Queensland Health

Baseline Mapping of Ambient Gamma Radiation Dose Rates in Queensland

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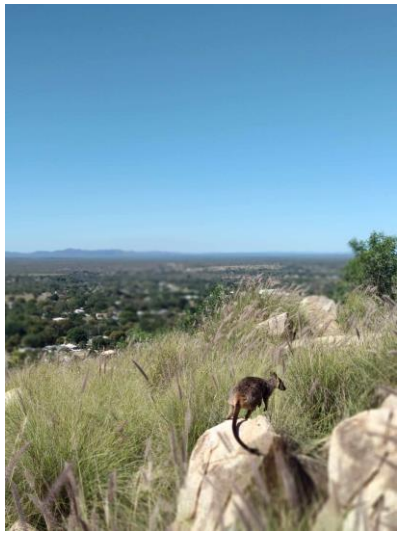
Queensland Government


SCHOOL ZONE
80
7 - 9 am
2 - 4 pm
SCHOOL DAYS


30




DAWSON HIGHWAY
Springsure
A7
CARNARVON HIGHWAY
Injune

Dear ARPS,
So far on our trip we have found:

- Since 2017 we have been mapping using our large detector
- Over 1 million individual readings across Queensland collected
- The beginnings of a baseline survey

Seaworld Drive,
Main Beach,
QLD 4217,
Australia

Image made with AI

What is a baseline survey?

Initial Data Collection	Gathering essential information about a specific area or system.
Establishing Norms	Determining standard conditions and parameters relevant to the assessment
Setting a Reference Point	Providing a benchmark for future evaluations and interventions.
Long-Term Monitoring	Facilitating tracking of changes and assessing the effectiveness of interventions.

Why Map Ambient Gamma Radiation Dose Rates?

Assess Human and Environmental Exposure

Mapping dose rates helps estimate exposure to radiation from natural and man-made sources.

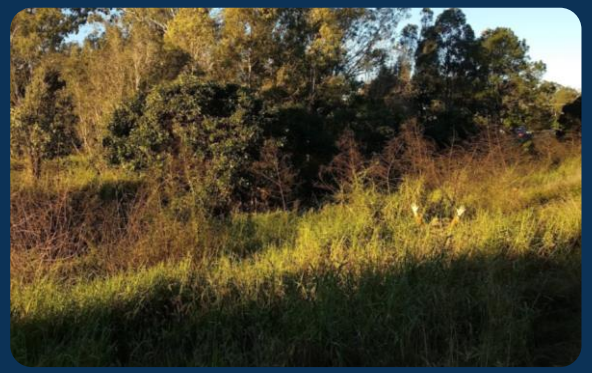
Radiological Incident Response Planning

Knowing background levels of radiation can aid response to a radiological incident.

Environmental Monitoring

Tracking radiation levels over time helps identify changes and trends, and evaluate effectiveness of remedial action.

Mapping Methods

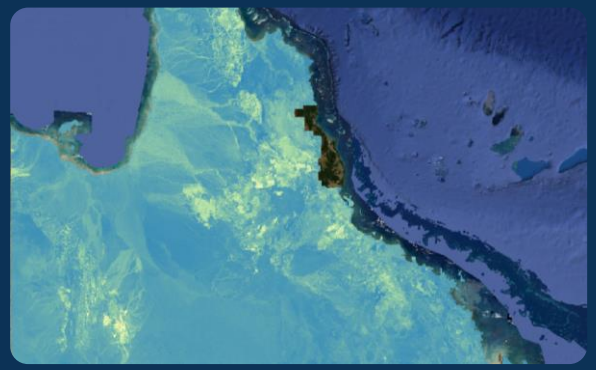


Walkover Surveys

High resolution, physically intensive

Vehicle-Based Mapping

Moderate spatial resolution, reasonable expense and effort.



Aerial Radiometric Surveys

Lower resolution, but can cover large geographic areas

Introducing “MONA": Our White Elephant

Mona:

- 2 x 4L NaI(Tl) detectors
- 1x Large GM-Tube
- Fast acquisition (up to 0.1 s)
- Spectroscopic detection
- Integrated GPS
- Long battery life

Methodology

We conducted the study by using various techniques and instruments to measure and map ambient gamma radiation dose rates across Queensland. The gamma radiation dose rates were mapped using GIS software and results were analysed using statistical methods.

Data collection

1

Collection locations and roads were mostly based on opportunity, when client work or other research projects overlapped.

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Data collection 1

Data Analysis 2

The data needed to be normalized and calibrated, for when the voltages in the system changed or change of vehicle. This was done using our large area environmental calibration pads.

