

*Drive-in drive-out workforce:  
Extent, impact and solutions.*

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# Overview

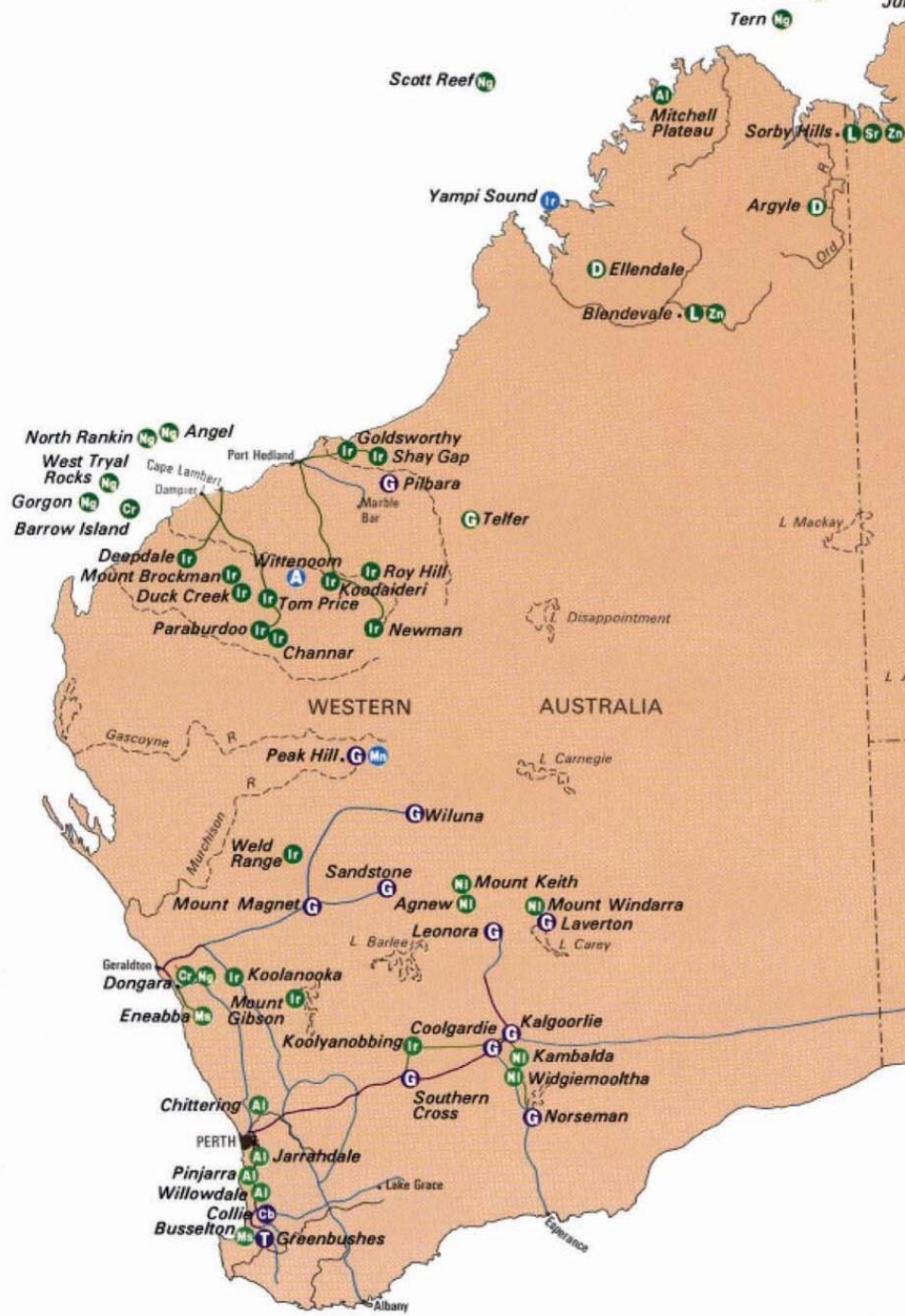
- Why we have a problem in transport?
- What do we know about Long Distance Commuting in Central Queensland
  - Extent
  - Impact
- Solutions
  - Journey management plans
  - Are we rational creatures?

