The Digital Opportunity for the Pilbara

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Executive **Summary**

Western Australia is a state of ancient culture and geological wealth. Within WA, the Pilbara represents the extremes of the state: vast open spaces, diverse environments, isolated communities and boundless opportunity. The region faces challenges. These include the volatility of global resources markets, the pressure on essential services, a small pool of workers and enduring difficulties in connecting far-flung areas. Yet, businesses, communities and governments are finding innovative and creative solutions.

In this paper, we identify **12 use cases for how digital technology can help** industries, businesses and communities in the Pilbara and Western Australia more broadly, to address the challenges of today and the future.

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The 12 use cases are

Transformation of industry and agriculture

1. Improve decision-making with data-driven insights
2. Optimise operations with real time monitoring and control
3. Create safer working environments
4. Improve productivity through automation
5. Enhance the workforce experience

Drive economic inclusion

6. Improve education outcomes and skills availability
7. Broaden the economic opportunity
8. Encourage entrepreneurship

Support sustainable communities

9. Enable innovative healthcare services and delivery
10. Inform better service design
11. Help close the gap
12. Contribute to environmental sustainability and resilient communities

Achieving these benefits, and transforming industry and public services, requires the right digital infrastructure. Such infrastructure must have the capacity, quality, scale and resilience not just for today, but for the way we will use digital services and tools years into the future.

At Telstra InfraCo, we are building the network of tomorrow, today. It will be the backbone for Australia's future digital economy, enabling innovation, economic growth and connected communities.

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The connected future of the Pilbara's industry and community

The Pilbara has long punched above its weight in economic terms with a GDP contribution approximately 15 times higher than its share of national population (0.2%).[1]

Much of that GDP contribution comes from the resources industry, which is undergoing significant change as it transitions to become more sustainable. The region's industry will also play a vital role in driving the global shift to green energy. The Pilbara has considerable deposits of three of the eight key minerals required for battery manufacturing – lithium, manganese, and vanadium. Currently, 40%[1] of the world's lithium production comes from the Pilbara.[2]

> **The Organisation for Economic Co-operation and Development (OECD)**
>
> "Its competitive mining ecosystem, robust export infrastructure and its potential to deploy renewable energy to decarbonise mining operations and export emissions free raw materials along with its proximity to Asian markets could transform Pilbara into a global leader in the green energy transition."[3]

The green energy sector, and Australia's economy, depends on a resilient, thriving Western Australia and Pilbara. That means overcoming challenges related to industry decarbonisation, global competitiveness, improved liveability, growth of economic sectors outside of the resources industry, and equitable access to services.

In this section we examine the use cases for digital technologies in industry, agriculture, and communities, and how they can help Western Australian businesses and governments address the challenges in the years ahead.

[1] Pilbara, Australia PRELIMINARY POLICY HIGHLIGHTS OECD Mining Regions and Cities
[2] Pilbara Development Commission
[3] OECD, June 2023

Transformation of Australian industry and agriculture

Australian resources and agriculture industries are already some of the world's most innovative. Australian mines for example have some of the world's highest penetration of technologies, especially drones, autonomous and remote-control vehicles and mine management software. [4]

However, industry and agriculture continue to evolve and innovate. Deepening the integration of operational technology and information technologies will help drive their competitiveness, help them reduce their environmental impact and improve safety and wellbeing for their workforce.

Here are five ways digital technology will shape the future of industry in the Pilbara.

Use case 1
Improve decision-making with data-driven insights

Miners are adopting electrification strategies as they target zero carbon and zero particulate mining sites.[5] Electrification creates different challenges for site management. Many mines are isolated from the national grid and have to provide their own power. Now miners have to think like energy companies, and shape site planning and operation around energy usage. Energy production data from renewable resources is used in real time to inform production schedules and optimise energy consumption.

Innovative businesses are connecting sensors on almost every aspect of operations to collect data and use artificial intelligence (AI) and machine learning (ML) to inform decision making.

AI solutions can provide mine managers with deeper insights into energy use, air and water quality, equipment performance that help them make better strategic decisions. Machine learning can be applied to improve efficiency of everything from machinery use and safety measures, to site planning, ore stockpiling and blending.

In agriculture, machine learning tools can help farmers predict pasture intake, and identify the most efficient individual grazing animals, breed more efficient animals, and improve livestock productivity and rangeland management. AI and ML include identifying and predicting pest and disease outbreaks, soil degradation, water scarcity.

