

# Australian Update

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# Outline

- Development of the PNT Roadmap for Australia
- Latest information on development of SouthPAN SBAS by the governments of Australia and New Zealand





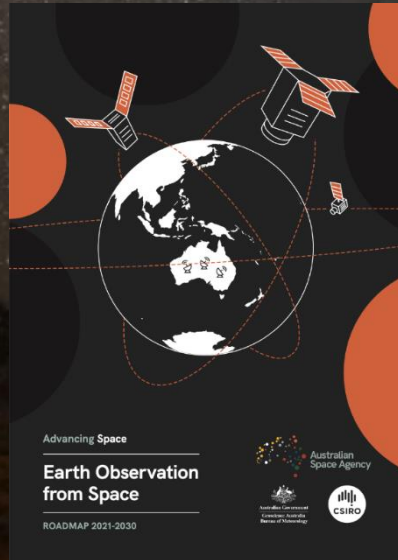
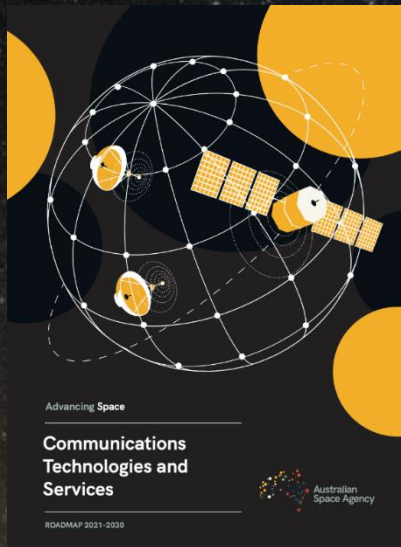
Australian Government




Australian  
Space Agency

# A National PNT Roadmap for Australia





# PNT is Everywhere!




## Positioning, Navigation and Timing




### Communication Technologies and Services

- LEO satellite services
- Reconfigurable networks, radios, modems and waveforms
- Timing synchronisation for higher bandwidth
- Secure communications



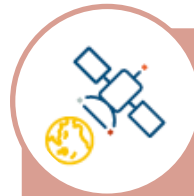
### Access to Space

- Launch to orbit and space navigation
- Payload recovery
- Launch abort systems
- Launch vehicle and space platform tracking
- In orbit servicing




### Space Situational Awareness

- Ionospheric monitoring
- High accuracy debris and asset positioning



### Earth Observation

- Australian EO missions and payloads
- International EO partnership and leadership
- Improved temporal and spatial accuracy
- Radio-occultation and GNSS reflectometry



### Robotics and Automation

- Remote operations and logistics
- Analogue facilities and services
- Robotic platforms
- Alternative PNT (e.g. SLAM, INS)
- Resource mapping



### Applied Space Medicine and Life Sciences

- Wearable health and safety devices
- Astronaut position and velocity monitoring
- Astronaut Search and Rescue (SAR)

# Increasing Dependence on PNT



**AUTOMOTIVE**



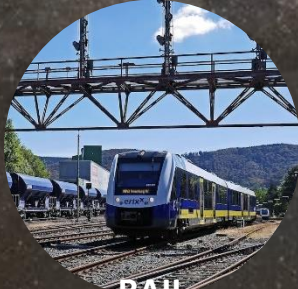
**CONSTRUCTION**



**RESOURCES**



**MARS  
AUTONOMOUS  
VEHICLES**



**RAIL**



**AGRICULTURE**



**DEFENCE**



**MARITIME**



**DEEP SPACE  
NETWORK**

**Positioning  
Navigation  
Timing**



**FINANCE**



**UTILITIES**



**AVIATION**



**LUNAR  
AUTONOMOUS  
VEHICLES**



**SPACE  
SITUATIONAL  
AWARENESS**

# The State of Australia Today

## Dependence and Vulnerability

Australia is dependent primarily on GNSS for both precision positioning and highly accurate time synchronisation. Australia does not control the systems it is so greatly dependent on which is also susceptible to deliberate or accidental interference

Quantum Timing

Beacon Systems

Spoofing/Jamming Detection & Geolocation

Advanced INS

Increased Manufacturing in Australia

Australian Cutting Edge Research

Underground / Indoor Positioning

Signals of Opportunity

Quantum Sensing

## Resilient PNT

It is important for different strategies and technologies to be developed and adopted for improving resilience across Australia's PNT reliant industries and infrastructures. Multiple solutions will be the way forward.

