FIRE + RESCUE

FACILITATING TRIALS OF RADIONAVIGATION-SATELLITE SERVICE (RNSS) REPEATER DEVICES IN ROAD TUNNEL NETWORK

# RESPONSE TO THE CONSULTATION PAPER

WE ARE
FIRE AND RESCUE
NSW AND WE ARE
PREPARED FOR
PREVENTION
AND EDUCATION.
FIRE.
RESCUE.
HAZMAT.
PROTECTING THE
ENVIRONMENT.
COUNTER TERRORISM.
NATURAL DISASTER AND
HUMANITARIAN RELIEF.
MEDICAL RESPONSE.
ANYTHING.

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# EXECUTIVE SUMMARY

The New South Wales Government has established a transport infrastructure strategy to support the economic and populous growth of the state through to 2056. This strategy includes a road network that is expected to produce another 60kms of integrated tunnels to move vehicles rapidly around Sydney. This poses challenges for the emergency services within New South Wales.

Fire and Rescue NSW (FRNSW) has identified a key challenge while operating in the tunnel network because of the absence of Radionavigation Satellite Systems (RNSS), which is used by the agency in various ways as part of their emergency operations. These challenges have been identified as primarily being:

- **Diminished response of the closest emergency vehicle** as the agency's Automatic Vehicle Location system relies on Radionavigation Satellite Systems, which do not naturally function within closed environments.
- **Potential safety implications for firefighters** as the loss of functionality with the Automatic Vehicle Location system diminishes the agency's accountability of personnel that are travelling or operating within the tunnel environment.
- **Potential safety implications for the community** as drivers risk exhibiting unsafe driving behaviours when navigating through areas that they are unfamiliar with, or may be disorientated (given the nature of the extended and closed environment), especially in the absence of their turn-by-turn navigation system that primarily relies on Radionavigation Satellite Systems.
- **Wayfinding for firefighters will be compromised** especially as they respond under emergency conditions through the road tunnel network and are travelling from parts of Sydney that do not frequent the tunnels.

These challenges can be overcome using equipment to augment the natural absence of RNSS, such as Simulators or Repeaters. An analysis has identified that this has not been done in any other jurisdiction internationally or domestically, although it is something that can be theoretically achieved through a series of trials of existing technology that can be adapted which are currently prohibited under *the Radiocommunications (Prohibited Device) (RNSS Jamming Devices) Declaration 2014*.

FRNSW supports the proposition put forward in the *Facilitating trials of radionavigation-satellite service (RNSS) repeater devices in road tunnel networks Consultation Paper,* but proposes three aspects for consideration:

- The terms of the Declaration should be expanded to include 'any other underground or closed environment that is naturally a RNSS-denied location as this technology stands to be adapted to other environments as technology and legislation permit'. An example of another suitable environment may include rail tunnels.

- Regulatory and legislative compliance should be achieved through apparatus licensing, as it would be beneficial for emergency services and other segments of the community to know where this equipment is being used, especially where the functional experience of a RNSS Repeater or Simulator may be different to the real RNSS.
- The technical guidelines should consider the evolution of RNSS as there are emerging systems and standards that may be prevented or limited.

# INTRODUCTION

FRNSW is the New South Wales State Government agency responsible for the provision of Fire, Rescue and Hazardous Material (Hazmat) services in cities and towns across the state under the *Fire and Rescue NSW Act 1989* (NSW), the *State Emergency and Rescue Management Act 1989 (*NSW) and other related legislation. FRNSW is one of the world's largest urban fire and rescue services and is the busiest in Australia. Our overriding purpose is to protect the irreplaceable.

FRNSW use state-of-the-art and mission-critical technology to support frontline firefighters in their daily operations. This includes the use of location-aware technology for various purposes but most notably, the dispatch of the closest and most appropriate fire appliance to an emergency. This and most other location-aware technology relies on RNSS, which only functions correctly in open spaces. However, this faces limitations and challenges as critical infrastructure is built in closed or underground environments across New South Wales.

The New South Wales Government has launched the Future Transport 2056 strategy, which includes the Greater Sydney Services and Infrastructure Plan. This plan is set to meet the growing needs of mass transport across Sydney, ahead of population and demand growth especially with the establishment of the Western Sydney Airport. Working alongside Transport for NSW, it has been identified that there will be a significant growth in the development of road tunnels. This is expected to bring unique challenges for the State's emergency services, including their ability to respond to emergencies. The continued operation of RNSS technology in closed environments is essential for the safety and efficiency of the emergency services.

