



Transport Network Strategic Investment Tool (TraNSIT) – Predicting the Future of Logistics

Andrew Higgins - CSIRO

4th May 2016



www.csiro.au

This initiative has been funded through the Australian Government Agricultural Competitiveness White Paper, the government's plan for stronger farmers and a stronger economy



Outline

- Overview of TraNSIT
 - Innovations
- Informing \$100m beef roads
- Broader applications and future extensions
- Take home messages

Thanks to TraNSIT team co developers and co-authors

- Stephen McFallan, Matt Beaty
- Luis Laredo, Caroline Bruce
- Oswald Marinoni, Adam McKeown
- Peter Stone, Chris Chilcott



TRAnsport Network Strategic Investment Tool - TRANSIT

➤ Beginnings and rationale

- Initially developed for northern Australia beef in 2013
- Long distance transport and vulnerable supply chains
- Infrastructure investment could reduce costs but no way to holistically evaluate best options
 - need for independent evaluation of infrastructure investments and policy changes by government

➤ A modular transport network analysis tool that can

- Rigorously maps and optimises **every** vehicle movement
- Across the supply chain - farm - processing – market

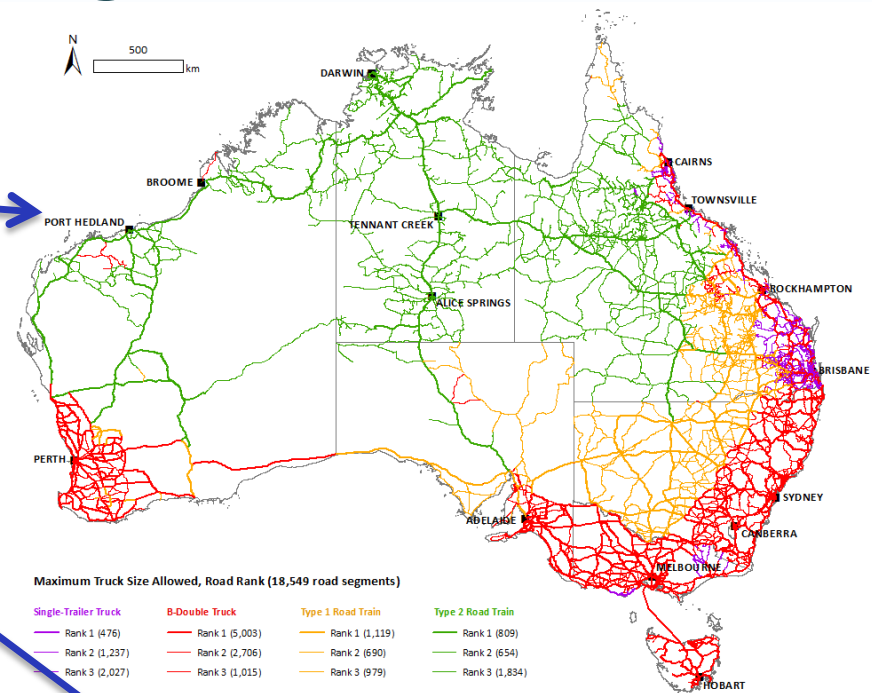
➤ Calculates transport costs of moving commodities

- Ground up road transport costing model
- Includes associated costs: food losses; driver fatigue; etc

TRANSIT Engine

Components

Network - Roads and features - Rail lines and load points
Vehicle - Types - Costs, speed limits - Optimal vehicle selection
Policy - Driver fatigue - Vehicle access
Calculation - Vehicle route optimisation



Type	Modelled cost (\$/ km) for a given travel speed				Idle cost (\$/ hr)
	100 km/h	80 km/h	60 km/h	40 km/h	
Semitrailer	1.91	2.16	2.58	3.43	119
B-Double	2.35	2.64	3.13	4.10	141
Type 1	2.71	3.02	3.54	4.57	169
Type 2	3.43	3.78	4.36	5.52	177