# The Australian PNT Market Today

Global Space  
US\$ 6.8B\*

Space  
US\$ 58.3m\*  
13%

Downstream  
US\$ 362.6m\*\*

Market value is primarily driven by manufacturing

PNT in Space:

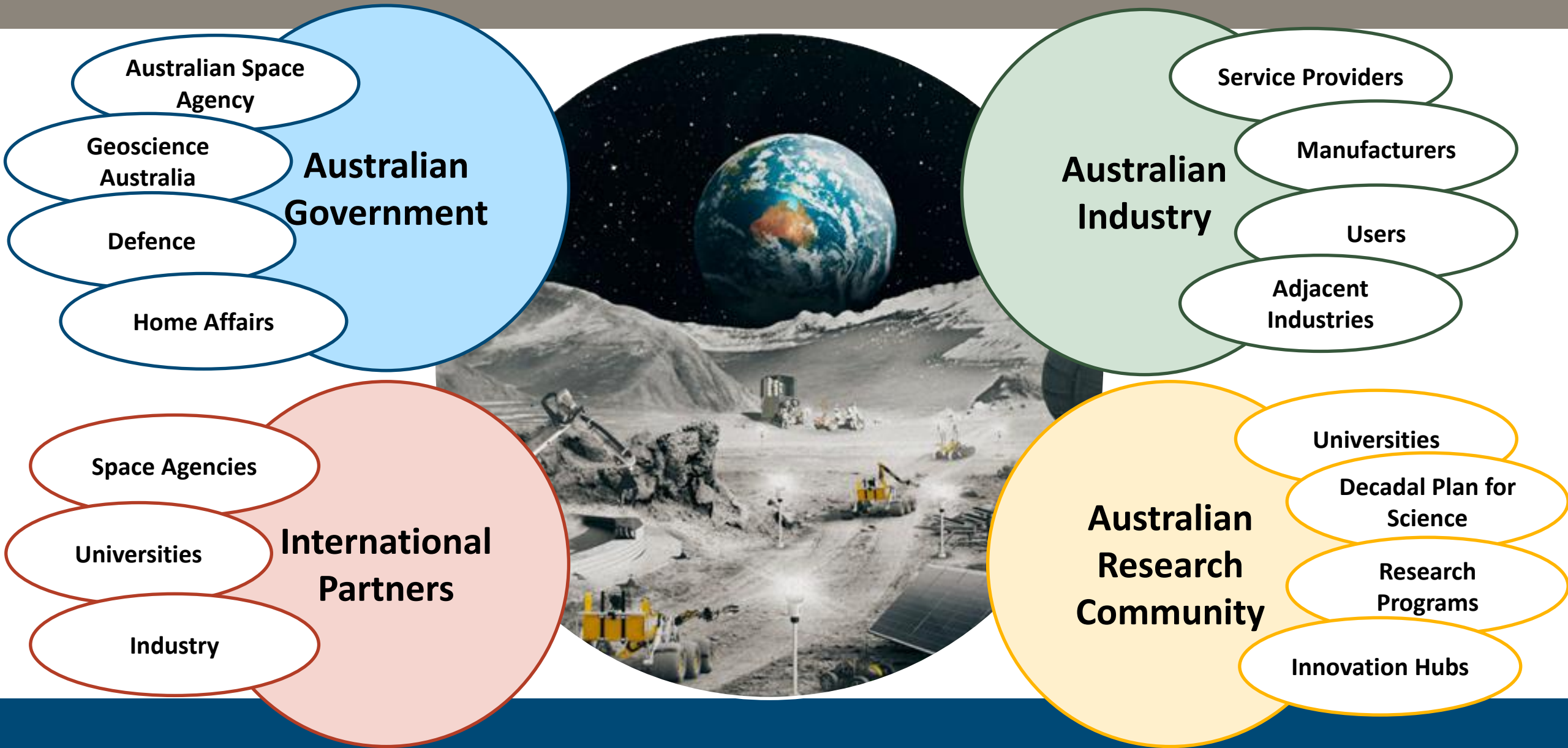
- Satellite & spacecraft manufacturing
- ISRU
- Software

\* PNT in Space Market Assessment and Trend Analysis Report – ASA & KPMG August 2022

\*\* Economic Baseline Study – ASA & Blade



# How will we get there?





**SouthPAN**



**Australian Government**

**Geoscience Australia**

## SouthPAN Overview

- Joint service delivered by Geoscience Australia and Toitū Te Whenua Land Information New Zealand
- Improve and augment the accuracy, integrity and availability of GNSS in Australia and New Zealand
- Contribute across both economies, including the transport, agriculture, construction, resource and utility sectors
- Benefit all users of satellite positioning, particularly in remote areas without mobile phone coverage

