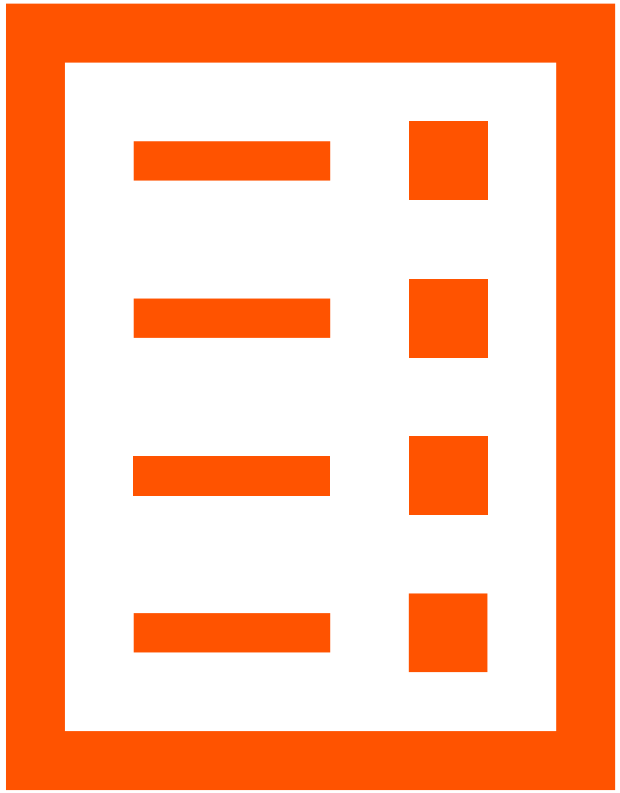
Vegetation cost model overview

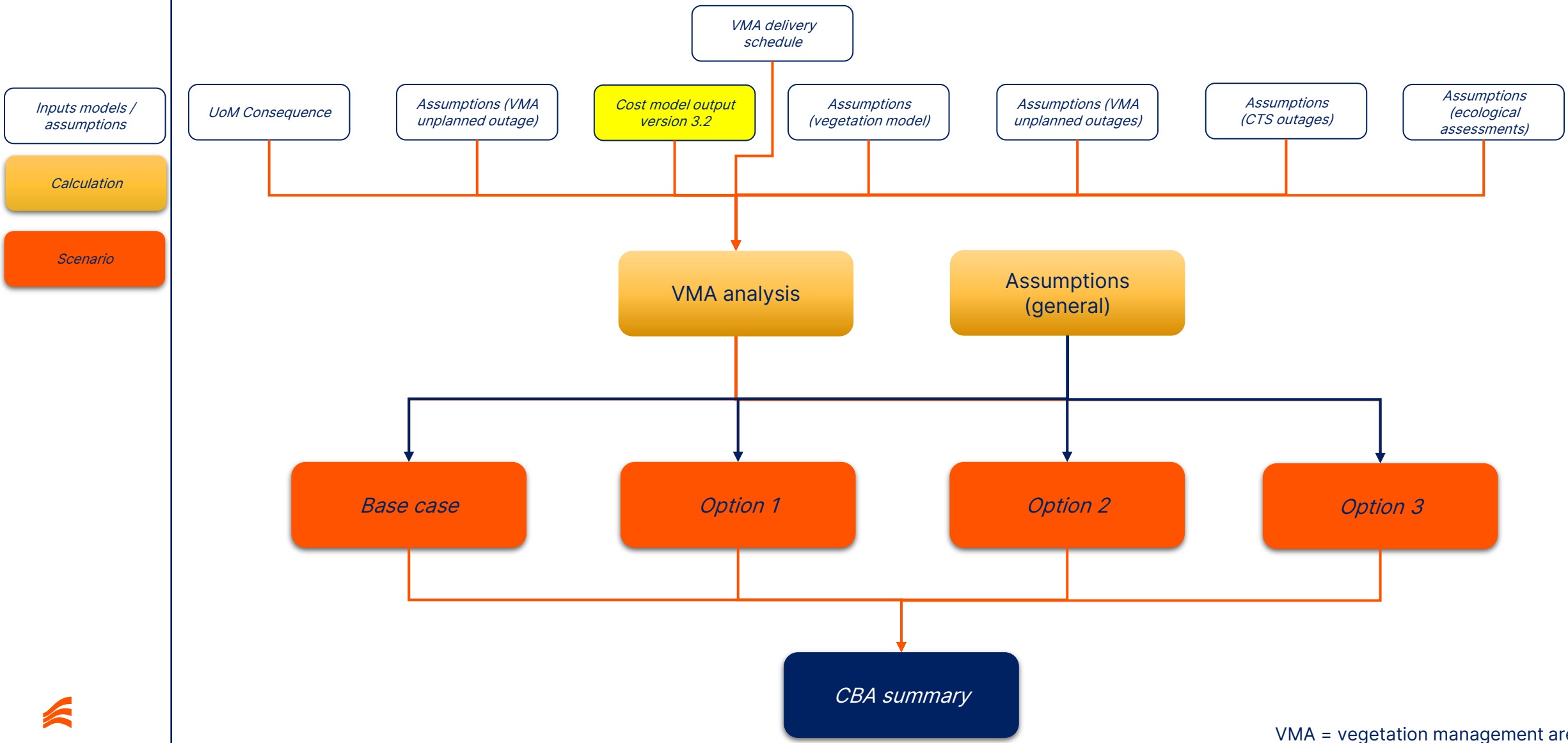
15/11/24

Essential Energy

Contents

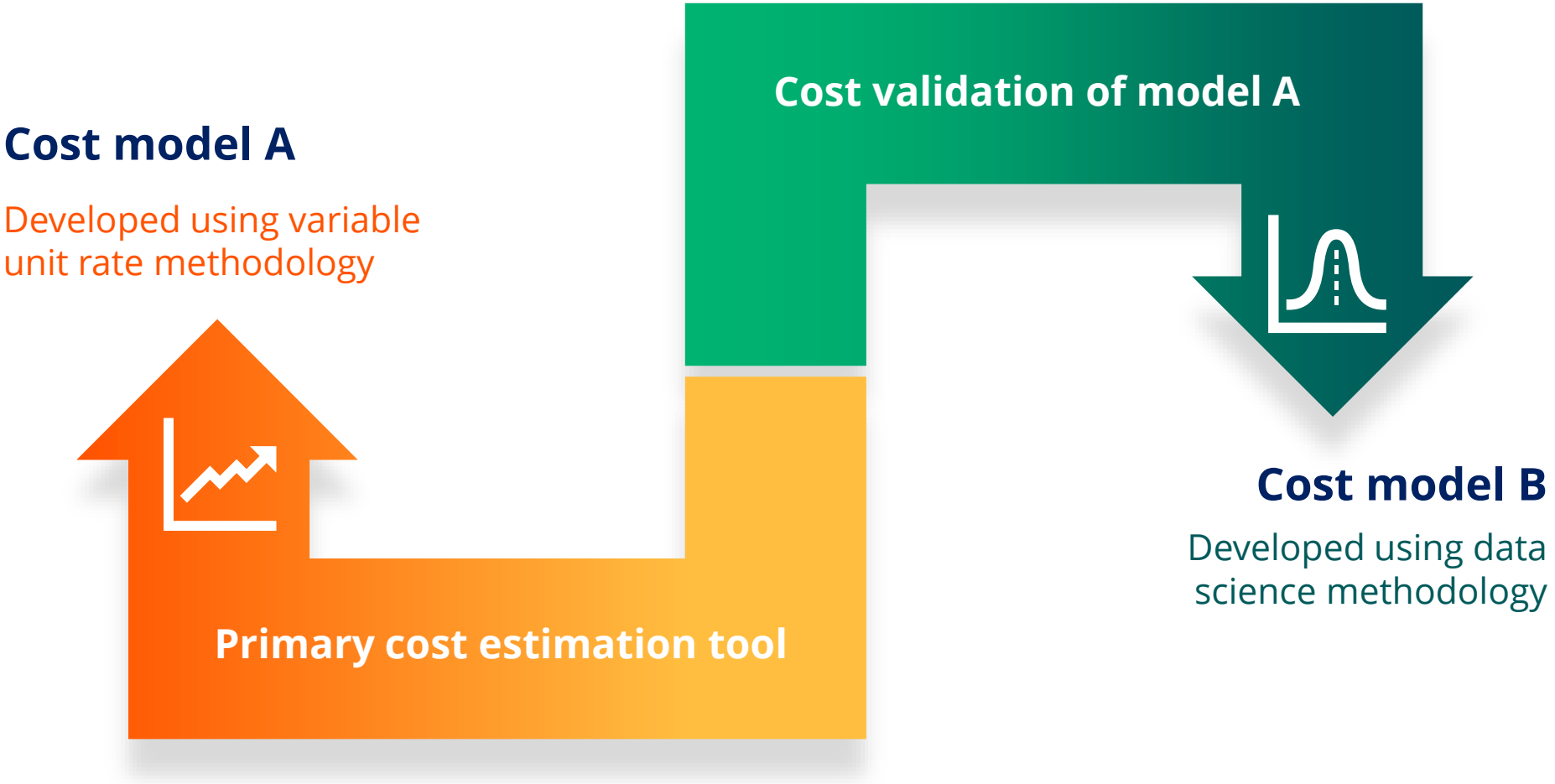


Cost benefit analysis architecture

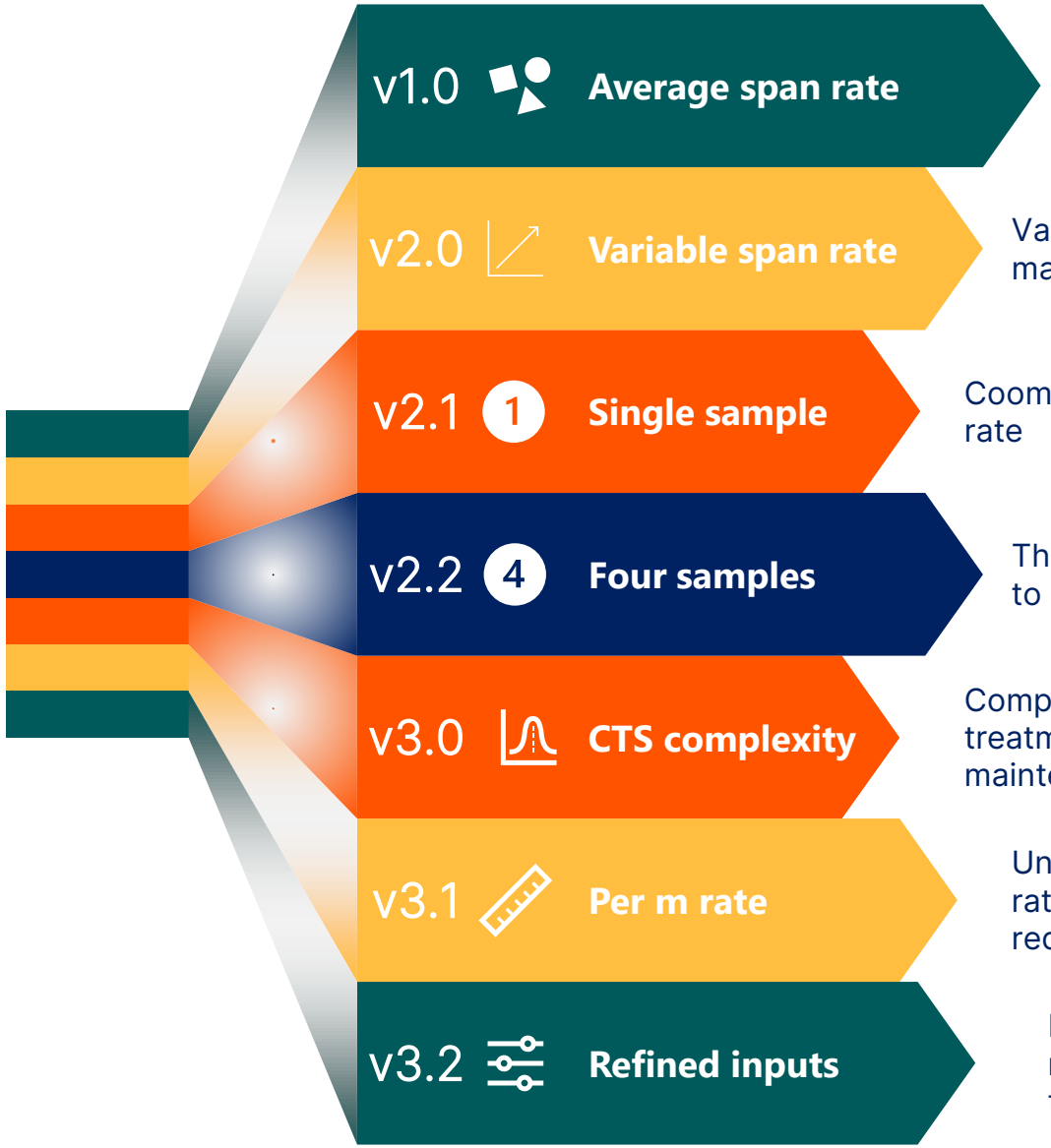


VMA = vegetation management area
CTS = clear to sky

Multi-model approach



Cost model A
Modelling evolution



Historical unit rate calculated and number of spans requiring CTS treatment estimated

Variable unit rate scale based on historical VMA maintenance complexity metrics

Coomba park VMA sample used to determine span rate

Three additional VMAs treated CTS and actuals used to inform span rates across the complexity spectrum

Complexity rating scale modified to incorporate CTS treatment complexity metrics in place of VMA maintenance complexity metrics

Unit rate modified from a span rate to a per metre rate, where meters represents the length of the VMA requiring CTS treatment

Noise removed from LiDAR data and per m rate modified to include only spans which were scoped / treated within the 4 sample VMA datasets