Semitrailer



B-Double



Type 1



Type 2



TRANSIT— Simulation of All Cattle Transport Movements

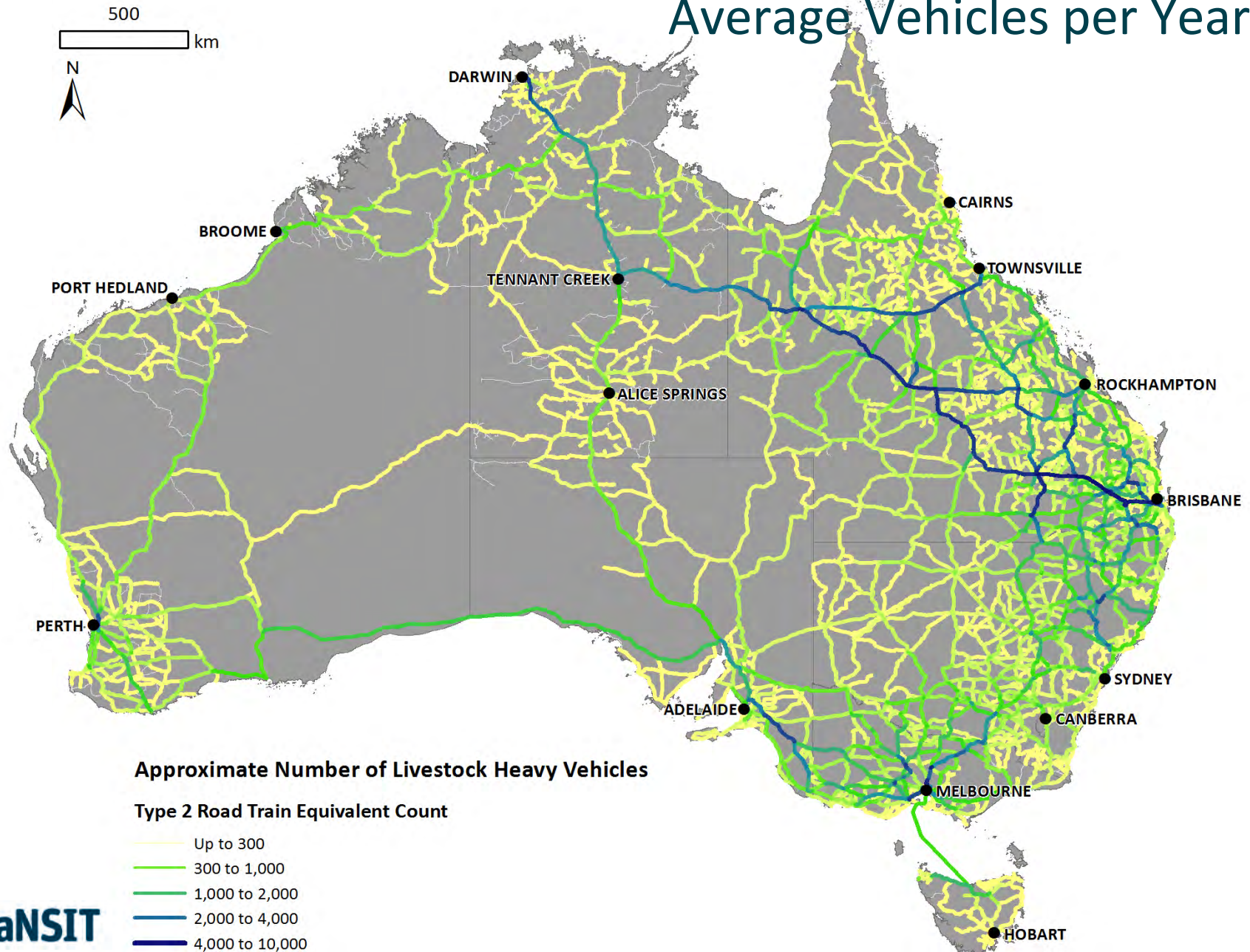


Application to Predicting Beef Logistics

- Over 20 million head of cattle transport across Australia each year
- Processed and live export supply chains
- Some of the longest distance land transport in Australia
 - Often over 1500 km from paddock to processing
 - Transport cost up to 35% of live weight cattle price
- 48,000 enterprises and 88,000 unique origin to destinations

