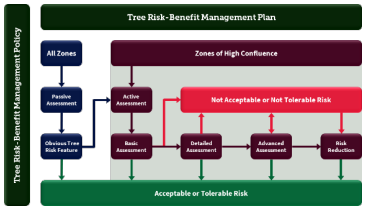
1 The benefits of upgrading to VALID

The case for upgrading DSG's tree risk management with VALID

1 This is a briefing note for the General Manager State Roads, Department of State Growth (DSG), Tasmanian Government. The note explains why DSG is updating their approach to tree risk from QTRA to **VALID**. DSG based their original Tree Risk Management Framework on QTRA. VALID is a more recent evolution in tree risk, and has many substantial improvements that are explained on this page. It has also become apparent there are several critical faults in QTRA. We'll explain some of these critical faults on the next page.

1.1 Tree Risk-Benefit Management Strategy

The Strategy at a glance



2 VALID is a complete Tree Risk-Benefit Management and Assessment system, and not just another way of assessing tree risk. At its core is a comprehensive Strategy The Strategy explains why and how DSG is taking a reasonable, proportionate, and reasonably practicable approach to managing the risk from trees or branches falling. It establishes the context for any risk-benefit assessment that's carried out. In the extremely unlikely event that an Acceptable or Tolerable risk happens, and someone is killed or seriously injured on a state road. The Strategy gives DSG robust layers of defence about how they managed the risk. If there's a threat of legal or enforcement action, it's the Strategy that 'speaks truth to power'.

1.2 VALID's risk model

VALID's risk model has been developed with a Risk Professor

3 We built the engine behind VALID's risk ratings with a Professor of Natural Hazards & Risk Science. The Professor's an internationally eminent expert in this field and has tested the model to breaking point:

> *"We have stress-tested VALID and didn't find any gross, critical sensitivities. In short, the mathematical basis of your approach is sufficiently robust and dependable for any practical purpose."*
>
> Willy Aspinall
> Cabot Professor in Natural Hazards & Risk Science
> University of Bristol

1.3 Simpler • Clearer • Smarter

Ease of use & improved consistency
Reduced chances of error
Increased cost-effectiveness

4 VALID's strategic approach to managing tree risk with Passive and Active Assessment is much easier to understand and carry out. It's also more cost effective. By substantially reducing the complexity, we increase consistency in application, and reduce the chances of assessment error.

There are only 2 road use zones instead of 10

5 We only have 2 zones of road use instead of 10 in the QTRA framework. Roads that have a traffic volume of 1400 vehicles per day or more, no matter the speed limit, are high use zones. We'll manage the risk on all state roads with Passive Assessment, day in day out. We'll manage the risk on high use roads with Active Assessment, at a Basic Drive-by level, every 5 years.

Field staff only need to identify 5 Obvious Tree Risk Features

6 Field staff who carry out Drive-by Assessments have had **Basic Validator** training. They're trained to recognise **5 Obvious Tree Risk Features**, make decisions about Emergency Callouts and Priority 1 Work. And when to get a **Validator** (trained Arborist) in to take a closer look. With the QTRA framework, field staff had to align pre-defined and questionable 'tree defect' categories with a Size Range and Probability of Failure Range for each of the 10 road use zones.

Validator consistency

7 When we need to carry out a Detailed Assessment, consistency by Validators is a key asset. In VALID's Tree Risk App, Likelihood of Occupancy and Consequences decisions are pretty much effortless. We then have a unique and innovative approach to the challenging Likelihood of Failure decision. That is to practise good '*decision hygiene*' by breaking down Likelihood of Failure into bite-sized decisions for each letter of the VALID mnemonic. How Validators colour these letters are guides them to a base rate colour, and then to a Likelihood of Failure category. The App also prints a one side pdf report that has the same design and formatting, no matter who's assessed the risk.

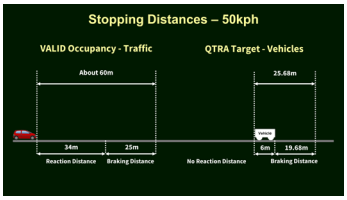
2 Exploring some of QTRA's critical faults

Several critical faults in QTRA are clear

8 DSG adopted QTRA for their Tree Risk Management Framework in 2015. At the time, it was the most robust tree risk assessment out there. Since then, some key critical faults with how QTRA assesses risk have become clear.