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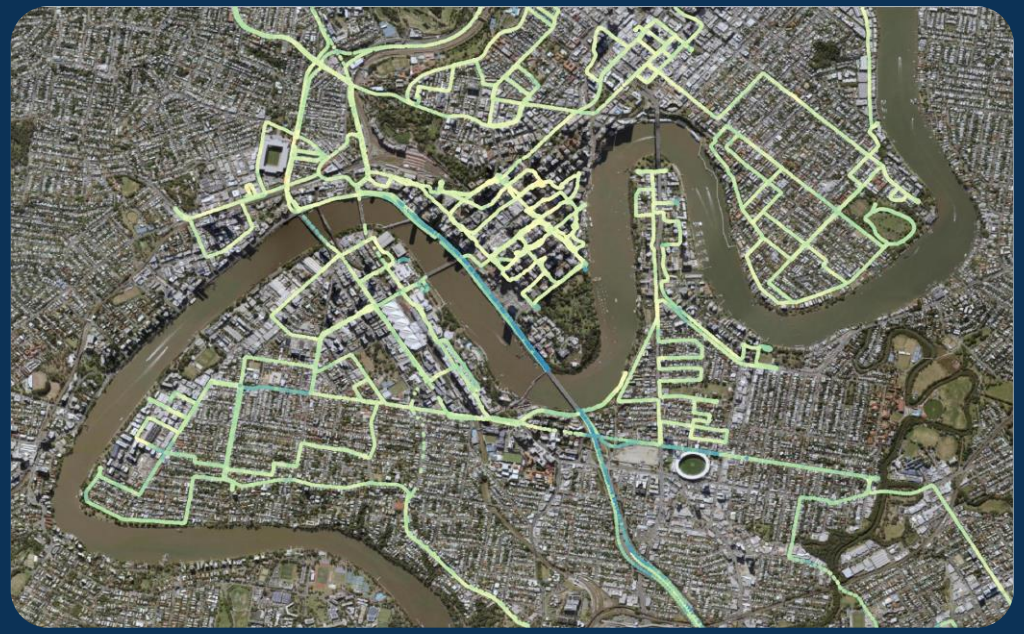
Data collection 1

Data Analysis 2

Data visualization 3

We used GIS software to map the radiation levels and run statistical analyses of the data to obtain key measures and trends.