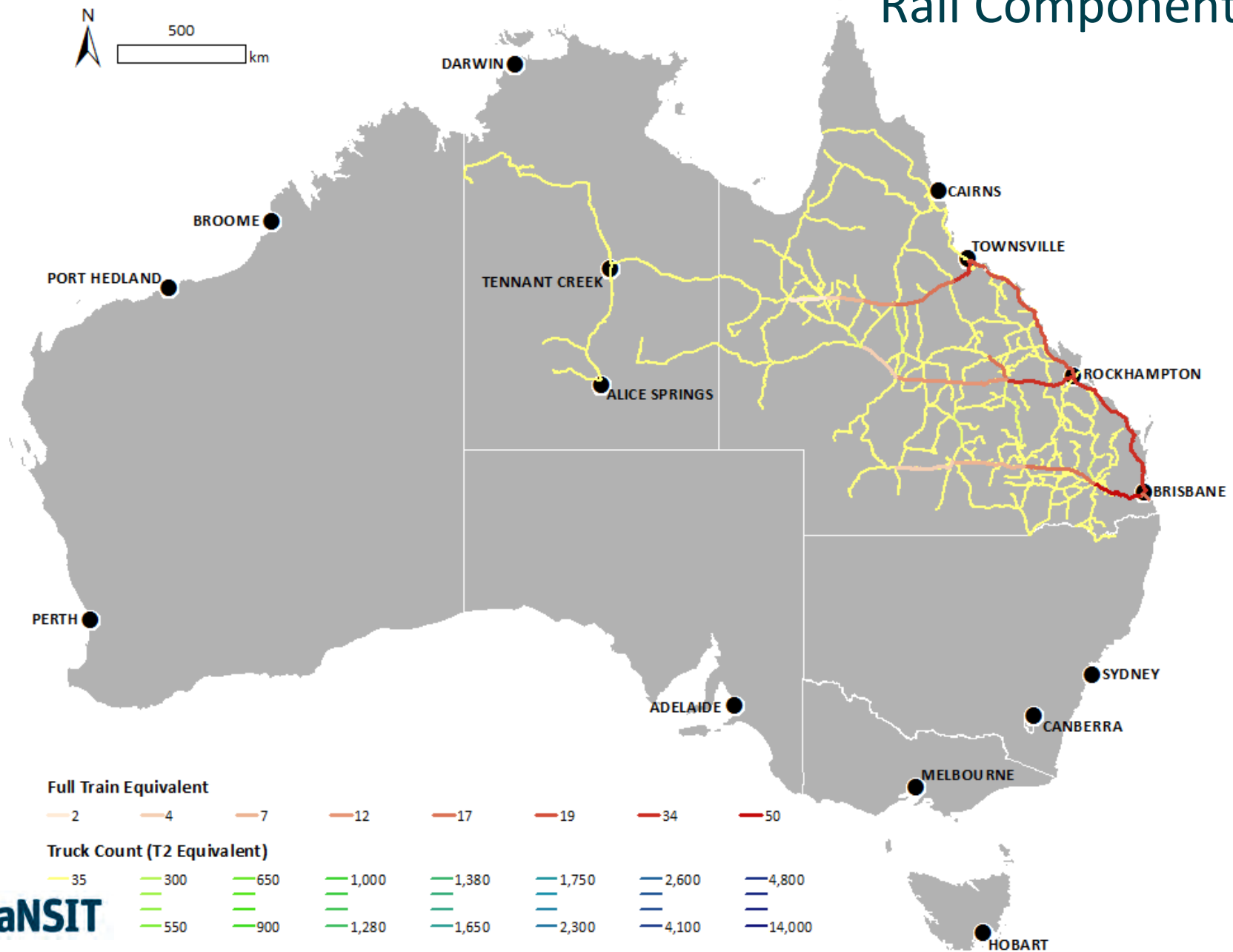
Application to Australian Livestock Transport

