data use metered between 4 pm and midnight. This reduced network congestion and data costs significantly.

At the time, nbn were in the process of trialling an unlimited download product with much faster speeds of about 100 Mbps, later released as the new Sky Muster Plus Premium product. APN upgraded the Kalumburu network to the new Premium service in November 2023, following upgrades to the other WA-based Wi-Fi network sites (Tjuntjuntjara, Mowanjum and Jigalong). This has dramatically improved data speeds and eliminated the need to charge for data use for the remainder of the 7-year funding. As shown in Table 1, there has been a substantial increase in usage as a result. Community feedback on these changes will be included in our 2024 report.

A section of the network was not working during our 2023 visit

While the network was working in most of the community, there was an issue for houses in the southern part of the community with an Access Point not working. This included the CEO's residence.

- **"**Part of the network is down in the community [around the Boulevard and my house] which is very unfortunate. [It] hasn't been active for [a] couple of months now." (Madeline Gallagher-Dann, CEO, Kalumburu A.C., 2023)

APN were aware of the issue but were waiting for the roads to re-open in May following the wet season closure to drive a truck in to make repairs. To address this issue in future, APN were planning to leave some equipment on site to enable a technician to fly in during wet season.

One of the co-researchers urged that when technicians come to the community, they should talk to community staff to find out about faults within houses or user experience issues.

- "When they came and they fixed [the towers, they] never stop [to] ask if anyone's got problems in their home on their Activ8me. They just blew in and blew out [too] fast [but we still have issues like] the phones stop [and] you can't recharge on your card anymore." (Kelwyn Gore, KAC / Co-researcher, 2023)

Figure 33: An Access Point had failed, limiting connectivity for a section of the community

Network capacity

During our 2022 visit, we heard that the shared Wi-Fi capacity across the network did not have sufficient broadband speed for households to stream movies. Survey respondents reported that speed was still an issue in April 2023 (see Survey comments, Appendix 1).

We also heard that the monthly data allocation had been used up within two to three weeks in some months with no access to the data or voice services until the next re-set.

- "There's a certain limit or a certain quota that you get [on the network] every month. And so by about the 20th [day], sometimes maybe quicker, the data for the whole community runs out. Then you have to wait maybe a week or so before it regenerates itself." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023)

- "It's got a timeframe it'll work. [When the data runs out] everyone has to wait. [This includes] the phones, they go dead … You just hear a horrible [buzzing sound]." (Kelwyn Gore, KAC / Co-researcher, 2023)

The upgrade to 1.8 TB/ month in August 2022 resolved the capacity issue in the short term, with a significant increase in data usage as a result (see Table 1 below). The upgrade to Sky Muster Plus Premium services in November provided significantly greater network speed and capacity, and usage rose dramatically as a result.

Network usage patterns

The following table shows network usage from installation in October 2021 to December 2023, along with notes of changes or repairs to the network during the two-year period. Charts and analysis of the phone and data usage patterns are outlined below.

Month	Data		Telephone			Notes
	Data Used	No of Devices	Calls Made		Calls Received	
	(GB)	Connected	Externally	Internally		
Oct-21	364.11	170	2246	1102	7	Deployment underway
Nov-21	641.17	241	7057	3990	916	Service fully operational
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 weather event
Jun-22	165.58	57	219	9	60	
Jul-22	254.46	85	159	24	60	
Aug-22	1096.3	159	1610	573	272	Site visit week of 8/8/2022
Sep-22	1518.3	189	3749	505	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	1461.79	179	4790	1072	1445	
Feb-23	2059.33	260	1927	117	875	
Mar-23	1482.92	199	3110	273	1306	
Apr-23	1466.7	217	3108	363	1523	
May-23	1386.22	206	2868	294	1081	
Jun-23	1345.79	239	2833	437	914	
Jul-23	1372.08	278	2304	303	943	
Aug-23	1385.54	301	3626	433	1419	
Sep-23	1417.04	320	3202	409	1032	
Oct-23	1435.19	311	3421	375	894	
Nov-23	5475.81	578	3653	442	892	Sky Muster Plus Premium upgrade early November
Dec-23	12102.72	616	2788	493	1200	
Jan-24	13048.21	594	2952	683	639	

Table 1: Data usage (GB), devices connected and number of calls made over Kalumburu Wi-Fi network from October 2021 to December 2023 (Source: WA Government)

