Safe System Complementary Thinking: A step change for improved safety

Bruce Highway cross section treatment

David Bobbermen, Safety Program Manager, Austroads
Our values, our diversity

Customers first
Unleash potential
Be courageous
Ideas into action
Empower people
Our values, our diversity

Customers first

Safety as a Priority

Unleash potential

Be courageous

Ideas into action

Empower people
Our values, our diversity

Customers first

Unleash potential

Be courageous

Ideas into action

Empower people

Integrate Disciplines

Diversity inspires create innovate
Our values, our diversity

Customers first
Unleash potential
Be courageous
Ideas into action
Empower people

Design Exception

diversity
inspire create innovate
Our values, our diversity

Customers first

Unleash potential

Be courageous

Ideas into action

Empower people

6 Principles

diversity
inspire create innovate
Our values, our diversity

Customers first
Unleash potential
Be courageous
Ideas into action
Empower people

Hundreds of TMR Staff
2012 Media and issues

Toll rises on highway of hell
Emergency services faced with more horrific tragedy
Bundaberg News Mail - 7 August 2012

FIVE die in horrific collision
FIVE people were killed in a horrific crash between a four-wheel drive and a semi-trailer in southern Queensland yesterday.
Adelaide Advertiser - 1 Oct 2012

CRASH: Five occupants of a 4WD died at the accident south of Childers.
Picture: NEWS MAIL

Traffic chaos: tanker driver’s miraculous escape

Bruce Hwy claims another life
A motorist has died after colliding with a truck in Ambrose - Page 7

DRIVER DIES
Horror smash keeps Bruce Hwy closed for hours - Page 3

Inferno closes Hwy

Woman dies in highway crash
Rockhampton Morning Bulletin - 30 July 2012

Trucks waiting in Cardwell after flooding
Calms Post - 6 April 2011

Mackay Daily Mercury - 15 Sept 2012
Gladstone Observer - 30 July 2012
Call for improved safety

- 53 fatalities in 2012

- 33% high risk sections but 8% of the national network

- 17% of deaths but only 8% of the national network

- Quoted as a “death trap” (source: Sunday Mail 29 April 2012)

- .... most dangerous roads in Australia (source: Automobile Club, RACQ)

- 1 of the 10 worst roads in the world

- Head-on crashes – 40% of fatalities.
Risks - Practical and Realistic

No open cheque book

Crashes at many locations, no “Black Spots”

Asset with varying age, standards, and condition

Opportunity to integrate thinking
Finding 1 – Use a Network-wide Strategy

- Network-wide focused decisions
- Improve the network in increments
- Don’t leave to chance via decisions on many projects
- Top down comprehensive assessment
- Integration of disciplines
- Identify road stereotype
- Assess for a likely funding profile
- Evaluate against the existing asset condition
- High risk in applying a Blackspot approach to a network
- Best defence against claims (non-feasance rule overturned)
- Safe System Project ≠ Safe System
“Balanced crash risk for $ profile with consistent standards”
Finding 2 – Set Network-wide Standards (intervention and construction)

- Network-wide standards for consistency
- Identify the significant components for the stereotype
- Not a single vision standard
- Both Intervention and Construction Standards
- Intervention Standard to trigger enhancement
- Construction Standard to define the level of enhancement
- Iterative approach
- Design Exception Approval
- Design in network planning (CPEng and RPEQ implications)
- Comprehensive risk check
Engineering analysis

- Treatments and risks
- Risk check

- Balance and minimise crash risk
- Network standard
- Network analysis

- Challenge extra 1 metre
- Desired vision and benefit
- Network affordability
- Implement and review
Finding 3 – Balance Crash Risk

• Road consistency across the type cross section
• Largest crash risk is head-on crashes but no CMFs
• Balance crash risk of shoulders, lane width and WCLT
• Interpreted a CMF for WCLT
• In 2012 balanced at about CMF of 1.1
If you had to make a choice?
Balance crash risk