Average Vehicles per Year



Application to Australian Livestock Transport

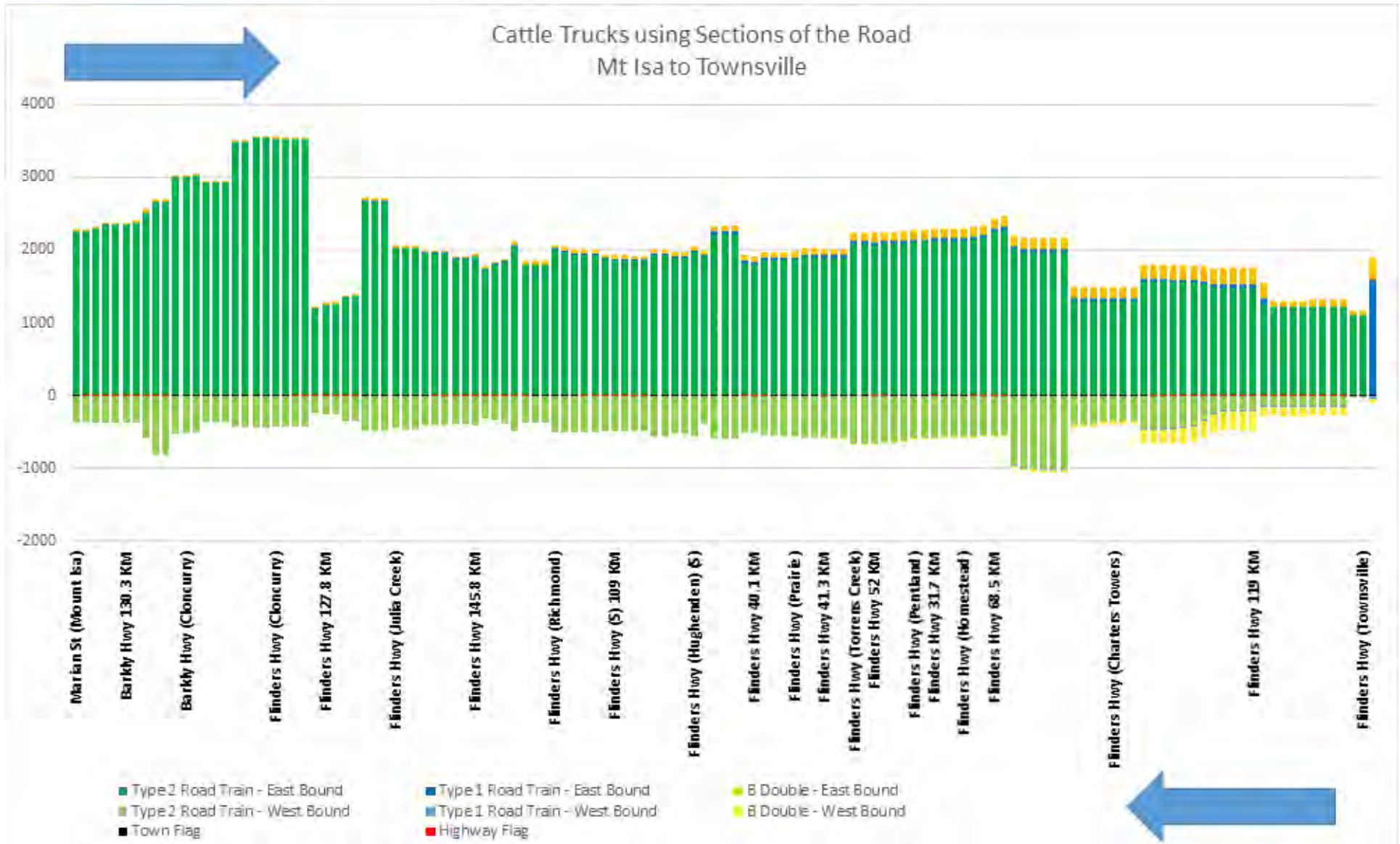
Rail Component



Baseline Livestock Transport costs

	Cost
Travel	\$209,425,033
Fatigue	\$12,126,314
Decoupling	\$6,288,947
Other costs	\$34,361,098
Total with cattle	\$262,201,393
Return journey of empty trailers	\$227,840,295
Total cost	\$490,041,689