VoIP Phone Use

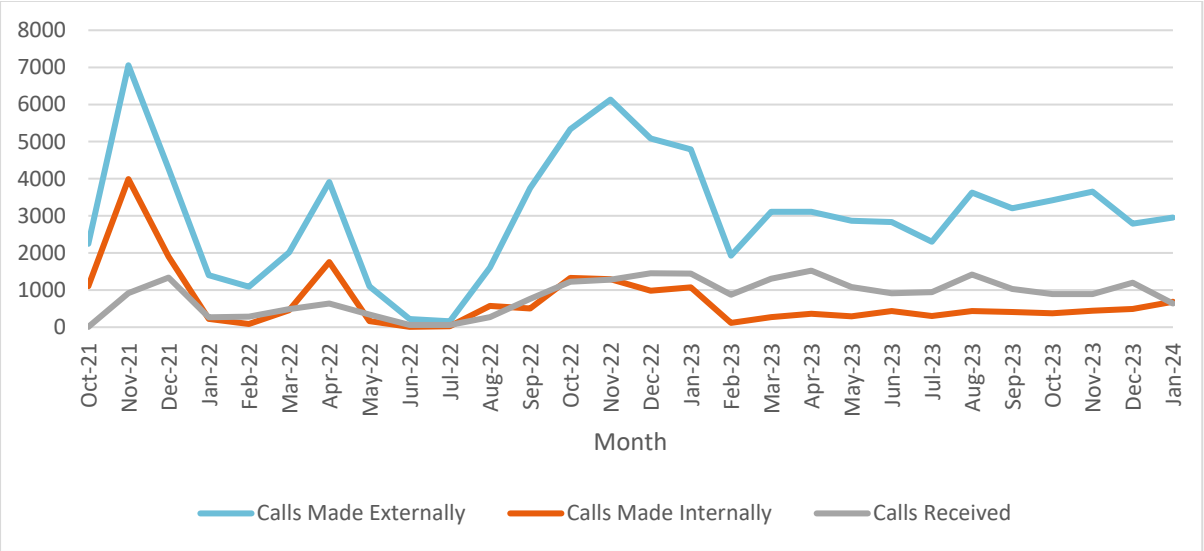

Figure 34: Chart of VoIP phone usage October 2021 to December 2023

The VoIP phones in households enable free calls both within the community and externally, as well as ensuring a household phone number for incoming calls. There was high initial use of the VoIP phones of up to 7,000 calls per month, with people making the most of this new means of communications. However, we heard that some of these calls may have been out of curiosity or by children making prank calls when it was first installed.

Usage dropped following the network damage in May 2022, shortly before our 2022 visit. After the network repairs in August 2022, usage increased substantially to up to 6,000 external calls and over 1,000 internal calls. This has since stabilised during 2023 to monthly averages of about 3,000 external calls, 1,000 calls received and about 400 internal calls. This may have been a result of increased use of mobile applications (Wi-Fi Calling, WhatsApp, Messenger etc) via the Wi-Fi. This capability of most smartphones, including with pre-paid services, has reduced the need for fixed line phones.

In April 2023, some residents reported the VoIP phone not working in their house, possibly due to the AP7 outage. We also heard that the VoIP phones were unable to call 1300 numbers, including bank helplines.

Data Usage

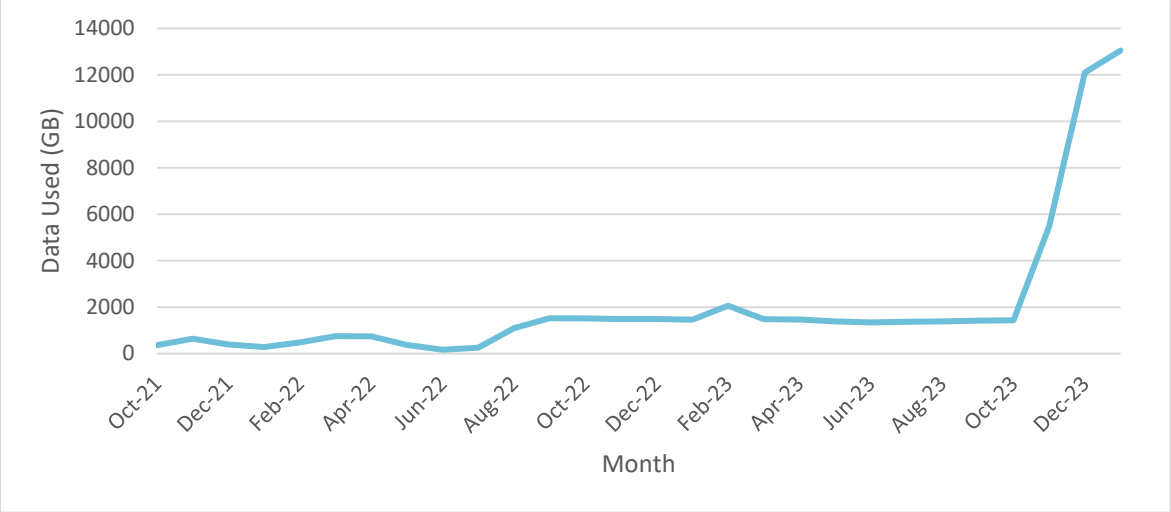

Figure 35: Chart of total network data usage in Kalumburu October 2021 to January 2024

Initial data use across the community was limited by the backhaul capacity of the four Sky Muster dishes and the cost and availability of vouchers. There was also a significant reduction in availability of the service following the lightning strike on a repeater tower in May 2022. The chart shows a dramatic increase in data and voice calls since the repairs in August 2022, and when monthly backhaul capacity was increased from 1.2 TB to 1.8 TB in September 2022.

There has been relatively consistent data usage since that time averaging about 1.5 TB per month, other than a spike in February 2023 (reason not known). While this appears to suggest that the the network was meeting a relatively constant demand, anecdotally we heard that this was due to the service reaching its data limit prior to the end of the month, with no access until the monthly reset. Once the limit is reached, vouchers were not able to be issued so there was no ability to purchase or use further data.

The introduction of the Sky Muster Plus Premium service in early November 2023 demonstrated the real demand for data in Kalumburu. With free data usage and much higher speeds, data use rocketed to 5.5 TB in November, then up to 12 TB in December and 13 TB in January 2024. This clearly shows the high demand for data, which was previously constrained by network capacity and affordability (see below). The unlimited data capacity is clearly being appreciated by residents over the long wet season.