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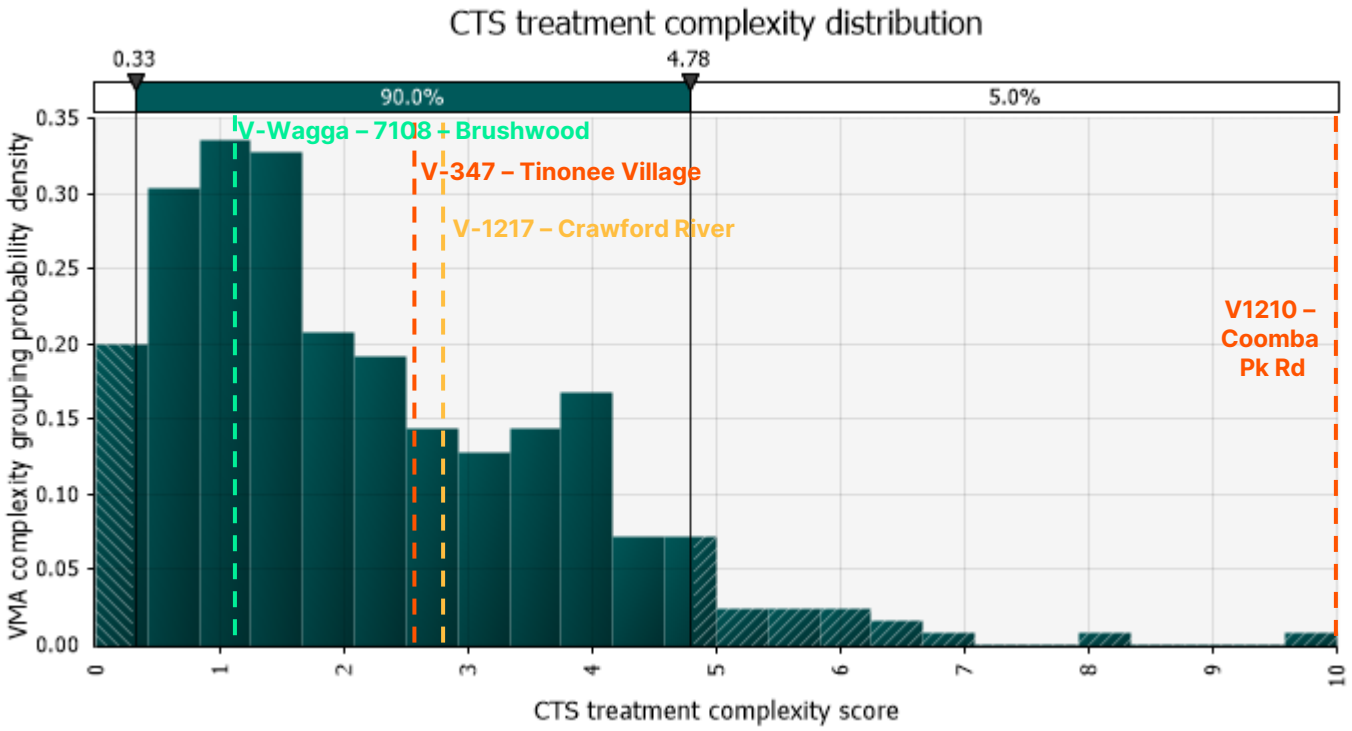
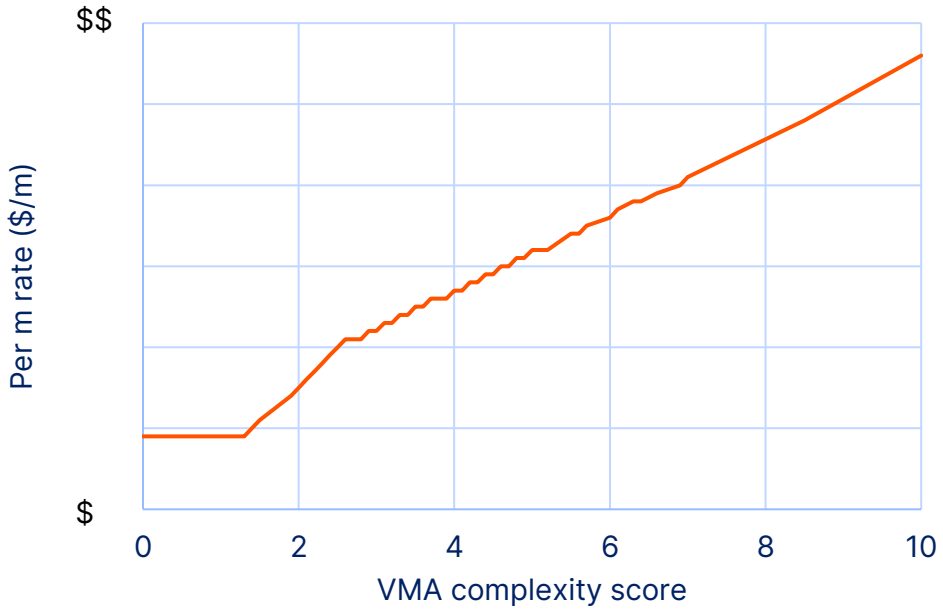
Cost model A – v3.2



The model rates each VMA by **clear-to-sky** treatment complexity factors and extrapolates **per m rate** sample data based on these factors (see below).



