The Department of Transport and Main Roads (TMR) Spatial Labs 2022

Information webinar – Call for proposals

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FRONTIER SI

Queensland Government

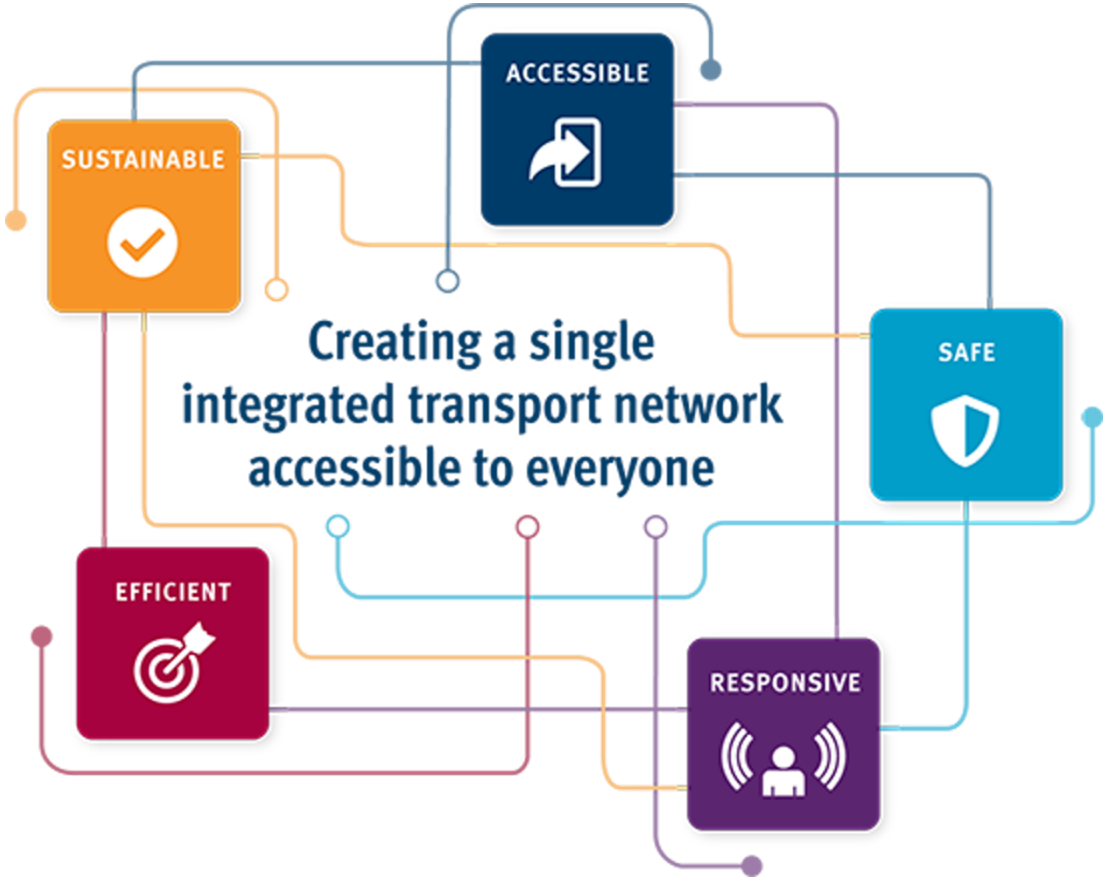
About us

Agenda

Purpose: To help organisations who would like to apply for an TMR Spatial Labs 2022 project understand the drivers behind the program and the individual challenges.

1. Introduction to TMR and FrontierSI
2. TMR Spatial Labs Overview
3. Challenge topics explained
4. Live question and answer

TMR Strategic Plan 2019-2023



TMR Spatial Labs 2022 will play a role in achieving this vision

FrontierSI

FrontierSI is a partner driven, not-for-profit, applied spatial research center that exists to build spatial capabilities and deliver major benefits to governments, industry and the community in Australia and New Zealand.

Capability Areas

- Geodesy
- Positioning
- Spatial data infrastructures
- Analytics

Work across numerous sectors

Vision

The TMR Spatial Labs 2022 program aims to identify innovations for TMR to access timely, efficient, accurate, and sustainable data and insights to support state-wide planning and decision-making, and enable future focused smart, connected and autonomous infrastructure, networks and vehicles.

What is TMR Spatial Labs 2022?