Cost of data use

Initially, users were provided 1 GB of free data per month, plus free access to MyGov and Centrelink websites at any time. Beyond that, vouchers for additional data could be purchased online or at the store at $3/GB. The vouchers were reduced to $2/GB in May 2022. While most residents accepted this rate, some raised concerns about only having 1 GB vouchers available, with suggestions of 5 GB and 10 GB voucher options to better accommodate usage needs.

- "Two dollar for one gig is not bad for [elders] trying to jump onto their MyGov [but] younger generations [are] on TikTok, Facebook [and YouTube]. That one gig of data is not getting them a lot. You go and download one movie, there's your data gone." (Natalie Perry, resident, Kalumburu 2023)

Automatic payment deduction can be set up the Activ8me app, with a PIN number to activate the next data allowance. This is useful for video streaming and other data-hungry applications, however we heard that Wi-Fi data costs can add up quickly if this code is shared.

- "[If a person shares their] code from the Wi-Fi [and] everybody using it, [that] person [can] have a big bill." (Julia Campbell, CRC Coordinator / Co-researcher, 2023)

We also heard that auto payments can result in high costs for movie streaming.[25]

- "I was watching a good movie which was just over 2 hours. [It took] 25 times to recharge [so] I spent $50 to watch [one] movie." (Kelwyn Gore, KAC / Co-researcher, 2023)

The storekeepers told us that printing of vouchers disrupted their busy workload, taking about three minutes per voucher via the merchant terminal. To reduce the impact, they were printing multiple vouchers prior to opening hours and during breaks to reduce impact. They also restricted voucher sales to two per customer to avoid exceeding monthly data limits.

- "[Wi-Fi vouchers are] just a real thorn in the side for us … We get nothing done because people are [always wanting a voucher]. We need [a] faster [process] and let them buy more than two." (Chris Nolen, Uraro Store Manager, Kalumburu, 2023)

With data use now free, the removal of the voucher system will be welcomed by the storekeepers.

[25] While most streamed videos use only 1-2 GB, high definition or 4K can use much more.

Network maintenance

While APN schedule annual maintenance visits, they also have remote monitoring in place to identify if services are not working. Faults can occur due to power outages to towers, antenna or cable damage, or interference by trees in microwave signal path between repeater towers.

- "[There's] general wear and tear [and damage from birds or] kids throwing rocks, it's a bit of everything, it's just not clear [what the problem is] if something's broken or malfunctioned … out here it's a lot of factors come into it." (Madeline Gallagher-Dann, CEO, Kalumburu AC, 2023)

The CEO urged that more regular maintenance visits are needed to address these factors and ensure network reliability. She also urged the use of robust equipment to reduce potential points of failure.

APN also contract a local Community Liaison Officer (CLO) in each site to provide first-in fault identification and repairs where possible. In Kalumburu, that person is KAC's Municipal Service Officer. However, the CEO raised that the CLO was not provided a detailed network map, making it difficult to identify which tower to check. Also, with some equipment on private houses, access for undertaking repairs can be an issue.

- "David is the local support but he is not the technician … If Activ8me [want] someone on the ground to do this work, that person needs to be trained up properly and have [access to the] data [to respond to faults] without [waiting on a call from] Melbourne." (Madeline Gallagher-Dann, as above, 2023)

Ongoing operations

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

- "[We want ongoing support so the network] stays free, because there are no jobs up here … We lack [communication services] that people in town take for granted." (Madeline Gallagher-Dann, as above, 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 are useful learnings from the Kalumburu project to inform future Wi-Fi mesh network projects in remote communities. WA Government has expanded the Wi-Fi mesh network model to other communities, including Mowanjum near Derby and Jigalong in the Pilbara, with funding received under RCP3 to expand the model to Guda Guda, Burringurrah, and Bidyadanga and 10 surrounding homelands. nbn have also installed free Wi-Fi mesh networks as a pilot in four remote communities across Australia – Warakurna in WA (also a MtDG research site), Indulkana and Koonibba in South Australia, and Aurukun in Cape York, Queensland – with plans to expand to up to 40 communities.

The dramatic increase in data usage since the Sky Muster Plus Premium upgrade in November 2023, in time for the wet season, has demonstrated the full potential of the network when backhaul and access costs are no longer limitations. We look forward to seeing how this demand changes over time now that the service is fully functional and meeting community needs, and how this contributes to digital inclusion within the community and the social, economic and cultural opportunities that can flow from this.

07. 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 outlined below are based on input from community stakeholders and are provided as possible options for local planning to improve communications services and digital inclusion in Kalumburu. These are not intended to be prescriptive, nor are they listed in order of priority.

Based on our 2023 interviews and discussions, the proposed Digital Inclusion Plan has been updated with new/revised strategies and a column for Progress/ Next Steps, to track progress on the actions over time.