TRANSIT - Vehicle Counts- Mt Isa to Townsville



Application to \$100 Beef Roads Programme

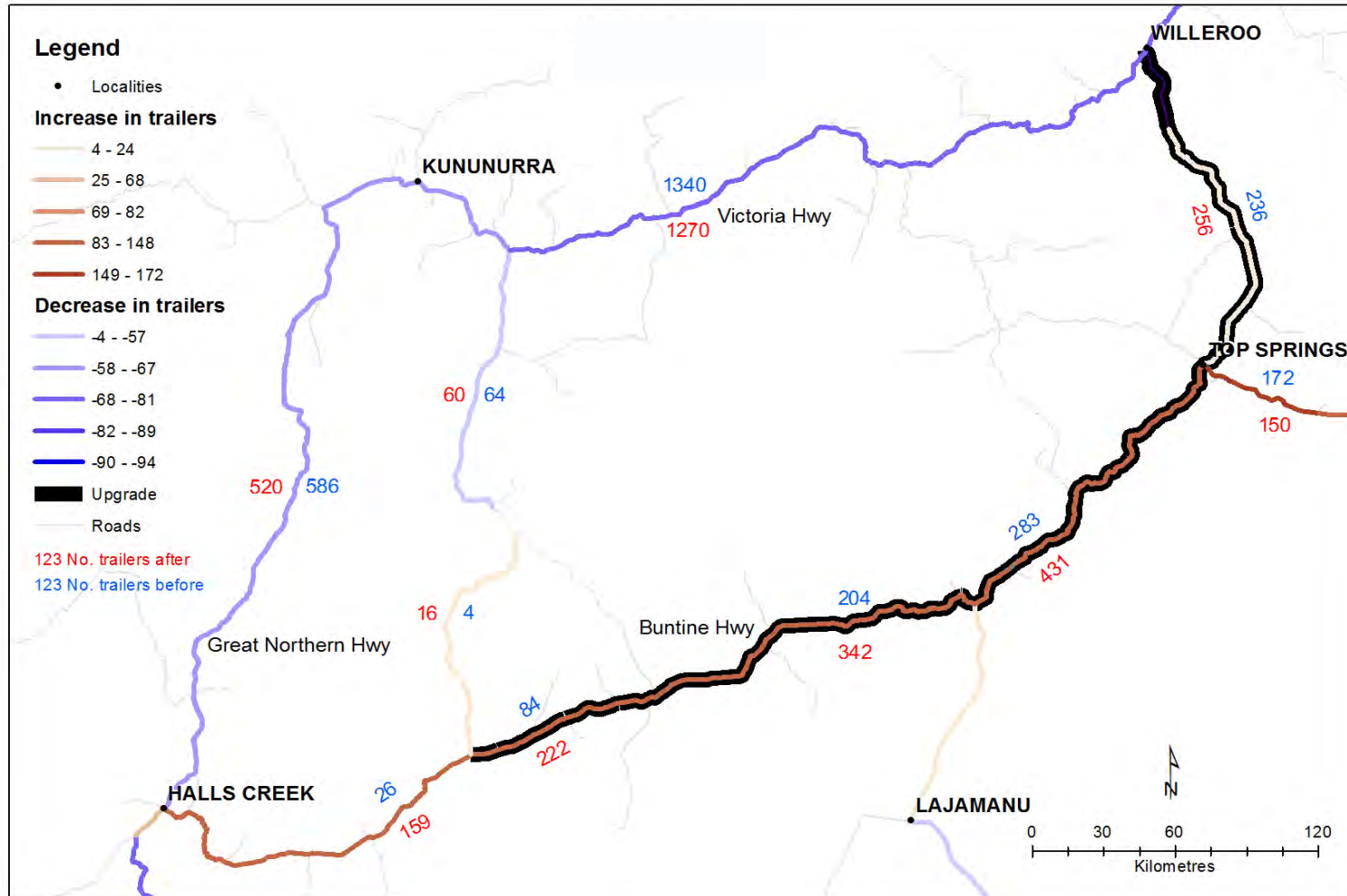
- Northern Australia White Paper Initiative
 - TraNSIT estimate transport cost savings for submissions
 - Informs Government where to target investment
- 60 road upgrade submissions
 - 40 in Queensland, 10 in NT, 6 in WA + others
 - Cost of all upgrades was about \$3 billion
 - Upgrades included: sealing of unsealed roads, widening roads, bridges, higher productivity vehicles, last mile