# Service Announcements



The Hon Madeleine King MP  
Minister for Resources and Minister for Northern Australia



## Australia and New Zealand advance satellite positioning

16 September 2022

Businesses, communities, farmers and first responders across Australia and New Zealand will reap the benefits from greater satellite positioning accuracy with the award of an AUD\$1.18 billion, 19-year contract to bring the Southern Positioning Augmentation Network (SouthPAN) to life.

The new service will improve positioning from current services, which provide accuracy of between 5 to 10 metres, to as little as 10 centimetres. This 50-fold increase in accuracy will boost economic productivity and be the Southern Hemisphere's first satellite navigation augmentation service.

Minister for Resources and Northern Australia Madeleine King said SouthPAN is a major commitment between the Australian and New Zealand governments to provide essential satellite positioning services across Australasia.

16 SEPTEMBER 2022

## NZ/AU partnership to bring world-class satellite positioning services



HON DAMIEN O'CONNOR

Land Information

Land Information Minister Damien O'Connor today announced a joint Trans-Tasman partnership which will provide Australasia with world-leading satellite positioning services that are up to 50 times more accurate, boosting future economic productivity, sustainability and safety.

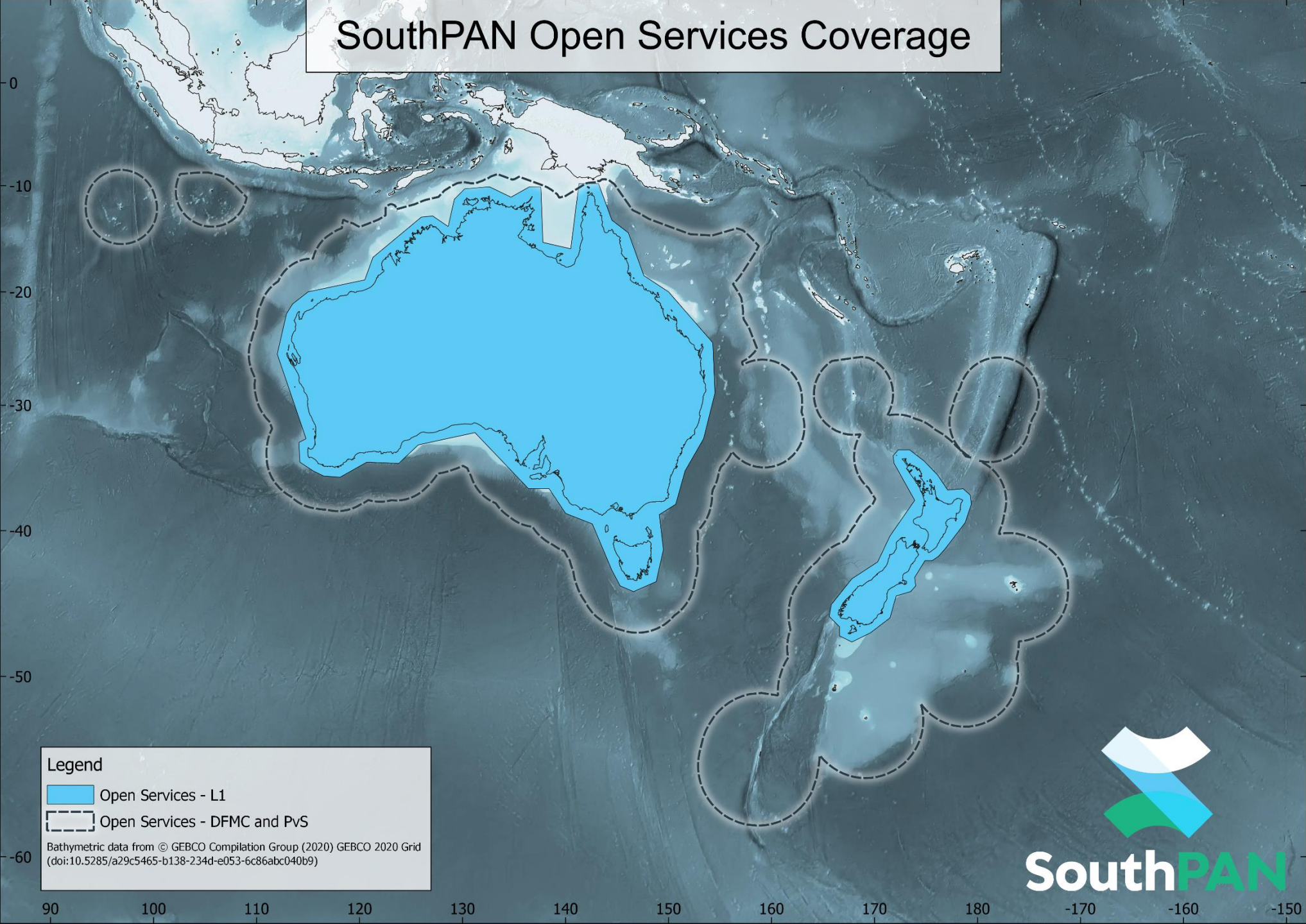
New Zealand and Australia have partnered to deliver the Southern Positioning Augmentation Network (SouthPAN), with the first services available in the next few weeks.