2.1 Vehicle Occupation - recognition and reaction times

Vehicle Occupation is undervalued



9 QTRA calculates Vehicle Occupation stopping distances with a braking coefficient of friction (+6m) at a range of speed limits. There are substantial flaws with how QTRA quantifies its stopping distances. Most importantly, they don't include any recognition and reaction time. In Australian highways literature, the recognition and reaction time most commonly used is 2.5 seconds (as it is internationally). 2.5 seconds is a substantial additional exposure to the risk that's not counted. As well as that, tree failures are most likely during storms when roads are wet. QTRA's braking distances are too short for wet roads.

2.2 'Risk of Harm' is undervalued - where it matters

The highest risks are often too low by x10 or x100

10 The busiest roads have an occupancy that's so high, on average, more than one vehicle is exposed to the risk. That's greater than QTRA's highest Target Range 1. The systemic errors in QTRA's stopping distances mean Vehicle Occupation is habitually undervalued on the busiest roads. If Targets are undervalued, so are the risks. Target errors for vehicles can be x10 too low. That means a QTRA 1/100K Risk of Harm might actually be as high as 1/10K. Target undervaluation is even greater for busy pedestrian zones. Or for traffic and pedestrians. The Target error here can be x100 too low. That means a QTRA 1/1M Risk of Harm can be a risk that's as high as 1/10K.

2.3 Size Range - questionable consequences

Size Range Impact Potential consequences aren't credible

Size Range	Size of tree or branch	Impact Potential
1	> 450mm (>18") dia.	1/1 - >1/2
2	450mm (18") dia. - 260mm (10½") dia.	1/2 - >1/8.6
3	250mm (10") dia. - 110mm (4½") dia.	1/8.6 - >1/82
4	100mm (4") dia. - 25mm (1") dia.	1/82 - 1/2 500

* Range 1 is based on a diameter of 600mm.

11 How QTRA quantifies the consequences of trees or branches hitting pedestrians, or people in vehicles, has significant shortcomings. The Size Ranges and their Impact Potential consequences aren't credible.

- 600mm is a 1/1 fatal consequence. There's no evidence to support this. The only reason 600mm is the highest consequence is because it's the largest diameter in the **Tritton & Hornbeck** biomass data that QTRA uses. What's more, 600mm is the weakest data because there are so few data points; they're outliers. To compound the problem, QTRA Size Ranges are all scaled from this dubious and weak 600mm assumption.
- Size Range 1 is a 1/1 - >1/2 of a death. At a scaling factor of less than x2, this range is too narrow and accurate to be believable. Similarly, Size Range 2 is a narrow scaling factor range of about x4. It then claims a far-fetched two significant figures and decimal point accuracy at 1/8.6 of a death.
- Size Range 4, by comparison, is extraordinarily wide at a scaling range factor of x30. It measures consequences down to 1/2500 of a death. In the medical professions' Abbreviated Injury Scale, the lowest rating is a minor injury. A minor injury is not much less than 1/300 of a fatality. At 1/2500, QTRA is claiming to measure injury consequences about x8 lower than the medical profession can.

2.4 Risk of Harm - reality checks

Risk of Harm outputs are too accurate to be plausible

12 Tree risk has too much uncertainty to claim single significant figure accuracy, which QTRA does with risks like 1/4, 1/300, 1/20 000, or 1/5 000 000. Neither is it plausible to claim a measurable difference between a risk of 1/10 000 and 1/50 000. Or to modify these risks by double or single significant figure values like 0.25 or 2, 3, or 4.

QTRA fails some basic reality checks

25mm deadwood over busy roads is not an Unacceptable Risk of Harm

13 In QTRA, 25mm diameter deadwood over a Target Range 1, with a Probability of Failure Range 1, is a Risk of Harm somewhere between 1/500 and 1/2000; depending on whether you use a 'reduced mass' factor of 0.25 or 0.5. This is an Unacceptable risk. Yet, if we reality check this, it can't be the case. There are countless 25mm diameter deadwood in trees over the busiest of roads. Yet Duty Holders aren't reducing these risks. Neither are insurers inundated with claims.