# Why we have a problem in transport?

- Unparalleled resources boom
  - Govt get royalties
  - Business got massive profits
  - Unskilled labour earned \$100k
- BHP Billiton
  - '13 - US\$10.9 billion
  - '14 - US\$13.8 billion
- Resources  $\neq$  population; 'move labour'

# Why we have a **FIFO** problem in transport?

- Mining long association with remote locations
- Logic: plentiful resource = company town
- Given way to Non-resident Workers (NRW)
- FIFO first used in WA goldfields in 70s, now widespread.
- 2013 - Iron ore \$68 bill, Petrol/gas \$25 bill, other minerals \$21 bill

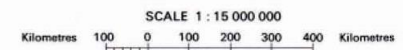


### Key to minerals

- |                         |                                  |
|-------------------------|----------------------------------|
| <b>A</b> Asbestos       | <b>N<sub>g</sub></b> Natural gas |
| <b>Al</b> Aluminium     | <b>Ni</b> Nickel                 |
| <b>Cb</b> Black coal    | <b>O</b> Opals                   |
| <b>Cl</b> Brown coal    | <b>Os</b> Oil shale              |
| <b>Cr</b> Crude oil     | <b>Ph</b> Phosphate rock         |
| <b>Cu</b> Copper        | <b>S</b> Sapphires               |
| <b>D</b> Diamonds       | <b>Sr</b> Silver                 |
| <b>G</b> Gold           | <b>T</b> Tin                     |
| <b>Ir</b> Iron          | <b>Tu</b> Tungsten               |
| <b>L</b> Lead           | <b>U</b> Uranium                 |
| <b>Mn</b> Manganese     | <b>Zn</b> Zinc                   |
| <b>Ms</b> Mineral sands |                                  |

### MAJOR MINERAL DISCOVERIES

Period	Minerals	Railway opened
Before 1860	Cb, Cl, G	—
1860-1879	Cb, Cl, D, G, S, T	—
1880-1899	Cb, Cu, G, Ir, L, O, Os, Sr, T, Tu, Zn	—
1900-1959	A, Al, Cl, Cu, G, Ir, L, Ms, Mn, Ni, Os, Sr, T, Tu, U, Zn	—
After 1960	A, Al, Cb, Cr, D, G, Ir, L, Mn, Ms, Ni, Os, Ph, Sr, U, Zn	—



SOURCE: Adapted from maps in Camm and McQuilton (1987).

Figure 1: Queensland's coal – Central Queensland map



# Why we have a **DIDO** problem in QLD?

Three drivers underpin driving risk

- Commute is looong
- 12h shifts
- Limited & affordable housing

Importance of coal

- '11 - 188 million tonnes (A\$31 bill)  
internationally + 20 million domestically



# What do we know about the population in the Bowen Basin?

- In '06 = 72% of miners in BB: '11 est. 41%
- QRC ('10) est. 50% NRW
- QLD Office of Econ & Statistical research 59%
- ABS labour;
  - Feb '10 = 39,300
  - Aug '11 = 66,800



# Long distance driving in CQ? (Di Milia, 2006)

- 1579 drivers between 08 - 10
  - 11% driving after NS; 4 x 12h NS
  - Mean 211 km (600km max)
  - Between shift journey - 581km
  - Awake about 17h prior to journey
  - KSS  $\geq 7$ : 19% of NW V's 1% of DW

# Long distance driving in CQ? (Di Milia et al, 2010)

- 649/1080 phone survey
- 148 NW (140m, 8f) or 23% worked NS
- NW - 40 yo V's NNW - 44 yo
- NW
  - 93% mining
  - 28% worked 2 or 4 NS; 18% 5 NS, 13% 3 NS

## Descriptive statistics for distance travelled, sleepiness and sleep

	NW		NNW		
	Mean	SD	Mean	SD	p
Distance at Time 1 (kms)	140.29	72.17	117.55	89.74	.001
Distance at Time 2 (total kms)	229.62	125.86	182.79	139.76	.001
KSS - Time 1	3.10	1.87	1.99	1.42	.001
KSS - Time 2	3.51	1.86	2.00	1.39	.001
Sleep in previous 24h	6.82	2.21	7.74	1.36	.001
Sleep in previous 48h	6.94	1.90	7.62	1.35	.001
No. full nights sleep in past 7	3.93	2.21	5.43	2.21	.001