"The SouthPAN project will immediately improve the accuracy, reliability and availability of existing satellite positioning systems in Australasia," Damien O'Connor said.

## Early Service Update

- Contract for service signed 13 September 2022
- Lockheed Martin Australia, with GMV and Zeta Associates, will establish and operate SouthPAN
- Initial Operating Capability with early Open Services commenced 26 September 2022
  - L1 SBAS
  - L1/L5 DFMC SBAS
  - PVS on L5

# SouthPAN Open Services Coverage



**Legend**

- Open Services - L1
- Open Services - DFMC and PvS

Bathymetric data from © GEBCO Compilation Group (2020) GEBCO 2020 Grid (doi:10.5285/a29c5465-b138-234d-e053-6c86abc040b9)



## SouthPAN Initial System Configuration

- 'Build 0' configuration uses existing infrastructure to provide Open Services with a base level of performance.
- 62 existing AU/NZ continuously operating reference stations
- Prototype software and hardware for corrections processing and message generation
- Current-gen navigation signal generator for L1 and L5
- Single computation/uplink centre in Australia
- Single satellite broadcast

# SouthPAN Early Open Services

## L1 SBAS Open Service

- Augments GPS L1 C/A
- Better than 3m (H) and 4m (V)

## DFMC SBAS Open Service

- Augments GPS L1 C/A + L5, and Galileo E1 + E5a
- Better than 1.5m (H) and 2.5m (V)

## PPP via SouthPAN

- Augments GPS L1 C/A + L5, and Galileo E1 + E5a
- Better than 0.375m (H) and 0.525m (V), with 80 min convergence

1. Early Open Service performance will improve as SouthPAN is deployed
2. Safety-of-Life Services are in development, expected 2028

More detail is available in the SouthPAN Service Definition Document for Open Services