- Challenge-based approach to industry innovation and capability.
- FrontierSI delivering the program.
- Focus on machine learning and Artificial Intelligence (AI) analytics to extract insights from remotely sensed data to address challenges and gaps.
- Four $50,000 projects available – Three to four months in length:
  - Two in first half of 2022
  - Two in second half of 2022.

What are we seeking in proposals?

- Clear statement of proposal objectives.
- Description of the timeframes, phases and deliverables.
- Demonstration of innovative capabilities, techniques or approaches to challenge topics.
- Technology that has a potential path to operational use.
- Communication strategy of how TMR will be engaged.
- Provision of a future vision of ‘next steps’ after the completion of the challenge to further advance the technology:
  - Proposals should focus on Proof-of-Concept stage, rather than the operational testing stage.

What’s in it for you?

- Funding to demonstrate your technology in a TMR context.
- Opportunity to demonstrate and present capability.
- Access to specific TMR data to develop Proof-of-Concept.
- Access to advice and program management from FrontierSI.

Provided data

Datasets available at multiple scales centered around a case study area in South-east Queensland (the RACQ Mobility Centre and a section of Mount Cotton Road next to the center):

- Drone imagery (visual, hyperspectral and thermal)
- LiDAR (Drone, Static, Aerial and MLS)
- Georeferenced images from a vehicle (7 angles)
- Aerial imagery (10-20cm resolution)
- Satellite imagery (RGB 80cm resolution)

Applicants are welcome to bring additional datasets when addressing *Challenge Question 4.*

Challenge questions

Challenge Topic One: How many can you get?

Extracting road surface, asset and surround datasets from high-resolution remote sensed data

How many quality derivative datasets can you extract from the provided datasets to augment TMR's existing transport network data in a reliable, timely and automated way?

TMR is seeking demonstrations of novel approaches of using AI/ML to extract information and insights about what's on the road, around the road and in the road corridor from very high-resolution imagery products.

Potential examples include:

- Recognising to a high degree of confidence lane connectivity at intersections, including possible movements, stop bars, etc.
- Automating the detection of the number of usable lanes, including the width of sealed road surfaces and the position of line markings
- Identifying and classifying various assets surrounding the road, including poles, street signs, footpaths and gutters, buildings, and trees
- Detecting defects in the road surface such as cracks or potholes

Challenge Topic Two: To infinity and beyond

Extracting data from lower-resolution remote sensed data using ML models trained on high-resolution data

How effectively can you scale up the extraction of information and insights about what's on the road, around the road and in the road corridor for a larger area, and how good is the data, really?

TMR is seeking demonstrations of novel approaches to the creation of derivative products trained on very high-resolution data which can be applied to generate these same derivate products from lower-resolution aerial photography data.

Potential examples include:

- Training an AI/ML model with very-high resolution visible imagery to extract a derivative line markings dataset to 10cm resolution with 80% confidence, then applying this modelling to extract the same features from 30cm satellite visible aerial photography with 60% confidence.

Challenge Topic Three: Viva le resolution

What problems do different data resolutions create across a road network at scale?

How well can we quantify how different data extraction methodologies (including training AI/ML models for lower-resolution imagery), and image resolutions affect the accuracy and utility of derived datasets for specific use cases?

TMR is seeking a research-based investigation into the accuracy and precision limits when using AI/ML algorithms to extract enriched road information and insights at different image resolutions.

Potential examples include:

- Conceptual proposals of how to solve the problem of integrating areas of high-resolution and lower-resolution data within a smart transport network.
- Statistical exploration of the differences in the data required to facilitate safety for autonomous vehicles in urban and rural environments.

Challenge Topic Four: Seeing in the dark

Can AI/ML and non-visual remote sensed data be used to identify early warnings of road problems?

Can we detect problematic unplanned changes due to natural disasters, vegetation growth, drainage issues, subsurface changes before they become a major problem?

TMR is seeking demonstrations of novel applications of AI/ML to mine non-visual (i.e., multispectral, hyperspectral, thermal, LiDAR/point cloud, radar, other) remote sensed data to detect information and insights about the roads, and road corridor.

Potential examples include:

- Creation of a model that can detect degradation in pavement or road surface.
- Creation of a model that can map drainage patterns in the road corridor in order to predict where sinkholes might arise and to plan for flood impacts.
- Creation of a model that can map vegetation densities along road corridors to predict where areas of soil erosion might occur during high rainfall events.