Identified Issue	Possible Actions	Potential Stakeholders	Progress/ Next Steps
Access			
Kalumburu Wi-Fi Mesh network: Need for upgrade to improve resilience, speed and data capacity. Need for ongoing monitoring of network functionality, and timely repairs as needed.	Beyond network upgrades undertaken in 2022, undertake further upgrade to Sky Muster Plus / Premium. Fault logging system needed, plus communication with householder and Community Liaison Officer about faults and repair timeframe. More training and network map requested by Community Liaison Officer to identify faults, AP locations and undertake basic repairs with remote support.	WA Government Australian Private Networks (APN) Kalumburu Aboriginal Corporation (KAC)	DONE – APN repaired damaged AP and upgraded to six Sky Muster Plus services in May 2023. Further upgrade to Sky Muster Plus Premium in November 2023 addressed speed, data limit and cost issues. Remote monitoring undertaken by APN, with reporting to Kalumburu AC and WA Government. *Yet to do – Fault logging system, communications plan, network map, and CLO training update.*
Optus mobile service: upgrade needed to increase backhaul data, user capacity, improve audio quality and reliability issues, and extend battery backup.	Optus 4G to provide timeline for service upgrade. Outline user experience issues to WA Government and Optus to ensure these are addressed.	WA Government Optus KAC	*Yet to do – timeline for upgrades to backhaul and line capacity.*

Identified Issue	Possible Actions	Potential Stakeholders	Progress/ Next Steps
Telstra small cell mobile service for Kalumburu.	Seek timeline for installation of Telstra 4G service, as well as characteristics (coverage, number of users, speed). Telstra to consult community re usage requirements.	WA Government Telstra Australian Government KAC	Regional Connectivity Program funding for Telstra micro-cell announced in December 2023. *Yet to do – Rollout timeframe, community consultation.*
KAC broadband upgrade: Need for fast broadband and increased data capacity for KAC office block, including Centrelink, CDP, youth program and meeting room videoconferencing.	KAC to upgrade existing Sky Muster service to Sky Muster Plus Premium or Starlink service/s (check usage requirements and do service and cost comparison first).	KAC	*Yet to do.*
UHF Radio Repeater: Limited range of UHF radio, used by community agencies	Set up UHF repeater on existing broadcast tower or water tank in community to enable communications by agencies, vehicles, residents and tourists in vicinity of Kalumburu, airport and nearby homelands.	KAC Rangers School Kalumburu Clinic Kimberley Regional Service Providers (KRSP)	*Yet to do.*
Computer access: Demand for online computers for community access, virtual meetings, workplace training, skills development and creative and cultural use. (Currently one computer available in Centrelink office and one in CRC for $5 per/ 30minutes).	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. Apply to CRC Support Unit for funding to replace two computers in CRC to enable free access for digital skills development, use of online services and content creation.	KAC Centrelink Kalumburu Community Resource Centre (CRC)	*Yet to do.* *Yet to do.*

Identified Issue	Possible Actions	Potential Stakeholders	Progress/ Next Steps
Affordability			
High cost of pre-paid mobile data: High cost of pre-paid Optus mobile data as proportion of household income. Likely same issue when Telstra mobile service installed. Awareness needed on costs of data use, and ways to reduce costs.	Optus and Telstra to develop more affordable pre-paid plan for remote low-income residents. 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.	Optus Telstra KAC Uraro store NIAA	*Yet to do*
Activ8me Wi-Fi network pre-paid voucher cost: Pre-paid vouchers only allow 1 GB, costly at $3/GB, and time-consuming to issue.	Enable larger data capacity on vouchers, or remove need for vouchers.	APN WA Government KAC	DONE – Need for vouchers removed and data and phone use made free under upgrade to Sky Muster Plus Premium in November 2023.
High Device Turnover: Replacement of devices multiple times a year is common due to phone or screen damage.	Provide rubber phone cases as standard with new phones, especially high-priced models.	Uraro Store KAC	*Yet to do*
Digital Ability			
IT Training and Support: Need for more regular IT and mobile use training, and cyber-safety awareness, particularly for seniors and other target groups.	Provide more regular training opportunities in-house at CRC. Increased awareness and strategies to address cyber-safety, online privacy and security, online banking.	CRC NIAA Office of e-Safety Banks	*Yet to do*
Digital Mentor needed: High demand on service providers for support in setting up and using online services, banking, sourcing identification, SIM activation, etc.	Employment and support of Digital Mentor role at CRC to assist residents with online services and other digital support needs; Extend CRC or Centrelink staff hours with role to provide more digital support.	KAC East Kimberley Job Pathways (EKJP) CRC Centrelink NIAA	Funding for Digital mentor roles has been recommended by the First Nations Digital Inclusion Advisory Group. *No funding program in place as yet.*

Identified Issue	Possible Actions	Potential Stakeholders	Progress/ Next Steps
Workplace Digital Skills: Demand for IT skills for workforce readiness and use of online services.	Provide specific training workshops or one on one support in workforce readiness skills and applications as needed.	EKJP CRC Kimberley TAFE All agencies	*Yet to do.* *EKJP have previously arranged workplace IT skills training.*
Access to media services			
TV Services failure: VAST direct-to-home satellite TV services not working in over 50% of homes; high cost for households to repair equipment and replace set-top boxes; VAST services don't work during rain or heavy cloud.	Advocate for funding to upgrade or install VAST satellite services in all residences, replace VAST set-top boxes where not working, and provide power surge protectors for set-top boxes. Consider cost-benefit of switching to local TV broadcasting to improve reliability and reduce ongoing maintenance costs (1.8 m satellite dish may reduce rain fade impact).	Kalumburu A.C. PAKAM WA Government, Australian Government (DITRDCA)	*No funding program as yet for VAST equipment repair/ upgrades or for communities to switch to local broadcast model.* Note: DITRDCA currently have an Audit group for remote and regional TV services to review future of VAST services in remote communities.
ABC Radio not working: No funding to maintain ABC radio service in Kalumburu.	Advocate for funding to upgrade ABC re-transmission equipment (currently old PAKAM transmitter) and provide annual maintenance.	Kalumburu A.C. NIAA ABC PAKAM	*No funding as yet.*
Inactive RIBS radio studio: RIBS studio not active with no RIBS broadcaster at time of 2023 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	PAKAM and EKJP currently recruiting for RIBS broadcaster (February 2024)
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	*Yet to do*

Appendix 1: Summary of Survey results

Note: Surveys undertaken in 2022 included 1 of 49 non-First Nations respondents, whereas 100% of the 71 respondents in 2023 were Yarnangu (First Nations people). Please note this difference when making comparisons between the two sets of results. Not all respondents answered all questions so percentages are based on the number of respondents to that question.