As the Australian Communications and Media Authority (ACMA) seeks to amend the legislation, Fire and Rescue NSW wishes to respond to the Consultation Paper titled "*Facilitating trials of radionavigation-satellite service (RNSS) repeater devices in road tunnel networks*" dated May 2020.

This response seeks to:

- Provide context as to the need for RNSS within New South Wales road tunnels.
- Outline the approach proposed by New South Wales in addressing this technical challenge of reproducing RNSS within road tunnels.
- Provide feedback to the 'Options to Facilitate Use' set out in the Consultation Paper.

# TRANSPORT INFRASTRUCTURE IN NEW SOUTH WALES

The New South Wales Government's Future Transport 2056 strategy is set to support the population and economic growth of the State and builds on the success of already-established transport infrastructure. The underlying Greater Sydney Services and Infrastructure Plan looks to provide access to jobs and services within 30 minutes by public transport to their nearest metropolitan city centre, for which there will be a further three in addition to the Sydney CBD. Consequently, this includes the development of a road network that will see the construction one of the largest road tunnel networks in the world, known as the Sydney Integrated Road Tunnel Network (SIRTN). Upon completion, this will result in an additional 60kms of additional road tunnels.

This strategy does not simply focus on mass transport but looks to embrace new technologies including Connected and Autonomous Vehicles (CAVs) and make more effective use of alternate fuel vehicles. Similarly, it will seek to embrace alternate business and service models including Mobility as a Service as well as on-demand transport services.

# THE CHALLENGE FOR FIRE AND RESCUE NSW

Although the new road infrastructure poses significant benefit to the people and economy of New South Wales, it poses a number of challenges to FRNSW's emergency response operations.

## Diminished Response of the Closest Emergency Vehicle

FRNSW dispatch the closest and most appropriate available fire appliance to a reported emergency, whether the fire appliance is at a fire station, returning from another emergency or simply mobile. The closest fire appliance is determined by the agency's Automatic Vehicle Location (AVL) system. FRNSW's AVL and other location services systems use industry standard technology, which rely on the RNSS technology. The limitation is that RNSS does not typically work underground. This is not a problem with the existing road tunnel networks in New South Wales, as they are approximately 2-3 kms long and have a limited number of ingress and egress portals. However, this is not the case with the SIRTN.

As the SIRTN will be a major transport corridor, there is a high probability that FRNSW vehicles will be travelling through one of the tunnels at any given point in time. Without RNSS technology being available then FRNSW's emergency dispatchers will be unable to identify the location of any FRNSW vehicle travelling through the SIRTN and therefore, they will not be able to dispatch that vehicle to an incident even if that vehicle is the closest and most appropriate available resource.

In accordance with the requirements of section 11 of the *Fire and Rescue NSW Act 1989*, FRNSW personnel have a statutory obligation to proceed to an incident in the quickest possible time and by all possible means to reduce the risk to life or damage to property. Anything that delays the FRNSW closest response capability is likely to increase the risk to life and property. In addition, any delay in FRNSW intervention is highly likely to require deployment of a significant number of resources to manage an emergency incident to bring resolution to the situation.

## Potential Safety Implications for Firefighters

The inability of FRNSW to use AVL potentially increases the time to incident due to a diminished closest vehicle response capability, putting the surrounding community at an increased risk for longer as they await the arrival of FRNSW. Further to this, the loss of AVL functionality reduces the ability of FRNSW to provide accurate and timely information to other attending emergency services, the community and the Government.

FRNSW Incident Commanders have a statutory duty under the *Work Health and Safety Act 2011* (and its Regulation) to manage risks that may compromise the health and safety of firefighters during an emergency incident. The use of AVL and the subsequent ability to positively identify the location of FRNSW resources, both deployed and enroute, assists FRNSW to meet its statutory obligations to its employees.

## Potential Safety Implications for the Community

Motorist now rely heavily on turn-by-turn navigation technology to navigate and to assist in foreseeing their route. Without the availability of RNSS, many of the turn-by-turn technologies will be unusable, leaving drivers to rely solely on signage in unfamiliar locations. Limiting the availability of timely information to drivers will increase the likelihood of motor vehicle exhibiting unexpected driving behaviours such as unexpected slowing or sudden lane changes.