What's next?

April 2022

- 8 April: proposal submission deadline
- Late April: successful applicants notified

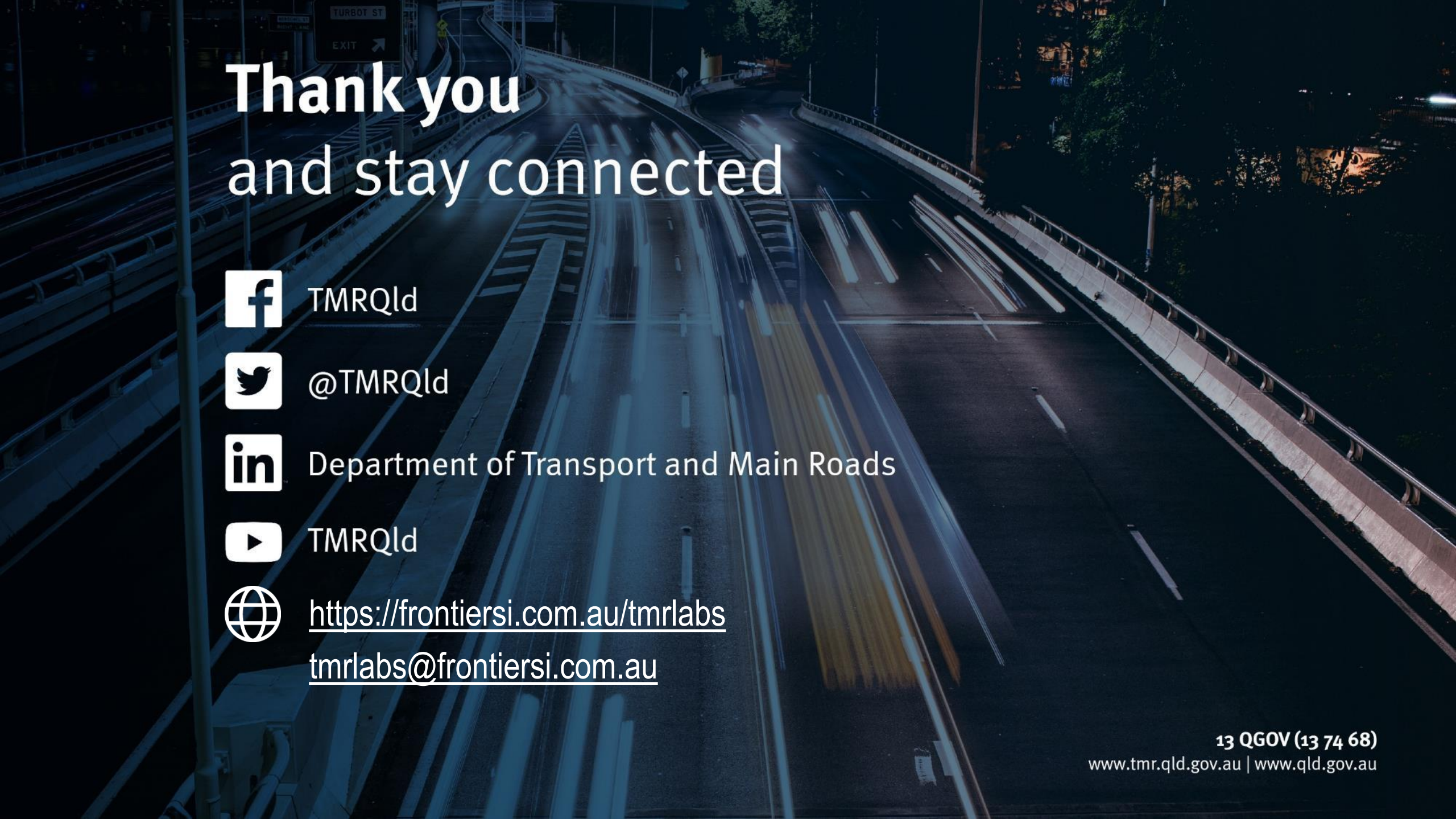
April-July 2022

- Late April: Round 1 projects begins
- Late June: Round 1 projects presentations and final reports submitted
- July: Round 1 projects formally wrap up

July-October 2022

- July: Round 2 projects begins
- October : Round 2 projects presentations and final reports submitted
- November: Round 1 projects formally wrap up.


Questions?



Thank you
and stay connected

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