> The adoption of AI has also exploded in the mining sector with 66% of mining companies using AI in 2022, up from 57% in 2021. [6]

[4] GlobalData, 2023
[5] Mining Technology, May 2023
[6] The AI Revolution in Mining: Opportunities and Risks - The Oregon Group - Investment Insights

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Use case 2
Optimise operations with real time monitoring and control

Site, equipment, and process efficiency is critical to achieving the lowest possible cost of operation.

One way to improve efficiency is through better monitoring , supported by Telstra's IoT network to help make this a reality.[7] Video is increasingly being used as a sensor to provide rich, visual data streams. In one example, video can be used to monitor the condition of a conveyor belt to identify leading indicators of failure. Coupled with pre-emptive maintenance, such monitoring can help prevent machinery breakdowns and reduce downtime.

Another example currently being researched is real time mineralogy identification in mill feeds. Real-time monitoring of ore attributes in the run-of-mine ore can provide rapid feedback to mining operations for dilution control and reconciliation in short time periods. This helps to protect ore quality, leading to better performance. [8]
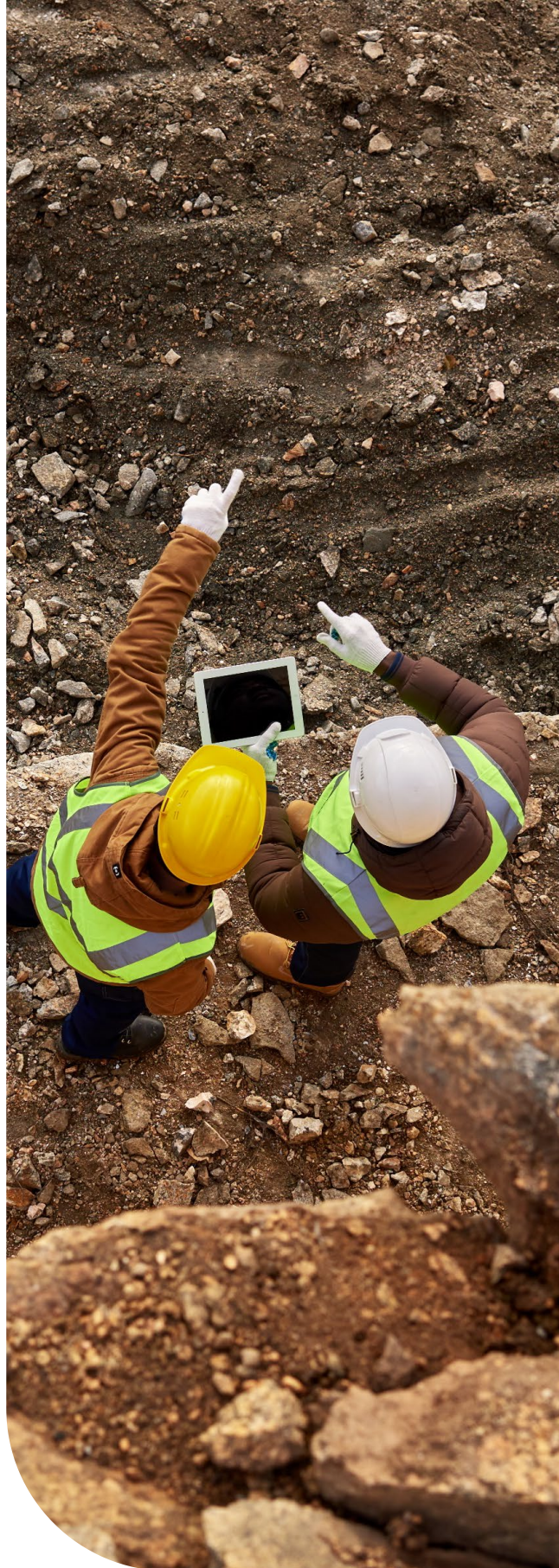
Use case 3
Create safer working environments

Safety is a priority in any industry. The connected mines of the future will use digital technologies to enhance safety and wellbeing.

24/7-connected sensors monitoring mine stability and dam walls will replace routine inspections. Automated machinery can reduce the need for people to enter higher risk areas of the site, while site surveillance can trigger alerts to security teams.

[7] IoT coverage map, Telstra.com
[8] The Integrated Mining Consortium, University of South Australia

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Use case 4
Improve productivity through industrial automation

Asset utilisation will be improved with semi-autonomous and autonomous machinery. Loaders can be deployed in a one-to-one or one-to-many remote operator to machine ratio. Autonomous trucks can haul resources from shovels or front-end loaders in a mine to a crusher area. Data from asset tracking will be used to plan charging cycles for electric vehicles and optimise availability.