Demographics	2022 (49 respondents)	2023 (71 respondents)
Gender	71% female; 29% male	61% female; 39% male
% Aboriginal	98%	100%
Education	22% up to year 12 35% year 10 or below 16% with tertiary education (certificate, diploma, degree)	21% up to year 12 41% year 10 or below 0% with tertiary education (certificate, diploma, degree)
Employment	65% employed or on CDP (44% of these full-time) 8% unemployed 8% unable to work due to disability 33% looked for work in past month	46% employed or on CDP (25% of these full-time) 31% unemployed 13% other activity 6% unable to work due to disability 39% looked for work in past month
Welfare	69% received Centrelink (primarily Family Tax Benefit and JobSeeker / Youth Allowance)	83% received Centrelink (primarily JobSeeker / Youth Allowance and Parenting Payment)
Housing	61% in multi-generational or shared households (4.7 people per house)	43% in multi-generational or shared households (4.5 people per house)
% with long-term disability or health condition	18%	14%
% who speak a language other than English at home	82%	24%
ATSI Languages spoken (multi-choice question)	20% Aboriginal Kriol 20% Kwini 14% Wunambal 12% Wunambal Gambera 9 others	14% Wunambal 14% Kwini 7% Aboriginal Kriol 7% Aboriginal English 5 others
Understanding of English (very and quite well)	Spoken English: 100% Written English: 88%	Spoken English: 100% Written English: 96%
Average weekly household income	$858.56	$760.73
Income breakdown	9% $1–$399 51% $400–$999 38% $1000–$1999 2% above $2000	14% $1–$399 52% $400–$999 30% $1000–$1999 3% above $2000

Phone use	2023 (49 respondents)	2023 (71 respondents)
Primary devices used for phone calls (multi-choice question)	69% mobile phone (own) 53% public phone 35% phone in community office or workplace 24% shared mobile phone 18% fixed line phone in home 0% without phone access	83% mobile phone (own or shared) 48% fixed line phone in home 28% phone in community office or workplace 20% public phone 0% without phone access
Reliability of public phone	22% don't use a public phone 39% said it was reliable 39% said it was not or sometimes reliable	1% with no access to public phone 28% said it was reliable 44% said it was not reliable 27% don't know
Rate of mobile phone ownership	80% own or share 92% of these smartphones	75% own or share 98% of these smartphones
% of phone owners on prepaid services	97%	100%
Average pre-paid data allowances	3% no data 77% pay for up to 10 GB/month 15% 11–40 GB/month 0% 41–60 GB/month 5% over 60 GB/month 0% unlimited	0% no data 69% pay for up to 10 GB/month 31% 11–40 GB/month 0% 41–60 GB/month 0% over 60 GB/month 0% unlimited
Average number of prepaid services per household	N/A	2.5
Household pre-paid mobile expenditure	**46 responses** Average household cost of $97 / month 59% pay up to $100 / month 37% pay $101–$200 / month 4% pay $201–$300 / month 0% pay over $300 / month	**69 responses** Average household cost $79 / fortnight 78% pay up to $100 / fortnight 20% pay $101–$200 / fortnight 0% pay $201–$300 / fortnight 1% pay over $300 / fortnight
Media use	**2023 (49 respondents)**	**2023 (71 respondents)**
Radio Access (multi-choice question)	37% listen via car 27% through VAST/ TV 14% listen to a radio at home 43% never listen to radio	7% via phone/tablet 6% listen via car 3% listen to a radio at home 83% never listen to radio
Primary radio stations listened to	PAKAM Radio (8% listening daily or weekly, 24% occasionally) ABC Radio (12% listening daily or weekly, 20% occasionally)	PAKAM Radio (1% listening daily or weekly, 3% occasionally) ABC Radio (4% listening daily or weekly, 7% occasionally)
TV Access (multi-choice question)	51% on TV via VAST satellite 16% only via USB/DVDs on TV 16% via phone 6% use subscription satellite TV service 8% never watch TV	49% on TV via VAST satellite 41% only via USB/DVDs on TV 24% via phone 8% use subscription satellite TV service 7% never watch TV