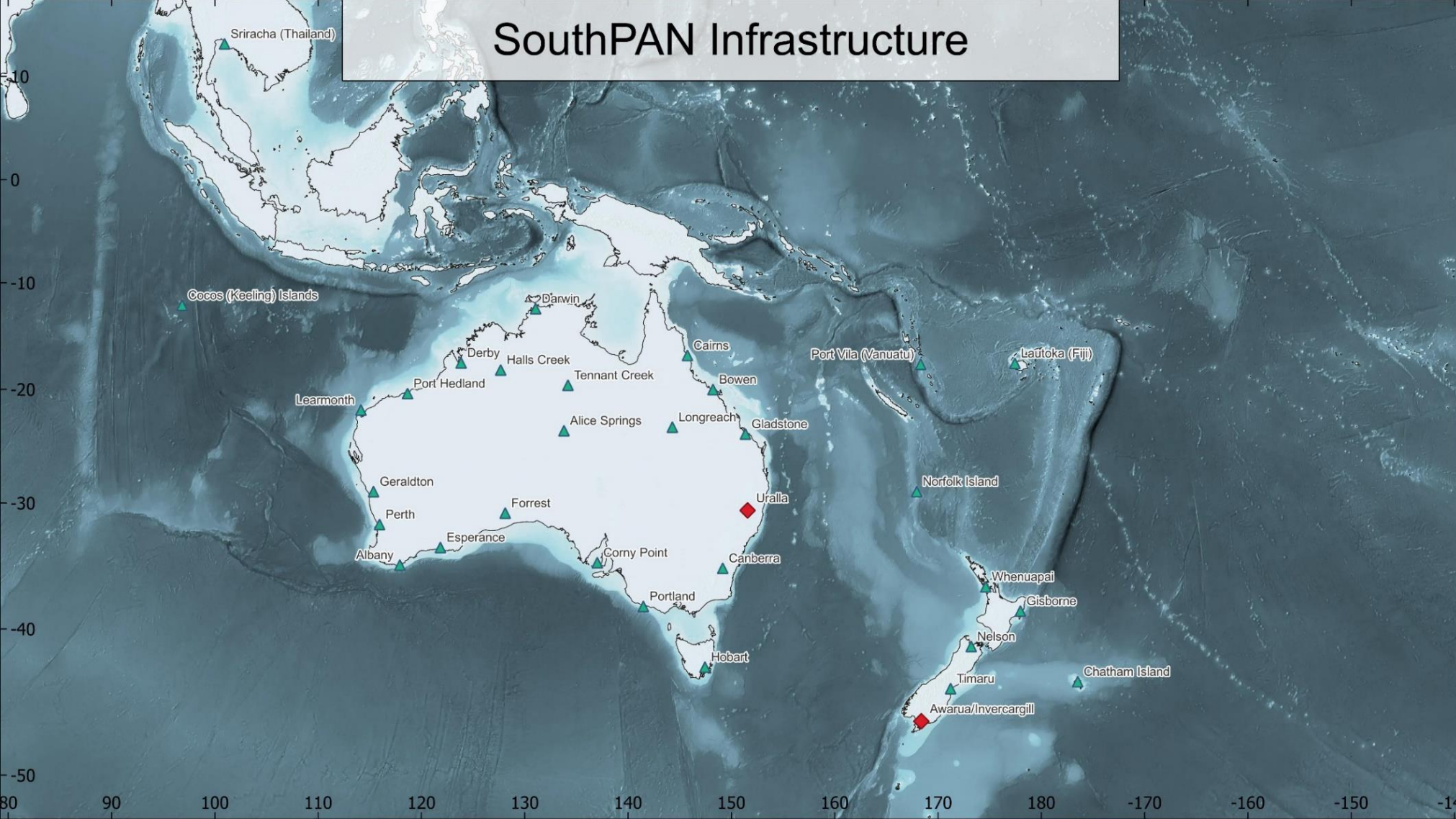




## Future Development (1)

- System design: Critical Design Review mid-2024
- 35 ground stations constructed
- 2 uplink centres in Australia and New Zealand
- 2 new SouthPAN GEO Payloads
- New navigation signal on 1,207.14 MHz

# SouthPAN Infrastructure



**Legend**

- ◆ Uplink / Processing Centres
- ▲ GNSS Reference Stations (Customer and Contractor)

Bathymetric data from  
© GEBCO Compilation Group (2020) GEBCO 2020 Grid  
(doi:10.5285/a29c5465-b138-234d-e053-6c86abc040b9)