In agriculture, driverless sprayers can help farmers cover more land, while small scale IoT-enabled spot sprayers reduce vehicle impact on the soil.

Use case 5
Enhance the workforce experience

Attracting workers to remote sites can be a challenge for mining companies. Established mine sites are becoming more 'metropolitan' with high levels of connectivity. This supports contact with home and entertainment to make the experience of being on-site more pleasant. As usage of digital services increases in everyday life, mine workers will come to expect similar experiences in major sites, such as the availability of fast 4G/5G wireless services.

Drive economic inclusion

The Federal Government states in its Better Connectivity Plan for Rural and Regional Australia that improvements in digital connectivity deliver some of the most tangible and widespread benefits across a huge range of areas including economic and social participation and equality.

Greater digital connectivity in the Pilbara can support new economic opportunities and help increase skills to drive economic inclusions beyond the returns generated by the resources sector.

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Use case 6
Improve skills availability and drive education outcomes

Greater availability of digital learning may help improve skills, raise school completion rates and provide opportunities for continued professional development. Research from University of Technology Sydney found high-quality edtech tools and services, including artificial intelligence and machine learning applications, can in the right environment, be used to improve outcomes for disadvantaged students. [9]

However, as education methodologies and tools evolve, there is a risk of remote areas such as parts of the Pilbara and Western Australia playing catch up.

The same UTS report states

"the existing digital divide will soon begin to be felt not just in terms of access to devices and reliable internet, but in access to advanced edtech learning tools. Access to adequate devices, internet connection, and supportive learning environments were [...] foundational for equitable outcomes."

Use case 7
Broaden the economic opportunity

Tourism is a significant growth opportunity for Western Australia. The OECD says that improving infrastructure outside mining, particularly for tourism (e.g., hotels, broadband), as well as supporting joint tourism strategies in the region as a whole-of-government approach can help boost tourism activities.

Digital connectivity can help local businesses in the Pilbara access new customers and encourage visitors to come to the region. It can also help to improve liveability and connectedness to other parts of Australia through increased capacity and coverage of fixed and mobile broadband services, encouraging service workers to live and work in the region.

[9] Shaping AI and edtech to tackle Australia's learning divide, Loble, University of Technology Sydney, December 2022

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Use case 8
Encourage entrepreneurship

Despite the Pilbara's economic clout, regional Western Australia under-indexes for entrepreneurship levels according to the OECD.

As the availability of skilled workforces increases, regional areas become better connected, and other sectors grow bigger, we can expect to see a growth in entrepreneurship.

Support sustainable communities

Sustainable communities are defined by their economy, ecology and equity. We have already touched upon the economic benefits of digitalisation, but it's just as important that communities have equitable access to public services and a resilient local environment. Digital divides can lead to social and economic inequalities. Since the first Australian Digital Inclusion Index (ADII) survey was administered in 2016, results have consistently shown that rural Australians score lower across all three dimensions of digital inclusion: access, affordability, and digital ability.

Use case 9
Enable innovative healthcare services and delivery

The virtualisation of healthcare and medical-technology is moving ahead at pace. Telehealth is now mainstream. In 2021-22, there were more than 43,000 regional outpatient telehealth appointments by video in Western Australia, an increase of 833% since 2012.[10] Demand for access to telemedicine services, video-enabled consultations, remote patient monitoring and the ability to transfer medical data in real-time will continue to grow.

Healthcare professionals in regional areas can benefit from access to enhanced remote professional training, collaboration with peers, and access to real-time medical data and imagery, ultimately delivering improved healthcare services to their communities.

Use case 10
Enable better service design

Insights based on timely, relevant and accurate data can inform the design, improvement and evaluation of government services, operations and policies.

With the growing ubiquity of IoT devices, local government authorities of the future will have access to live data feeds on utility performance, asset location and use, and transportation patterns to name only a few.

[10] Government of Western Australia, WA Country Health Service

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Use case 11
Help close the gap

The Australian Digital Inclusion Index (ADII) found a considerable digital gap between Australia's Aboriginal and Torres Strait Islander peoples, referred to as First Nations people in the ADII report, and other Australians.[11]

While regional WA in general has a lower ADII score than the national average, access to the internet is particularly challenging in remote communities. The digital divide is more pronounced for those living in remote areas, with over 200 remote Aboriginal communities in Western Australia among the most digitally excluded in the country. [12]

Availability of high-quality connectivity can also contribute to Target 17 of the Closing the Gap initiative, which aims to ensure First Nations people have equal levels of digital inclusion by 2026.