VAST TV Access	49% have VAST service working 31% VAST not working (72% due to set-top box not working, 22% due to a damaged dish or cabling) 20% do not have VAST installed at house	47% have VAST service working 39% VAST not working (46% due to set-top box not working, 26% didn't know) 14% do not have VAST installed at house
Most popular sources of TV and online content (multi-choice question)	Commercial TV (7, 9, 10) (29% daily, 22% weekly) YouTube (24% daily, 18% weekly) Streaming services (22% daily, 4% weekly) ICTV (16% daily, 8% weekly) NITV (16% daily, 12% weekly) ABC TV (14% daily, 10% weekly)	Commercial TV (7, 9, 10) (36% daily, 16% occasionally) YouTube (31% daily, 21% occasionally) Streaming services (29% daily, 14% occasionally) ICTV (24% daily, 17% occasionally) ABC TV (24% daily, 21% occasionally) NITV (23% daily, 19% occasionally) SBS TV (23% daily, 19% occasionally)
Primary sources of news and information (multi-choice question)	Direct / in-person communication (76% daily, 4% weekly, 2% occasionally) Local noticeboards (27% daily, 43% weekly, 10% occasionally) Online news services (24% daily, 4% weekly, 20% occasionally) Commercial TV (22% daily, 22% weekly, 22% occasionally) Facebook (22% daily, 6% weekly, 14% occasionally) Other social media (22% daily, 4% weekly, 8% occasionally) ABC TV (18% daily, 8% weekly, 41% occasionally)	Direct / in-person communication (51% daily, 6% weekly, 27% occasionally) Commercial TV (37% daily, 7% weekly, 17% occasionally) Facebook (29% daily, 10% weekly, 7% occasionally) ABC TV (23% daily, 16% weekly, 23% occasionally) ICTV (21% daily, 3% weekly, 17% occasionally) NITV (21% daily, 3% weekly, 23% occasionally) SBS TV (21% daily, 6% weekly, 24% occasionally)
Primary sources of emergency information (multi-choice question)	Direct / in-person communication (88%) ABC TV (29%) Facebook (27%) Commercial TV (20%) ABC radio (18%) Online emergency services (18%)	Direct / in-person communication (70%) ABC TV (46%) Commercial TV (42%) Text message from police or emergency services (35%) SBS TV (24%) Facebook (21%) Cyclone warning lights on community water tank (21%)
Internet use	**2023 (49 respondents)**	**2023 (71 respondents)**
Latest internet use	73% used internet in past week 4% in past month 14% never use the internet	77% used internet in past week 4% in past month 16% rarely or never use the internet
Rate of internet use (of respondents who had used the internet within the last three months)	20% use the internet almost constantly 39% several times a day 27% about once a day or several times a week	63% use the internet almost constantly 38% several times a day 7% about once a day or several times a week

Regular internet users (The following indented sections refer to respondents who had used the internet within the last six months)	**84%**	83%
Primary online devices (multi-choice question)	Smartphone (95%) Desktop computer (39%) Smart TV (27%) Portable laptop or notebook computer (12%) Tablet (10%) Games console (10%)	Smartphone (95%) Desktop computer (17%) Portable laptop or notebook computer (16%) Smart TV (10%) Tablet (5%)
Use of internet provided by others (multi-choice question)	59% public space with free Wi-Fi 41% at place of work or education	64% public space with free Wi-Fi 47% at houses of friends or family 38% community access centre 34% at place of work or education
Reasons given for not using the internet more (multi-choice question)	'I do not have convenient access to the internet' (54%) 'The internet is too expensive for me' (46%) 'I am concerned about privacy or scams' (32%)	'I do not have convenient access to the internet' (59%) 'I am concerned about privacy or scams' (45%) 'I do not need to use the internet more often' (36%) 'The internet is too expensive for me' (36%)
Concern about amount of time spent online	5% extremely concerned 2% moderately concerned 17% slightly concerned 66% not at all concerned	0% extremely concerned 5% moderately concerned 16% slightly concerned 64% not at all concerned
Low internet users	**16%**	17%
Reasons given for not using the internet more (multi-choice question)	'I do not have access to the internet' (75%) 'I am not confident using the internet' (63%) 'The internet is too expensive for me' (50%) 'I am concerned about privacy or scams' (50%) 'I am concerned about inappropriate content and causing conflict' (50%)	'I am not confident using the internet' (67%) 'I am concerned about privacy or scams' (58%) 'I have no need to use the internet' (50%)
Fixed broadband services (e.g. nbn Sky Muster, ADSL, Starlink)	78% did not have any kind of fixed home internet 18% on nbn service (100% Sky Muster)	66% other form of fixed internet (community-wide Wi-Fi) 26% did not have any kind of fixed home internet 9% on nbn service (100% Sky Muster)
Respondents with fixed broadband	22%	74%
Data allowances	73% had less than 49 GB/month 18% between 50-199 GB/month 0% above 200 GB/month 9% unlimited	98% had less than 49 GB/month 2% between 50-199 GB/month 0% above 200 GB/month 0% unlimited

Average cost	$42.00 / month	$50.67 / month
Mobile broadband Services (e.g. 4G modem or dongle)	6% other mobile broadband device 2% used a Wi-Fi dongle / device (75% of these pre-paid)	100% without any mobile broadband device
Respondents with mobile broadband	8%	0%
Data allowances	75% had less than 10 GB/month 0% between 11–40 GB/month 25% between 41–100 GB/month 0% above 100 GB/month 9% unlimited	N/A
Frequency of exceeding data limits	25% exceeded their monthly data limit between 1–5 times in the last year 50% 6-11 times 0% every month	N/A
Affordability	**2023 (49 respondents)**	**2023 (71 respondents)**
How often respondents cut back on essential household costs to afford personal or household internet	6% often or always 41% sometimes 53% rarely or never	3% often or always 34% sometimes 63% rarely or never
Respondents who compromise on internet speed and/or quality to prioritise affordability	73%	59%
Digital Ability	**2023 (49 respondents)**	**2023 (71 respondents)**
Regular internet Users (The following indented sections refer to respondents who had used the internet within the last six months)	84%	83%
Basic digital ability metrics (very true or mostly true of me)	Connect to a Wi-Fi network (90%) Open a new browser tab (88%) Use a mobile device as a Wi-Fi hotspot (85%) Find and install apps (85%) Complete online forms (83%) Download and then open a file (80%) Send and receive emails (78%)	Connect to a Wi-Fi network (76%) Use a mobile device as a Wi-Fi hotspot (72%) Find and install apps (67%) Complete online forms (62%) Open a new browser tab (60%) Send and receive emails (59%) Download and then open a file (59%)
Online security and cyber-safety awareness (very true or mostly true of me)	Set/manage secure passwords (90%) Identify which apps/software are safe to download (85%) Set/adjust privacy settings (83%) Add or remove friends or followers on social media (73%)	Set/manage secure passwords (66%) Set/adjust privacy settings (62%) Identify which apps/software are safe to download (55%) Check if information is trustworthy (50%) Decide what personal information to share online (48%)