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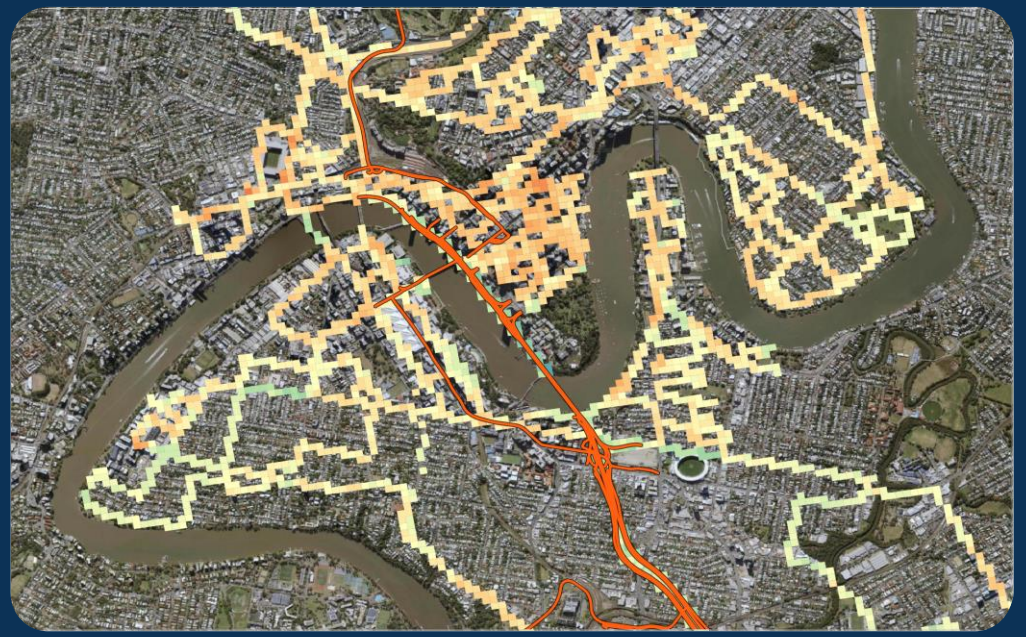
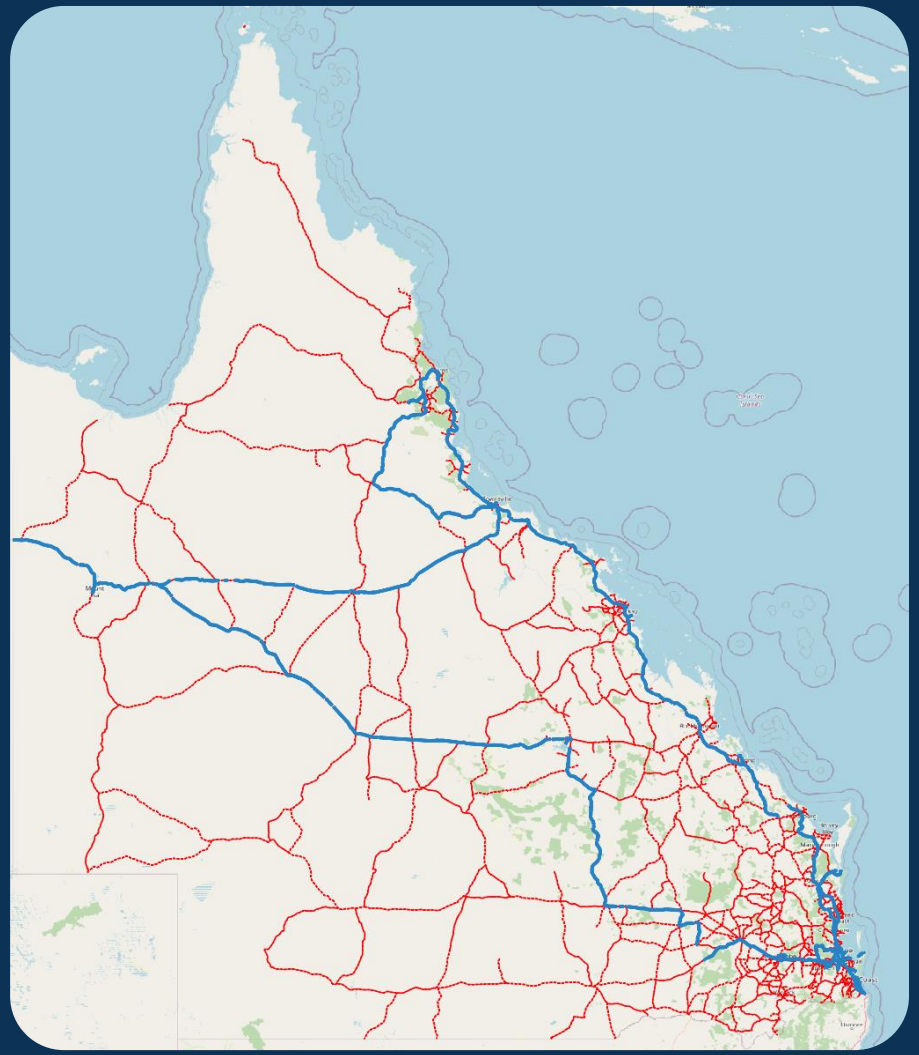
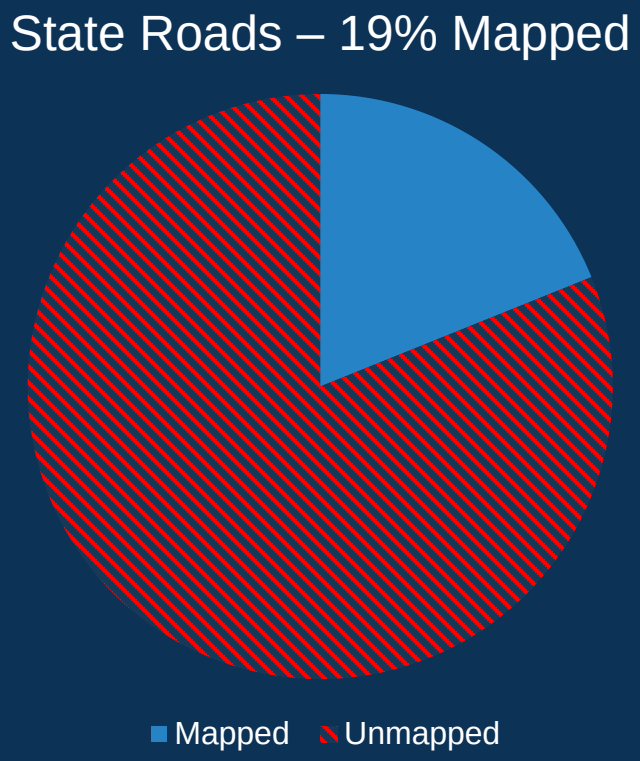


Orange - Roads in Queensland managed by the Department of Transport and Main Roads. Does not include roads managed by Local Government Authorities.

Results and Findings - Area Mapped

Results of our opportunistic mapping approach





Results and Findings

Our results show that ambient gamma radiation dose rates in Queensland vary between regions and are influenced by topography, geology, and other environmental factors.

Region	Average Dose Rate (nSv/h) 95% Confidence interval	Number of 50 m grids
All roads mapped in Qld	32 ± 11	150,993
Qld State roads mapped	32 ± 12	123,620
Local Government roads	32 ± 10	27,373

Results and Findings - no correlation

The scatter plot depicts the relationship between population density and average dose rate across various Local Government Areas (LGAs). Notably, our data currently shows **no correlation between urbanism and higher dose rate**.

And things to note! Where to next?

- We are still collecting more data with each new trip
- Collaboration of data with other organisations
- MONA preformed really well and was sensitive enough to pick geometry changes or road surface changes
- Discovery of a site that was historically impacted by mineral sands

Thank you!