

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

1 The benefits of upgrading to 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 thinking, and has many substantial improvements that are explained on this page. It's also become apparent there are several critical shortcomings in QTRA, and some of these are explained on the next page.

VALID is a complete Tree Risk-Benefit Management and Assessment system

1.1 Tree Risk-Benefit Management Strategy

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 Strategy that explains why and how the DSG is taking a reasonable, proportionate, and reasonably practicable approach to managing the risk from trees or branches falling. This establishes the context for any risk-benefit assessment. In the extremely unlikely event that a tree kills or injures someone on a state road, and there's a threat of legal or enforcement action, it's the Strategy that equips DSG with robust lines of in-depth defence about how they managed the risk.

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

1.2 VALID's risk model

3 The engine behind VALID's risk ratings has been built 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

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

1.3 Comprehensive, uncomplicated, & cost-effective

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 Consistency in Detailed Assessments by Validators is a key asset. In VALID's Tree Risk App, the Likelihood of Occupancy and Consequences decisions are effortless. We then have a unique and innovative approach to the challenging Likelihood of Failure decision. That is to break down Likelihood of Failure into bite-sized decisions for each letter of the VALID mnemonic. How these letters are coloured guides the Validator to a base rate colour, and then to a Likelihood of Failure category. The App also prints a 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.

Vehicle Occupation is systematically undervalued



2.1 Vehicle Occupation - recognition and reaction times

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

The highest risks are often too low by x10 or x100



2.2 Risk of Harm - where it matters

- 10 Systemic errors in QTRA's stopping distances mean Vehicle Occupation is habitually undervalued. All the busiest roads have an occupancy that's greater than QTRA's Target Range 1. If Targets are undervalued, then so are the risks. Target errors for vehicles can be x10 too low, meaning a QTRA 1/100K Risk of Harm might be x10 higher at 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. A QTRA 1/1M Risk of Harm might be as high as 1/10K.

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 (10 1/2") dia. | 1/2 - >1/8.6 |
| 3 | 250mm (10") dia. - 110mm (4 1/2") 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.

2.3 Size Range - questionable consequences

- 11 How QTRA quantifies the consequences to people or traffic has significant shortcomings. When analysed, the Size Ranges for tree or branch diameters and their Impact Potential consequences are far from credible.
 - 600mm is a 1/1 fatal consequence. There's no evidence to support this. 600mm is the highest consequence only because it's the largest diameter in the **Tritton & Hornbeck** biomass data that QTRA uses. What's more, 600mm is the weakest part of this data because there are so few data points; they're outliers. To compound the problem, QTRA Size Ranges are then all scaled from this dubious and weak 600mm assumption.
 - Size Range 1 is a 1/1 - >1/2 of a death. At less than a factor of x2, this range is too narrow and accurate to be believable. Similarly, Size Range 2 is very narrow at a factor 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 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. which is not much less than 1/300 of a fatality. QTRA is claiming to measure injury consequences x8 lower than the medical profession can.

Risk of Harm outputs are too accurate to be plausible

- 12 Tree risk has too much uncertainty to claim single 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 then to modify these risks by point 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, a 25mm diameter piece of 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 a 'reduced mass' factor of 0.25 or 0.5 is used. This is an Unacceptable risk. Yet, if we reality check this, it can't be the case. There's countless 25mm diameter deadwood over high use zones. Duty Holders aren't reducing the risk and insurers aren't inundated with claims.