		Decide what personal information to share online (66%) Check if information is trustworthy (56%)	Add or remove friends or followers on social media (48%)
	Online content creation (very true or mostly true of me)	Produce online content (54%) Post videos (56%) Create websites (32%) Awareness of online copyright law (41%)	Produce online content (31%) Post videos (31%) Create websites (21%) Awareness of online copyright law (28%)
	Smart devices (e.g. smart TV) (very true or mostly true of me)	Connect smart devices (e.g. smart TV) to the internet (73%) Adjust smart device privacy and security settings (71%)	Connect smart devices (e.g. smart TV) to the internet (47%) Adjust smart device privacy and security settings (36%)
	Primary online activities (activities undertaken in past six months)	Online banking (90%) Accessing government services (85%) Comparing prices of products or services (71%) Online shopping (59%) Online buying / selling (46%) Online learning / study (41%) Looking for work (39%)	Online banking (93%) Accessing government services (83%) Booking medical appointments (41%) Online shopping (35%) Online learning / study (33%) Tracking packages (33%) Comparing prices of products or services (31%)
	Social media use (activities undertaken in past six months)	Keeping in touch with family or friends (76%) Meeting new friends or reconnecting with old friends online (66%) Engaging with community (66%)	Keeping in touch with family or friends (62%) Meeting new friends or reconnecting with old friends online (53%) Engaging with community (55%)
	Online entertainment (activities undertaken in past six months)	90% used online entertainment services 54% attended an online music, arts, or cultural event online	89% used online entertainment services 74% played online games 60% attended an online music, arts, or cultural event online
	Online navigation and transport (activities undertaken in past six months)	49% had navigated a route via maps on a smartphone 20% had booked a taxi service via app	31% had navigated a route via maps on a smartphone

Comments:

Internet / Activ8Me Wi-Fi service quality:

- Internet is very slow. (x 5)
- The internet here is very slow and we need more services and support here. (x 6)
- Internet is really slow and it's really hard to log into Internet banking and MyGov to do online payments and reporting.
- The internet up here is very slow, we need more support and services.
- The Activ8me Wi-Fi and phone is not working at my house.

When the internet goes down when it's cloudy or raining, the shop closes and we can't get food or access services. We need more reliable Internet, especially in wet season.

- I want more reliable and faster internet. I would like to learn more digital skills.
- The Activ8me phone is not working at our house. Family help me to learn.
- Internet is too slow, so I can keep in touch with family.
- The Activ8me box is in the wrong place in the kitchen and it doesn't come to the other room. It should be in the lounge room where I use the phone and TV.
- Activ8me data doesn't last.
- Activ8me not working.
- We need faster internet for watching online content. The Optus is slow and drops out when it rains, so does the Activ8me.
- Internet and phones drop out when it rains.

We need faster Internet on Activ8me and Optus. We want Telstra here to have faster internet and because we have Telstra phones for other places. The internet and phone all stops when it rains or is foggy. Everything shuts down here, sometimes for days. We can't buy food or fuel.

Homelands Access:

- I use Wi-Fi on the outstations, it's good to be able to call from there

Mobile service quality and reliability:

- Mobile reception and satellite drops out when there's a storm.
- The mobile signal is too weak. When it's raining you can't use it for calls or Centrelink reporting.
- There's hardly any mobile reception. It drops out when it's cloudy and you can't get reception.
- We have to walk around to get a mobile signal. We need a better service here.
- A Telstra service would be better than the Optus problems with satellite.
- Phones are not so good in the community.
- Activ8me not working at my house so I need to use Optus data for internet and streaming. The Optus Is not working at the moment so we can't make calls or do banking.
- Internet is too slow, weak signal. Optus is not good, we want Telstra here.
- I just got a phone but I have had problems activating the SIM because of the slow mobile, it's very annoying.
- We need a Telstra mobile service here. We have to walk around to find a spot to pick up the mobile signal. It drops out all the time. The signal isn't good for streaming videos on Optus or Activ8me. We're always searching for a signal that works.

Access to TV and radio services:

- We need to get the TV services working here so we know what's happening in Australia and around the world.
- The TV dish got broken by a tree so we don't have TV.
- The TV is not working after a lightning strike affected our dish.
- I like watching TV, especially football.
- TV breaks up quickly when there's cloud cover.
- VAST box works but not during the wet season.
- Our TV is not working so it costs a lot for data to watch movies or TV shows. I want to learn how to connect TV to internet but we need someone who can help.
- Tv dish is broken. The Activ8me phone is not working. We need more technical support.
- We should have the radio back too.
- We need a radio broadcaster here.