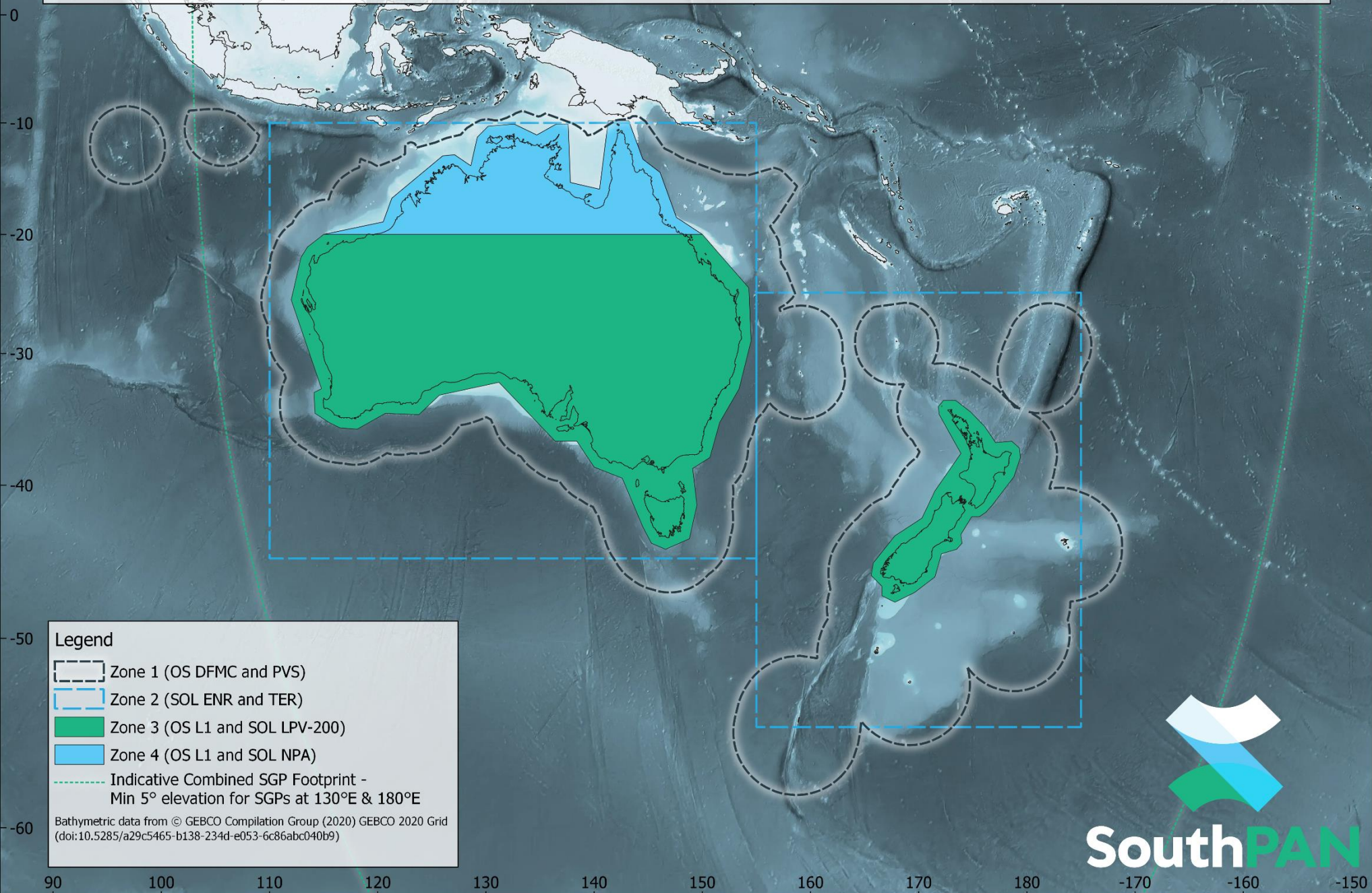
## Future development (2)

Milestone	Description	Timing
Initial Operating Capability 95	Commencement of early services using existing infrastructure Open services only	Q3 2022
Initial Operating Capability 99.5	Additional infrastructure will be integrated into the SouthPAN system, improving accuracy and availability Open services only	Early 2024 <i>(indicative)</i>
Initial Operating Capability 99.9	Additional infrastructure will be integrated into the SouthPAN system, improving accuracy and availability Open services only	Late 2026 <i>(indicative)</i>

## Future development (3)

Milestone	Description	Timing
Introduction of new navigation signal	A new satellite will include functionality for a new navigation signal on 1207.14 MHz, which will be used for the PVS service Open services only	Late 2027 <i>(indicative)</i>
Initial Operating Capability 99.9 with safety-of-life services	Following a safety assessment, SouthPAN will be certified for use in safety-of-life applications Open services and safety-of-life services	Early 2028 <i>(indicative)</i>
Full Operating Capability	The final satellite will be integrated into the SouthPAN system, providing the maximum level of service availability Open services and safety-of-life services	Late 2028 <i>(indicative)</i>

# Southern Positioning Augmentation Network (SouthPAN) Coverage



**Legend**

- Zone 1 (OS DFMC and PVS)
- Zone 2 (SOL ENR and TER)
- Zone 3 (OS L1 and SOL LPV-200)
- Zone 4 (OS L1 and SOL NPA)
- Indicative Combined SGP Footprint -  
Min 5° elevation for SGPs at 130°E & 180°E

Bathymetric data from © GEBCO Compilation Group (2020) GEBCO 2020 Grid  
(doi:10.5285/a29c5465-b138-234d-e053-6c86abc040b9)



## Further information

- Contact details
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  - [southpan@linz.govt.nz](mailto:southpan@linz.govt.nz)
- Websites
  - [www.ga.gov.au/southpan](http://www.ga.gov.au/southpan)
  - [www.linz.govt.nz/southpan](http://www.linz.govt.nz/southpan)

Service definition document available on above websites

IGNSS



# IGNSS2022

7 - 9 December 2022 | UNSW Sydney