Use case 12
Contribute to environmental sustainability & resilient communities

Digital technologies will play a crucial role in the transition to a low carbon economy. As noted above, the use of data, artificial intelligence and industrial automation will help industry reduce their environmental impact. This will enable the industry to deliver rare metals necessary for electrification and batteries without compromising on decarbonisation strategies.

Insights from data can help inform public policy and government planning to support communities. Greater reach of telecommunication networks can also help communities during times of natural disasters.

[11] Australian Digital Inclusion Index, 2023 key findings, The Australian Digital Inclusion Index is a collaboration between the ARC Centre of Excellence for Automated Decision-Making & Society at RMIT, the Centre for Social Impact Swinburne University of Technology, and Telstra.
[12] Western Australian Government: Remote Aboriginal communities

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Infrastructure to support a digital future

The growth in digital technology and its added value to industries and communities around Australia cannot happen without the network infrastructure to support it.

Productivity Commission

"Digital infrastructure, particularly in regional and remote Australia, is required to deliver productivity enhancing access to reliable internet for local businesses and workers, and increases social inclusion by ensuring that regional and remote Australians can access quality essential services and expertise that are increasingly available online."

We already see increasing digitalisation of industry, particularly the convergence of IT and operational technologies (OT), together with growing demands for digital inclusion. Digital network infrastructure is the central nervous system that connects sites, industries, and communities, and upon which we will work with service providers, businesses and partners to create new solutions that drive progress forward.

There are five components that digital infrastructure must have if it's to support continued digital transformation.

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1. High capacity

Much of today's networks were built between 20 and 30 years ago when the global average residential Internet download speeds were measured in kilobits per second.[13] Over the years, as data demand increased, we have invested heavily in our infrastructure to continue to provide a fast and reliable network.

We see continued, significant data growth on our networks, with more dispersed internet usage across Australia. Traffic demands on our mobile and fixed networks are growing at over 40% and around 25% per annum respectively. [14]

The demand for data on fixed and mobile networks will continue to increase exponentially as we transition from a connected world to a digitised world. Estimates of future demand vary but all indicate the requirement for increased backhaul capacity to support this growing data need.

Even at today's levels of data consumption, more businesses are demanding higher capacity links. In the near future, we expect large mining companies will procure 100Gb links into each established site, up from 10Gb common today, to support their digitalisation. Their capacity requirements will grow as use cases such as video-as-a-sensor, process automation, remote control, and real-time operational decision-making become more prevalent.

For example, some of the sensors deployed in mines supporting functions such as ground penetrating radar, GPS sensing for movement and thermal imaging to detect any movement are extremely bandwidth intensive.[15] Large scale adoption of video-as-a-sensor use cases is also likely to drive bandwidth consumption up considerably. Digital services to improve the workforce and resident experience will place greater emphasis on the capacity of links into sites and communities.

2. Scale

The creation and exploitation of new economic opportunities for Western Australian communities will require much more network infrastructure across the regions.

As businesses digitise more processes, collect and process data, and adopt automation, it's likely they will use a distributed architecture with a mix of core and edge compute. More analysis and control functions will take place at headquarters, but much will remain on the network edge to take advantage of proximity and low latency.

Network design, including connections to backhaul networks, then becomes a key attribute as companies and communities seek the most efficient way to operate services.

[13] Global average Internet speed, 1990-2050.
[14] Telstra upgrading its optical network to 400GE — TechDecisions, 2022
[15] Industrial Automation in Mining Environments, Cisco

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3. Low latency

Real time, or near-real time, use cases require low latency for effective performance and experience. Latency can determine the success of telehealth services such as video patient consultations, or live teaching experiences for remote students. Industrial remote control and safety monitoring depend on users being able to see and act in real time, even if they are in Perth and they are controlling machinery in the Pilbara.

4. Resilience

Australia's uniquely tough environmental conditions and varied landscapes pose challenges for the design and build of digital infrastructure. The Pilbara is characterised by extreme heat and variable rainfall.

Fibre optic cables and network sites have to be designed to withstand these environmental conditions. The cables themselves have to tolerate micro and macro bending caused by changing soil conditions without losing optical performance.