Queensland Submissions /1

Description	Annual savings (\$)	Annual Trailers	Trailers after upgrade	Savings per Head (\$)
Type 2 access Morven to Charleville, currently type 1	\$ 282,156			\$ 2.69
Type 1 access Biloela to Gladstone	\$ 87,858	920		\$ 0.92
Upgrade to Panorama Crossing, near Rolleston, raise bridge for reduced flooding	\$ 44,886	1524		\$ 1.22
Upgrade to Burnett Highway (Type 1)	\$ 218,689	3640	6088	\$ 1.18
Peninsula Development Road - unsealed sections	\$ 19,444	146	148	\$ 1.44
Savannah Way (Doomadgee to Burketown) sealing	\$ 37,882	914	962	\$ 1.14
Cloncurry to Dajarra road - sealing remaining sections	\$ 174,788	886	4640	\$ 1.15
Hann highway	\$ 162,126	2038	2786	\$ 1.30

Northern Territory Example - Buntine



TraNSIT can also predict future logistics from:

- New or consolidation of storage or processing facilities
- Disruption to supply chains from natural disasters and costs of contingency
- Improved rail facilities
 - Optimal use of road vs rail and where
- New road links
- Regulatory changes
 - Driver fatigue, biosecurity



Objectives of the White Paper Initiative

- Adapt to over 25 commodities
 - 95% of Australia agriculture volume transported
 - 85% of gross farm gate value (\$43 billion)
 - Widespread industry consultation
 - Progress in sugar, cotton, grains, pigs, rice, dairy, horticulture
- Baseline analysis and stakeholder workshops
 - Identify priority applications that benefit farmers and industry
 - Validate and refine analysis
- Industry adoption

