Managing the Performance of Bridges: Cost v Risk
Getting the balance right
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Agenda – Managing the Performance of Bridges

- Introduction
- What we know?
- Help from SAMP/AMP?
- What if we get it wrong?
- Where are we now with BAM?
- Where next with BAM?
- Conclusions & recommendations
- Questions and discussion
BAM - Who cares?...well the public seem to...?

- Bridge Asset Management (BAM)... we are getting better...

**State of disrepair: fear for ageing bridges**

John Power

More than two-thirds of bridges managed by Victoria are rated as being in "poor condition" while nearly half have never been inspected within the recommended timeframe, a Sunday Age investigation can reveal.

In a scathing overview of the gaps in Victoria’s infrastructure management, previously unreleased figures show that 63 per cent of the 3,027 bridges in the state maintained by VicRoads require some level of repair, and at least 40 per cent haven’t received a detailed inspection in more than five years, contrary to VicRoads’ own guidelines.

"Level 2" inspections, which check all of a bridge’s components, are supposed to be carried out every two to five years, according to the VicRoads Road Structures Inspection Manual.

Individual bridge components are rated on a four-point scale, with a "poor condition" rating assigned to any bridge containing a poor component in need of maintenance, whether or not it affects structural integrity.

The data, which was obtained under freedom of information laws, encompasses the length and breadth of Victoria, taking in bridges throughout Mildura, regional towns, remote areas and popular tourist destinations such as the Great Ocean Road.

Nearly two-thirds of Victoria’s bridges are in the "poor condition" category, analysts say, noting that bridges will likely face greater stress in the future, saying traffic volumes and weights are increasing.

"Freight volumes and weights are increasing, traffic jams on bridges are more common and we should prepare now for the demands of the future, which will certainly include faster-connection automated road transport," Dr Copin added.

The extent of disrepair pointed to a general problem of neglect toward infrastructure in Victoria and elsewhere.

"The costs of a collapse in terms of human, social, economic and reputational costs outweigh the costs of proper care," he said, while stressing that a "poor" rating, which can be based on the condition of a single component, doesn’t necessarily indicate that a bridge is unsafe.

"If someone in the ARRB.com.au told you that the number of people crossing a bridge by foot, by car or by bus is significantly reduced, that’s a clear indication that it’s unsafe."
BAM - What we know – History?

- Design criteria, specs and drawings
- Construction records
- Inspection records
- Maintenance records
- Upgrade designs
- Significant events
• Reliability of Visual Inspection for Highway Bridges – FHWA, 2001
• At least 56 percent of the average Condition Ratings are incorrect with a 95 percent probability.
BAM - What we know – Capacity!


• Monty Python LOB “…he’s making it up as he goes along…”

During the course of the investigation it became apparent that a third, and possibly more important, requirement is essential if robust and nationally uniform bridge assessment processes are to be successfully developed and implemented. That requirement is to have uniform processes and procedures for bridge assessment that are clearly articulated and have a well documented basis including technical justification.

Currently there are a range of bridge assessment methodologies used by Australian SRAs, which would lead to a range of outcomes for the same assessment task. The bridge assessment methodologies that are in use do not, in most cases, appear to conform to AS5100.7, the Australian Standard for bridge assessment. The departures from AS5100.7 are based upon the experience and judgment of bridge engineers in the SRAs, but it does put into question the mandatory nature of the AS5100.7 provisions which would apply to bridge assessments by independent third parties.
- Strategic Asset Management Plans (SAMP’s) and Asset Management Plans (AMP’s) have been developed over recent years, which helps capture strategy, plans and the basis for same.
- Is this the best data structure?
- How do we capture status against plan (dashboard)?
- Impact of operational decisions on asset outcomes?
What if we get it wrong – Failure – Legal process…
• Decision making process reviewed (R2A Due Diligence)

• AP-R412-12 AUSTROADS RESEARCH REPORT
Managing Asset Management Related Civil Liability Risk (2012)

Being able to robustly demonstrate that reasonable and effective measures have been consistently implemented in managing and maintaining the road network will go a long way towards the road authority being able to demonstrate that it has fulfilled its duty of care to road users. Effective record keeping becomes one of the key challenges.
What if we get it wrong – Level Of Service...

• Protecting the asset v’s protecting the environment and community...

• NTI’S Guide to the Trucking Industry (2016)

• Continual Improvement (CI) – document decisions and the basis for them...

ENVIRONMENT
The industry has been increasing the size and load factor of its vehicles to improve productivity. The larger trucks are more fuel-efficient per load and make fewer trips to carry the same volume of freight. The added benefit is that they are also better for the environment by reducing carbon emissions and traffic congestion. However, many local councils have banned the passage of ‘super trucks’ in response to community concerns, and much of Australia’s road network is unsuitable for such large vehicles, which is an area of concern for the industry23.
### What we do well OK…

<table>
<thead>
<tr>
<th>What we do well OK…</th>
<th>What we don’t do well…</th>
<th>What does it mean…</th>
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<tbody>
<tr>
<td>Increasing use AM principles</td>
<td>Focus on decision inputs</td>
<td>Limited effectiveness and efficiency</td>
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<tr>
<td>Collect historical data</td>
<td>Document decisions</td>
<td>Better decisions faster</td>
</tr>
<tr>
<td>Collect condition data</td>
<td>Document basis for decisions</td>
<td>Increased liability</td>
</tr>
<tr>
<td>Collect capacity data</td>
<td>Link decisions (line of site)</td>
<td>Limited continual improvement</td>
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BAM – So the journey continues…

Get better **outputs from the same (questionable) inputs**

- Disruptive technologies – how can they help – data & decision availability?
- Design (or re-design) decision process?
- How do we capture decision making at all levels and improve it?
- Re-think data structures, and data management – turn more data into usable knowledge?
- **Empower team decisions?**
Systematic Decision Design

- **Review Context**
- **Define Objectives**
- **Factors Influencing**
- **Courses of action**
- **Alignment of stakeholders**
- **Plan**

- Who makes them?
- How do they make them?
- When do they make them?
- How are they communicated?
- Who is accountable?
Systematic Decision Design

Scalability
- Business
- Strategy/network
- Operational/asset
- Maintenance
- Inspections
- Other

And…
- Priority - get the important ones right – criticality of assets & decisions
- Iterative nature of decision process
- Capture & link decisions – improve team decision outcomes
- Reflection – leads to Continual Improvement (CI)
BAM - Conclusions and recommendations

• We are doing OK with some things
  – Implementing AM principles
  – Collecting data (required for evidenced based decisions)

• The drivers are still very strong to improve outcomes
  – Do more with less
  – Limited opportunity to improve inputs

• Decision processes design – a key opportunity
  – Use emerging data management technology
  – Improve data structure and management to improve usability and visibility of knowledge
  – Facilitate CI
  – Reduce liability

• Outcome – **Better balance between CRP with existing resources**
Questions? Discussion?