The availability of RNSS technology in the SIRTN is likely to reduce the number of motor vehicle incidents within the tunnel network by providing accurate and foreseeable wayfinding directions for motorists.

## Compromised Wayfinding

RNSS is often used by FRNSW to enhance wayfinding when responding to an incident. FRNSW crews can be deployed over a wide geographical area, thus crews who are not familiar with the SIRTN could be deployed to an incident within the network. This issue is compounded by the length of the SIRTN (once complete) as well as the network's multiple entry and exit points. If an incident were to occur within the SIRTN or when a FRNSW resource is required to travel through the network to procced to an incident, the use of RNSS would reduce the likelihood of

unfamiliar crews becoming disoriented whilst responding to the incident, thus reducing response time.

Furthermore, the length and number of portals in the new tunnel network stands to pose a navigation challenge for motorists. There is an increased risk that motorists who experience challenges or confusion in navigating the tunnel network will demonstrate riskier behaviour and likely to result in a higher number of motor vehicle accidents.

### Future Technologies Considerations

FRNSW continues to explore emerging technologies to assist with the dispatch to, and management of emergency incidents. Much of these technologies now rely on the use of RNSS. As an example, Advanced Mobile Location (AML) will automatically locate and provide the position of a mobile phone from which an emergency number is dialled. This assists the emergency services call taker to accurately locate the caller, thus improving the response time. Such technology could dramatically improve response to an 'in tunnel' incident, especially since the caller is likely to be panicked and unable to provide a detailed location whilst in the tunnel network.

## ADDRESSING THE CHALLENGES

FRNSW together with Transport for NSW has formed a Working Group that includes NSW Police Force, Ambulance Services for NSW, and NSW Telecommunications Authority to address the technical and operational challenges with emergency services arrangements with the SIRTN.

The NSW Working Group has identified that any approach that does not include a technological solution will have limited operational benefit.

### Technology Options

Governments and tunnel operators around the world, especially those in Europe, Asia and North America, have been unable to address the seemingly common challenge of RNSS not being available in the underground environment. This is either because RNSS rebroadcast technology is illegal to own or operate; or require above-ground antennas, which need to be immediately above the position it is reproducing a signal for. This can often be in the middle of waterways or buildings.

Some jurisdictions have resorted to using non-RNSS technologies to provide location services, however many are proprietary which are not supported in the mainstream or unsuitable mission-critical environments. One of the popular emerging technologies is the Waze Beacons developed by Google. These are low-cost devices that rely on Bluetooth technology. The Waze Beacons have been deployed in tunnel networks in New York City, Chicago, Paris, Rio, Brussels, Oslo, Boston, Mexico City as well as Sydney's WestConnex tunnel. However, this technology is only compatible with the Waze or Google Maps smartphone applications.

## The Chosen Approach

The Working Group has determined anything that does not support RNSS is not sustainable for NSW emergency services. A reason for this is most of the available location-aware technology that is used for mission-critical purposes requires RNSS. Other alternatives are either proprietary or are not suitably robust for the mission-critical environment.

Consequently, there is an opportunity to work with private industry to assess the suitability of a network of RNSS Simulators as an approach to addressing the challenges. This technology is not typically deployed in this manner, hence what makes this an innovative initiative and requires an opportunity to prototype the unique use case for this technology, in a manner that does not interfere with existing RNSS networks.

The proposed roadmap developed by the Working Group will see this technology prototyped in three stages, before any potential mass rollout. The first phase is to assess the technology in a roadway tunnel during a single scheduled road tunnel closure, with the objective to determining the feasibility of the RNSS Simulators as a solution and the functional performance of the emergency services' technology with these simulators.

The second phase will further assess the technology in a roadway tunnel during a single scheduled road tunnel closure, with the objective of further refining the technology approach and determining the technology's suitability for a public evaluation. The third and final phase is to carry out a pilot in an operational tunnel for a period of time, which is yet to be determined. This will look to validate the lessons from the previous two phases, before a mass rollout is sought.

# PROPOSED APPROACH TO FACILITATE USE

FRNSW support the proposition put forward in the Consultation Paper. This section seeks to provide FRNSW's position on the proposed Options to Facilitate Use while providing input to other aspects for consideration.