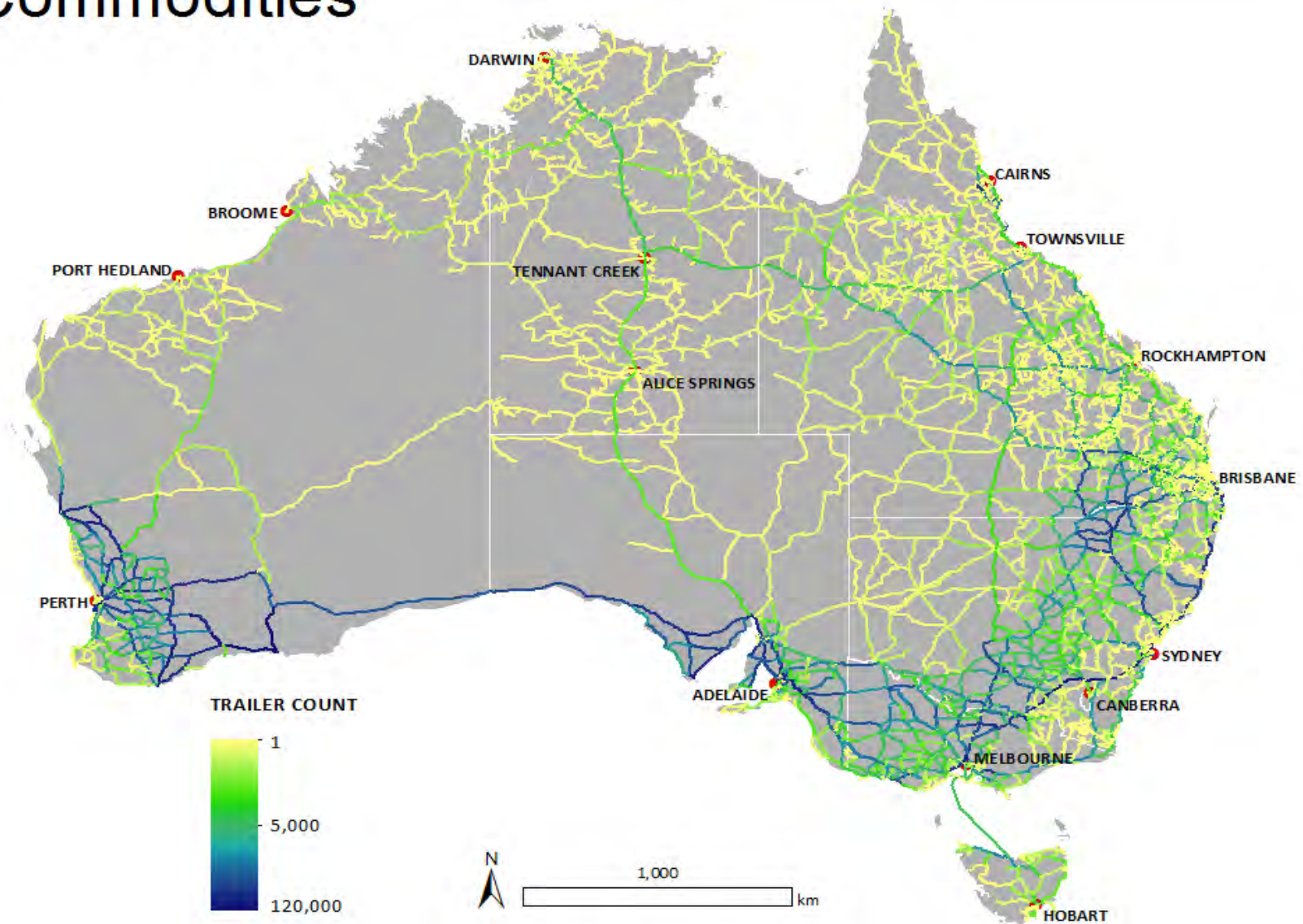
Statistics of the draft baseline analysis

- Beef, sugar, grains, dairy, cotton, pigs, rice, horticulture
 - 127 million tonnes transported from origin to destinations
 - 420,000 unique origin to destinations
 - Over 5 million vehicle trips routed
 - Rail incorporated for beef, grains, cotton and sugar
 - Total transport cost about \$4 billion
- Scope
 - To export ports or domestic consumption
 - Trips to properties, storage, processing, export, DC's supermarkets

Average Vehicles per Year – First Draft Only

Beef, Grains, Dairy, Rice, Sugar, Cotton, Pigs

All Commodities



Proposed Future Developments

- Extension to broader freight transport
 - Forestry, minerals, fuels, containerised freight, etc
- Matching climate prediction with transport movements
- Application in South East Asia
 - Beef and horticulture transport in Vietnam, China, Laos
 - Mapping Australia cattle to international markets
- Technical
 - Broader transport costs
 - Effect of unsealed or narrow sealed roads on
 - Safety, environmental
 - User friendly version
 - Web based with licenses for users



Game Changing Innovations and Capabilities

- Largest and most detailed transport optimisation tool ever built for agriculture freight movements
 - Over 5 million vehicle trips per year and expanding
 - Over 150,000 enterprises and 420,000 O-D combinations
 - Custom build road and rail layer
 - Data provided by freight companies improve model predictions
- Predicts knock-on impacts across entire freight network
 - From infrastructure investments
 - From future growth and production scenarios
- Changed how Government prioritise road investments
 - Informed \$100 million northern Australia beef roads programme

For further information contact

Andrew Higgins

CSIRO Land & Water

07 3833 5738

Andrew.Higgins@csiro.au

<http://www.csiro.au/en/Research/LWF/Areas/Landscape-management/Livestock-logistics/TRANSIT>

This initiative has been funded through the Australian Government Agricultural Competitiveness White Paper, the government's plan for stronger farmers and a stronger economy