Tully

Ingham

Townsville

Ayr

Bowen

Charters Towers

Proserpine

Hughenden

Collinsville

Mackay

Moranbah

Winton

Mainland

Queensland

Longreach

Emerald

Yeppoon

Rockhampton

Gladstone

Blackall

Bundaberg

Maryborough

Gayndah

Charleville

Mitchell

Roma

Kingaroy

Sippy Downs

Dalby

North Lakes

Toowoomba

Brisbane

Ipswich

Jacobs Well

Cunnamulla

St George

200 km

100 miles / s

## Distribution of sleep and work related variables (Bold = significant)

	Night workers		Non-night workers	
	%	CI 95%	%	CI 95%
<b>≤5h sleep in previous 24h</b>	<b>20.9</b>	<b>14.3 – 27.5</b>	<b>5.8</b>	<b>3.7 – 7.8</b>
<b>≤10h sleep in previous 48h</b>	<b>17.6</b>	<b>11.3 – 23.8</b>	<b>4.2</b>	<b>2.4 – 6.0</b>
<b>≤4 full nights sleep in last 7</b>	<b>62.8</b>	<b>55.0 – 64.3</b>	<b>26.2</b>	<b>22.4 – 30.1</b>
<b>Snore (yes)</b>	<b>69.0</b>	<b>61.3 – 76.7</b>	<b>59.4</b>	<b>55.0 – 63.9</b>
KSS, ≥7 (Time 1)	5.4	1.7 – 9.1	2.4	1.1 – 9.0
<b>KSS, ≥7 (Time 2)</b>	<b>8.1</b>	<b>3.6 – 12.5</b>	<b>2.0</b>	<b>.01 – 3.2</b>
ESS, >10	<b>19.6</b>	13.1 – 26.0	<b>18.0</b>	14.7 – 21.4
Diagnosed sleep disorder	4.7	1.3 – 8.2	3.9	4.7 – 8.2
<b>Work hours: &gt;40h per week</b>	<b>78.4</b>	<b>71.7 – 85.1</b>	<b>39.2</b>	<b>34.5 – 44.0</b>

## Adjusted odds ratio for variables associated with lane crossing

Variable	Category	Adj. OR	95% CI	p
KSS <sub>1</sub>	<7			
	≥7	<b>5.3</b>	1.4– 19.5	.01
Distance driven (kms)	<150			
	≥150	<b>3.6</b>	1.6 – 7.8	.001
Sleep in previous 48h	>5			
	≤5	<b>2.6</b>	1.03 – 76.4	.05
Worked Night	No			
	Yes	2.2	1.2 – 3.8	.001
Snore	No			
	Yes	2.0	1.1 – 3.6	.05
Age	≥43			
	<43	1.9	.1.1 – 3.4	.05
Mobile use	No			
	Yes	1.9	1.14– 3.3	.05

# Research findings

- Philip et al (2005)
  - Full sleep V's 2h sleep and awake from 01.00.  
Drove 200km - highway @
  - 09.00; 8 v's 65 line crossings
  - 11.00; 5 v's 122 line crossings
  - 13.15; 16 v's 91 line crossings
  - 15.15; 23 v's 123 line crossings
  - 17.15; 14 v's 134 line crossings
- Coroner Hennessy (2011) - 24 recommendations



# Countermeasures (& magic bullets)

- Managing fatigue during journey . .
- Ending NS early but . . . . .
- Remove volume of cars but . . . . .
- Training
- Attitude change
- Technology
- Car pooling
- Journey management plans

# JMP - Simple example

Name \_\_\_\_\_

Travel route (eg. Brisbane - Site - Brisbane) \_\_\_\_\_

Method (eg. company vehicle, Airline, private vehicle etc)

If vehicle:  alone  car pool

If alone:  always  mostly  sometimes  rarely

Risks (how could I get hurt?)	Controls (how can I control it?)	Risk Rating

# Journey Management Plans (& rational creatures)

- Goal Setting theory
- Reinforcement theory
- Theory of planned Behaviour (Ijzen, 1991)
- Dual process model of decision making
  - Cognitive; rational, slow and considered
  - Affective; experiential, emotional, fast
- Un-named Model - Valency of one goal dominates other considerations.

# Conclusions for DIDO in Central QLD

- Resource and labour markets
- 12h shifts: push to coast (41% in BB)
- Insufficient & expensive housing
- Increase in 11 - 23%
- NW - greater risk of lane crossings
- Countermeasures and no magic bullet

# That's it folks!

Thanks to:

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# Commuting: Risk factors

- Sleep loss
  - Night work
    - Sleepiness highest towards end of NS
    - Accumulating sleep loss & building homeostatic response
  - Other factors
    - Early rise; young children; med./sleep disorders, & medication.