<table>
<thead>
<tr>
<th>Shoulder Width</th>
<th>CMF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 m</td>
<td>1.08</td>
</tr>
<tr>
<td>1.25 m</td>
<td>1.14</td>
</tr>
<tr>
<td>1.0 m</td>
<td>1.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>CMF</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 m</td>
<td>1.02</td>
</tr>
<tr>
<td>3.25 m</td>
<td>1.1</td>
</tr>
<tr>
<td>3.0 m</td>
<td>1.3</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>C Line Width</th>
<th>Hazard</th>
<th>CMF (L shoulder)</th>
<th>AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m</td>
<td>1.4 m</td>
<td>1.09</td>
<td>0.7</td>
</tr>
<tr>
<td>150 mm</td>
<td>0.55 m</td>
<td>1.32</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Finding 4 – Prioritise for Delivery Efficiency

• Economy of scale
• Economy of location
• Opportunity for free projects
• Longer lengths completed sooner
• Higher network BCR
• Fee project benefits far outweigh deferment of a notionally higher BCR project
• Mandatory consideration for safety practitioners
# Network analysis

<table>
<thead>
<tr>
<th>Intervene Standard</th>
<th>&lt;10m 11m</th>
<th>&lt;10m 12m</th>
<th>&lt;11m 12m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formation Widening</td>
<td>$1.6 b</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2.2 b</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$4.5 b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervene</td>
<td>8m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pavement Widening</td>
<td>$100m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$200m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$500m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plan</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Treatments</td>
<td>$3.5b</td>
</tr>
<tr>
<td>Maintenance and Safety</td>
<td>$1.5b</td>
</tr>
<tr>
<td>Flooding and Safety</td>
<td>$3.5b</td>
</tr>
<tr>
<td>Capacity and Safety</td>
<td>$8b</td>
</tr>
<tr>
<td>Total</td>
<td>$16.5b</td>
</tr>
</tbody>
</table>

Total Saving $7b

$8.6 b / 10y actual
Finding 5 – Consider Risk Compensatory Influences

- 70% reduction in fatalities on treated and untreated sections
- Don’t underestimate the benefit from a consistent standard through rapid rollout
- Influences:
  - Narrower lanes,
  - 150mm centreline risk complacency
  - Regular Overtaking opportunities,
Driver - Risk Compensatory Behaviour

820km Untreated proportion

24 fatalities

680km Treated proportion

19 fatalities

Predicted

Lives saved

6

Fatalities

13

Actual

Lives saved

20
Finding 6 Leadership

• Is there a better way?
• Be practical and realistic – don’t accept naïve assumptions
• Objectives Need to be Clear
• Lead by owning the results
• Think from users perspective
Anecdotal experience
Safety step change

Fatalities & X-Section Length Implemented
(2008 – 2016)
Focus on the level of standards
Not solely a treatment type

• Deviated from traditional standards
• Balanced crash risk
• Network analysis justification
• Risk compensatory behaviour to be considered
• Improvement for cyclists and parked cars
• World-first Network-wide Design Exception
<table>
<thead>
<tr>
<th>Provocative Statement</th>
<th>Why</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don’t build the safest project driven solution !</td>
<td>Untreated sections remain</td>
</tr>
<tr>
<td>Don’t provide the complete solution now !</td>
<td>Realise incremental / comprehensive benefits</td>
</tr>
<tr>
<td>Don’t use traditional standards !</td>
<td>Balance all road component crash risks</td>
</tr>
<tr>
<td>Don’t use the blackspot approach everywhere !</td>
<td>Creates two network inconsistent interfaces</td>
</tr>
<tr>
<td>Don’t focus on past crash locations !</td>
<td>Crashes move to the next worst location</td>
</tr>
<tr>
<td>Don’t use the best project standard !</td>
<td>Benefits not maximised</td>
</tr>
<tr>
<td>Don’t do all work types at a location !</td>
<td>Forego savings through bulk programs of work</td>
</tr>
<tr>
<td>Don’t do the highest BCR project first</td>
<td>Forego free projects - delivery efficiency</td>
</tr>
</tbody>
</table>
3M Acknowledgement

3M Diamond Road Safety Award at the 2015 Australasian College of Road Safety conference
Step Change in Improved Safety

- Rapidly Completed 700km in 3 years
- Saving 70 lives
- 70% reduction in fatalities
- $7b saving in construction