Network architecture design should include diverse routes to help ensure service continuity in the event of a disruption on one path. This is a considerable undertaking when the distances covered are taken into account.

5. Collaboration

The Pilbara is home to more than 31 different Aboriginal language groups, each with their own spiritual links to specific land features and locations. [16]

Infrastructure build and management must be done in cooperation with traditional owners of the land to provide mutually beneficial outcomes.

For infrastructure providers, this means more than simply securing access to land where assets are located. It's about listening to communities, learning more about their relationship to Country and acting in a culturally appropriate way in every interaction.

Beyond community engagement, all parties – from infrastructure owners to service providers and end users – must collaborate to develop services, products, tools and solutions that meet the future needs of the nation.

[16] Home | Wangka Maya Pilbara Aboriginal Language Centre

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Telstra InfraCo is building the network of tomorrow

We are deploying new fibre technology to address the exponential growth and demand from global hyperscalers, and support future mobility, internet, cloud and edge computing that will underpin the increasing digitalisation of our economy.

Our network is designed with a unique dual cable diverse architecture to deliver benefits for a range of end customers and communities. This novel approach features two networks on each route. The first is an express intercity network designed for customers seeking point-to-point dark fibre over long distances. The second pathway is the foundation network that will enable connectivity to regional locations via access points, which can be provided at 5 - 10-kilometre intervals along each pathway.

This fibre infrastructure will be the backbone for Australia's future digital economy, with multiple pathways being built, or planned to be built, in the years to come. It will enable our partners' innovation, productivity and growth by supporting the adoption of AI, IoT, industrial automation and data analysis technologies; the development of new solutions and products; and greater community connectedness.

A new high speed intercity network

We are building a new express highway for data with up to six times today's capacity. Our intercity fibre network will enable transmission rates of up to 650 Gbps compared to today's common rate of 100Gbps. It will also deliver express connectivity between capital cities of up to 55 Tbps per fibre pair capacity compared to today's 8.8 Tbps per fibre pair.

"When built, the network could be considered the largest, most advanced long-haul terrestrial network deployed anywhere in the world to date"

We have designed the intercity network with flexibility to provide connectivity to non-capital city data centres (DCs) and DC hubs as future needs arise. And we are using the latest in cable technology to deliver a network a network that will provide high bandwidth intercity connections over long distances — while minimising latency and cost — that customers can rely on for decades to come.
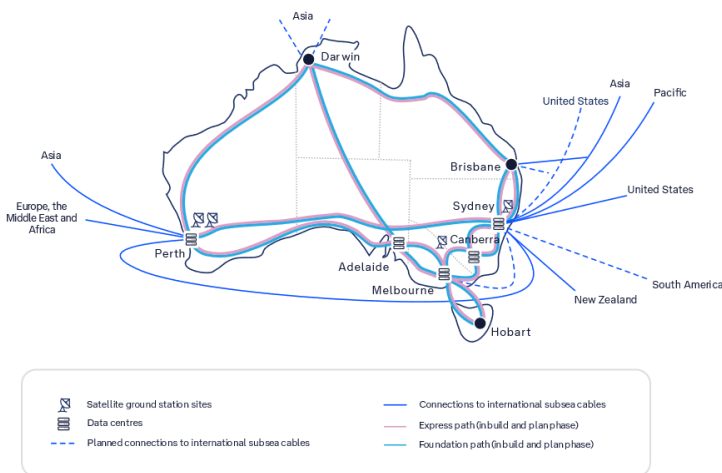
InfraCo is building two separate sheathed cables across Australia, with plans to connect all capital cities

Ultra-Fast ULL fibre

National fibre with regional access points

Direct burying two cables up to 1.2m deep

Legend:
- Satellite ground station sites
- Data centres
- Planned connections to international subsea cables
- Connections to international subsea cables
- Express path (in build and plan phase)
- Foundation path (in build and plan phase)

Supporting connectivity opportunities through offramps

Our aim is to offer regional communities the opportunity to connect to the intercity network. Our intercity fibre network will enable future connectivity to regional locations via access points along the foundation network.

These network access points are an enabler for connectivity and for greater economic investment into regional areas. In 2017, small businesses located in regions with nbn connectivity saw revenue grow by two-thirds and employment grow by one-third more than businesses in regions without the nbn. [17]

[17] Australian Infrastructure Audit 2019

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We're also building on and off ramp infrastructure to allow for future connectivity to regional and remote areas. With more offramps and points of interconnect, it will be easier and more cost effective to provide last mile connectivity to communities and sites around the region. For example, increased availability of infrastructure for mobile co-investment projects will reduce the cost and time to improve regional coverage and performance.