Affordability:

- It costs too much to buy a mobile phone so I share one.

Activ8me is costing too much and voucher not enough data. 1 GB goes really quick. We don't have VAST TV not working so have to pay for any TV services, costs a lot. The set top box costs $600 to replace. We're still waiting for a Telstra tower here.

- Activ8me is costing too much money.

Digital ability:

I want more help to use computers and online services. It would be good to have a helper for when I need it.

- I just use phone banking. I don't want to use the internet because people can rob your money. I would only use a phone for games and music.
- I would like to learn to use the internet and online services more. There's help at Centrelink and CRC but we need a bit more.

People here are smart and catch on quick but need more digital training and awareness about scams.

- I don't know how to use the internet. I get somebody to help me.
- I would like to learn to use computers and more awareness for kids about cyber bullying on social media.
- I want to learn more about using computers and online services. That would help me in getting a job.
- I need some support to use the internet so I can learn.
- I would like to learn more about using computers to help me get a job. We need a computer to learn on. The Wi-Fi is good but drops out when it's cloudy. The Optus mobile also drops out and doesn't work in the house.
- We need some training and support to learn the internet and online services.
- I would like help to learn to use a mobile phone and internet. I would like to be able to download music and movies and use MyGov but I don't know how.

Appendix 2: Community Communications Audit

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: 279 km (1hr 10 mins) by plane, 558 km by road; Broome: 615 km direct (charter flight), 888 km 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 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 $3,000
Median personal income – over 15 years	$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 (KAC; 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

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)
Home phones – number	Number of landlines not known; 128 VoIP phones installed.
Mobile – 3G, 4G, 5G, small cell (satellite backhaul), provider, location of base station	Optus satellite small cell – 3G (established 2018) and 4G (established 2020); Funding for Telstra satellite small cell approved December 2023, timeframe for installation TBC
Coverage description	Limited coverage (approx. 3 km diameter, reaches airstrip); low power transmitter requires access outside of most premises, mostly line of sight
Fibre to community	No
ADSL – number of connections	No ADSL services due to HCRC telephony network not supporting ADSL
Fibre-to-the-premises connections	None – all internet access via satellite services
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 business grade satellite services
UHF or HF Radio	UHF used by several agencies for staff communications, including Kalumburu AC, Kalumburu School, Rangers, CDP, KRSP and police; Police, rangers, emergency services and aircraft also use HF radio
Communications funding history – Mobile Black Spots, Regional Connectivity Program, State government investment etc	Regional Connectivity Program (RCP) funding for Telstra microcell mobile service announced December 2023; RCP co-funding 50/50 with WA Government (total $1.3 million) for Activ8me Wi-Fi Mesh and VoIP telephony network (7 year project).; Mobile Black Spots Program funding for Optus small cell, installed 2018
Any planned upgrades?	Telstra microcell mobile service planned for 2025 (date not known); Optus planning upgrades to LEO delivery of satellite small cell mobile services (dates not known)
Emergency information system	Kalumburu Police, clinic, KAC office and Uraro Store have satellite phones; Lights on water tank for cyclone warning codes (operated by police) with other emergency communications face to face
Telemetry network	Activ8me have remote monitoring of the Wi-Fi mesh network and all repeaters and VoIP phones; KRSP manage telemetry of water and sewerage plants, pipes, pumps etc; Horizon Power manage telemetry of generator and solar farm; 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 FM and ABC regional radio 104.5 FM; Both services re-activated in June 2022, but failed due to electrical issues; since repaired in November 2023. Christian radio service also installed in 2023
TV services – local broadcast, number of DTH services, number working	All TV services via VAST; VAST not working in approximately 53% of residents' households
RIBS radio station – location, staff, roles	RIBS radio station operational but no current RIBS operator
RIMO – regional provider	PAKAM – Neil Turner, Manager
Other media services – newspaper etc	Kimberley Echo gets sent to store occasionally
Community access facilities	
Public access facilities (computers, printers, videoconferencing or other facilities)	Community Resource Centre has one access computers ($5 per 30 mins), printing and laminating service; coordinator provides 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) now free data use and voice calls (since November 2023, was $2 per GB previously). Wi-Fi hotpot near community office and at Centrelink office for government service access
Access computers in other facilities	One in Centrelink office for Centrelink use only
Any programs running to support community access	Ongoing support by CRC staff and community office staff, and other agencies where required
Digital Training/ Support	
Any workplace digital skills training – rangers, art centre, media, store etc	East Kimberley Jobs Pathways have previously organised workplace readiness digital skills workshops, no recent training known. Kimberley TAFE can provide basic business skills training
Any staff/ resources to support digital skills or access to online or digital services	Community Resource Centre staff (Julia Campbell), Centrelink Coordinator and Kalumburu AC staff

Appendix 3: Photos of Research Activities

Figures 36 & 37: Co-researchers Julia Campbell and Karen Mangolamara; Julian testing the public phone in the Centrelink office

Figures 38 & 39: Julian and Daniel doing surveys with residents at the CRC; Karen does a survey with residents Edreena Unghango and Matilda Oxtoby

Figures 40 & 41: Daniel and Julian presenting about the project at a community gathering at the CRC; Kalumburu School entrance

Figures 42 & 43: Kalumburu Multi-Function Police facility; Traditional owner and guide Clarrie Djanghara with sign bearing his painting