## Limitation of Road Tunnels

While the immediate focus of the RNSS retransmission by the NSW emergency services is for use in road tunnels, this technology has uses in other underground environments and closed environments, which are expected to be further developed as legislation and technology permit. For example, underground railway stations and rail tunnels are frequented by emergency services. As it is imperative that emergency service organisations maintain accountability of emergency service personnel, the use of RNSS technology in that environment allows for the location of emergency personnel to be technological determined.

It is therefore, suggested that any change to regulation and legislation not be limited for use in road tunnels but expanded to any RNSS-denied location.

## Regulatory and Legislative Compliance

The ACMA Consultation Paper outlines Options to Facilitate Use with respect to legislation and regulation. It is FRNSW's position that as a long-term arrangement that *Option 2 - Amend the Declaration and develop long-term licensing arrangements* is implemented. However, due to the lengthy process that is involved in establishing apparatus licensing arrangements then *Option 3 — Amend the Declaration and authorise trials through scientific licensing* be adopted until an apparatus licensing arrangement are in place.

FRNSW acknowledge the benefits that apparatus licensing arrangements pose to ACMA and the broader community. Similarly, it will aid our operation of location-aware technology in knowing all instances where RNSS Repeaters have been implemented, especially where RNSS Repeaters are likely to produce an experience that is not consistent with true RNSS services. Conversely, the timelines required for establishing apparatus licensing arrangements is expected to prevent New South Wales in undertaking the necessary technology assessments and research required to progress to a mass rollout of this technology in a timeframe that will coincide with the opening of new road tunnel projects.

Operational RNSS Repeaters are required to be implemented in the WestConnex tunnel by the time it reaches Phase 3, which is expected to occur in 2023. When compared to the current roadmap for deploying RNSS into New South Wales road tunnels, a further two years of testing, development and mass rollout planning is needed. This requires an authorisation from the ACMA by August 2020 in order to reach that timeline. Without this, the New South Wales emergency services will increasingly face the aforementioned challenges in responding to emergencies within and around the tunnel network.

For this reason, FRNSW propose that the issuance of scientific licensing be an instrument for trials and analysis until apparatus licensing arrangements are established. Following this, the need for scientific licensing of RNSS Repeaters is recommended to be superseded.

## Compliance with Technical Parameters

FRNSW supports the ACMA's proposition of complying with international standards, including those stated in the Consultation Paper.

With respect to the frequencies used, it is our position that any technical guideline should make provision for the evolution in RNSS technologies. For example, the American-owned Global Positioning System (GPS) is currently the most popular system in many regions around the world. However, the Russian GLONASS system is a comparative alternative that is rapidly increasing in popularity, with emergent systems similarly gaining popularity like the European Union's Galileo system. While many of these systems utilise a similar frequency range, it is not inconceivable for other RNSS technology to utilise other frequency ranges.

# CONCLUSION

The SIRTN looks to provide considerable benefit to the state of New South Wales. However, this poses challenges to the emergency services, which cannot be overcome without the implementation of RNSS Repeaters within the tunnels, which is a heavily RNSS-denied environment.

In response to the Consultation Paper, FRNSW has identified a number of aspects for consideration by the ACMA as they look to make amendments to the *Radiocommunications Act 1992* (Cth):

1. The opportunity to expand the scope of RNSS Repeaters to more than road tunnel networks and include RNSS-denied environments, as it is expected that this technology will find additional and alternate uses as it evolves.
2. The regulatory and legislative framework should consider the establishment of apparatus licensing. This will be beneficial to emergency services and potentially other users of RNSS Repeaters, especially where the experience differs from a real RNSS constellation. Additionally, it would give the ACMA greater ability to deny use in a circumstance where the RNSS Repeater operator was not complying with the established standards.
3. Scientific licenses should be issued to emergency services, road operators and other public authorities to conduct trials of RNSS Repeaters in cases that that benefit the community, while the apparatus licensing framework is being amended to include RNSS Repeaters.
4. The technical guidelines established by the ACMA should allow for technological evolution. This includes, but not limited to, the specificity of radio frequencies in which they can be operated.

# GLOSSARY

| ACRONYM | DESCRIPTION |
|---|---|
| ACMA | Australian Communications and Media Authority |
| FRNSW | Fire and Rescue NSW |
| GLONASS | GLObal NAvigation Satellite System |
| GPS | Global Positioning System |
| SIRTN | Sydney Integrate Tunnel Network |

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