We are creating new colocation opportunities to support distributed network architectures. We have thousands of fixed network sites across Australia and we are exploring key sites for customers to use at the edge with their choice of network provider.

A more resilient, sustainable network

Together with Prysmian Australia, we have created a more sustainable cable with a lower carbon footprint by developing a product with a higher fibre count design that is lighter and easier to handle.

The new cable design is 214 kg per kilometre lighter than its predecessor, resulting in approximately 10,000 tonnes less plastic.

This has more than doubled the length of the cable on each drum, meaning less trucks on the road to transport the cable, reduced storage requirements and less scrap!

We have designed our network — from the fibre cables themselves to the way we monitor and maintain them — to withstand Australia's unique environmental conditions and reduce carbon footprint.

A Telstra InfraCo and Corning white paper[18] discusses the benefits of the innovative fibre solution, including the advanced cable design. The paper details the demanding parameters set for the cable design to cope in Australian conditions. It says:

"Parts of the direct buried path pass through reactive soils that create unique challenges for cable design, particularly in relation to axial compression. Telstra InfraCo, in conjunction with cable partner Prysmian, developed a new small form factor cable suitable for direct burial deployment in reactive soils. The design was derived from existing know-how proven over many years in Australian soils and adapted for Express Network requirements. Central to this work was a proprietary axial compression resistance test that had been previously developed by Telstra and Prysmian."

[18] Corning—Telstra InfraCo, November 2022

A respectful, collaborative approach to building and operating infrastructure

Community engagement

We are committed to responsible and respectful use of land, working with community stakeholders to achieve mutually beneficial outcomes, and provide accessible infrastructure to the nation.

Much of our infrastructure crosses the lands of Aboriginal and Torres Strait Islander peoples. It's important that we care for Country, protect Aboriginal and Torres Strait Islander lands, artefacts, and community interests, and consider environmental and heritage matters.

Our dedicated Land Stewardship, Engagement and Compliance Team support Telstra InfraCo's design, construction and maintenance activities. It's more than simply accessing land to maintain and build our infrastructure. We aim to work well beyond regulations and compliance to become a role model in engaging with Indigenous communities.

We engage with stakeholders including Aboriginal and Torres Strait Islander organisations and local and state government, face-to-face, early and regularly on thousands numerous land access projects every year.

All our agreements are co-designed with Aboriginal stakeholders and incorporate Aboriginal perspectives, as well as giving us the opportunity to listen and learn more about the people and Country our infrastructure is on.

Our approach to engaging with Aboriginal and Torres Strait Islander communities is helping us achieve mutually beneficial outcomes while providing accessible infrastructure to the nation.

Partnerships with industry

We know the challenges of investing in telecommunications infrastructure in the Pilbara due to the complexity and costs of building in remote areas.

We're open to forming collaborative partnerships with private fibre network owners with opportunities to explore leasing agreements or joint infrastructure builds.

It is an opportunity for Telstra to align our future infrastructure plans with the digital needs of industry in the region. It is a pivot from our traditional service operation model but one that presents value to future partners to leverage our existing infrastructure to enable seamless data exchange.

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Final word

We find ourselves in an age characterised by relentless digital advancement, where virtually no industry remains untouched. This is playing out in the wide range of technologies we see supporting our local communities, health, education and supporting connectivity in mobiles. Today we are witnessing the mining sector eagerly adopting cutting edge technologies from AI, the IoT, automation and sophisticated big data analysis.

These advances are connecting our communities and bridging the digital divide between our regions and cities. They have a huge benefit for industries' productivity, sustainability and safety.

For the Pilbara, digital transformation promises to maintain the region's global importance, bolster its industries' competitiveness, and bring far-flung communities closer together. As a leading digital infrastructure provider, we are excited to see how the region seizes these opportunities, and we look forward to playing our part.

The surge in digital growth and demand across the world is fuelling an insatiable appetite for high speed, low-latency, reliable and resilient fibre networks, and this is where Telstra's mission is paramount.

Telstra is committed to building the backbone for Australia's future digital economy and that is what we are currently doing with our new intercity fibre network. We envision an infrastructure network that will not merely adapt but drive Australia's digital evolution.

For more information on Telstra InfraCo, and how we are accelerating opportunities for our country with our network build, please visit our website infraco.telstra.com.au

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