VMA treatment complexity factors

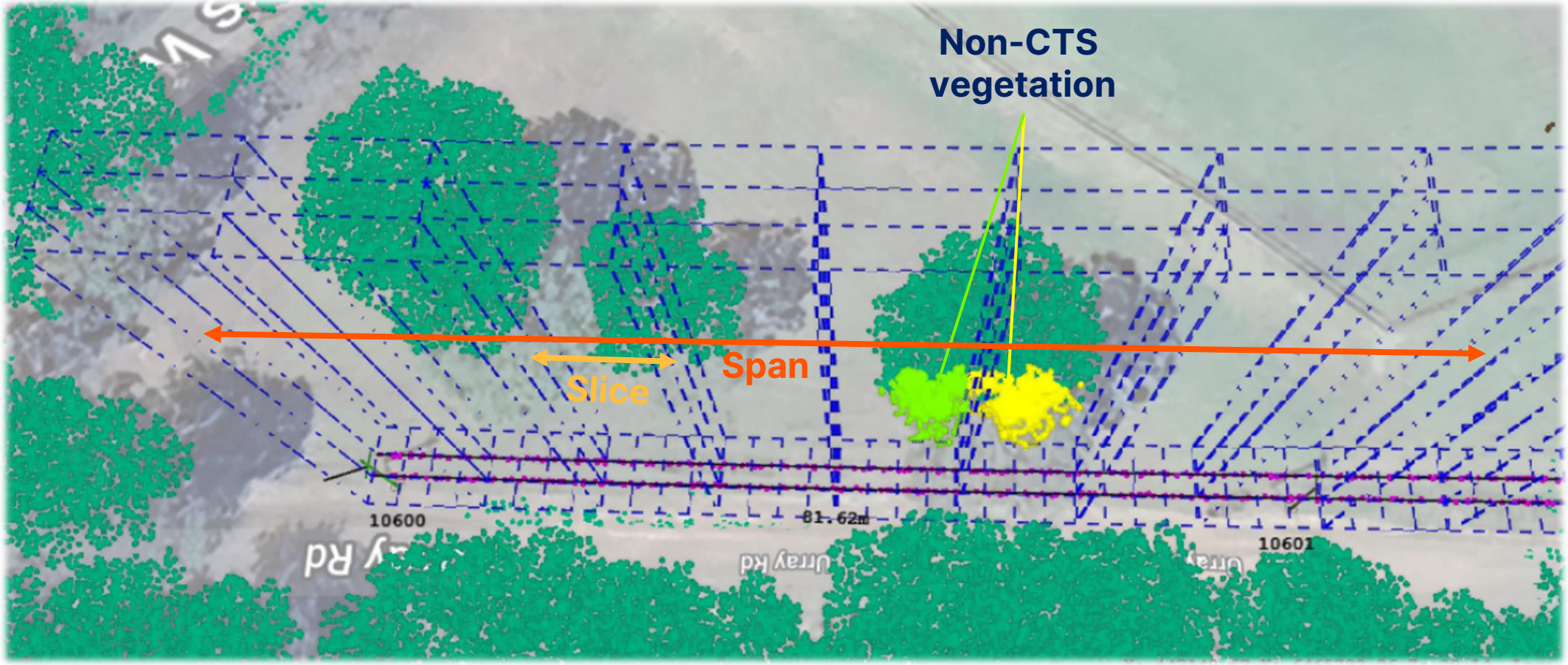
- Non-CTS length
- Number of LiDAR points in CTS space
- Tree height at edge of corridor

Equal weighting

90% of VMAs fall between a complexity rating of 0.33 and 4.78 (see top left).

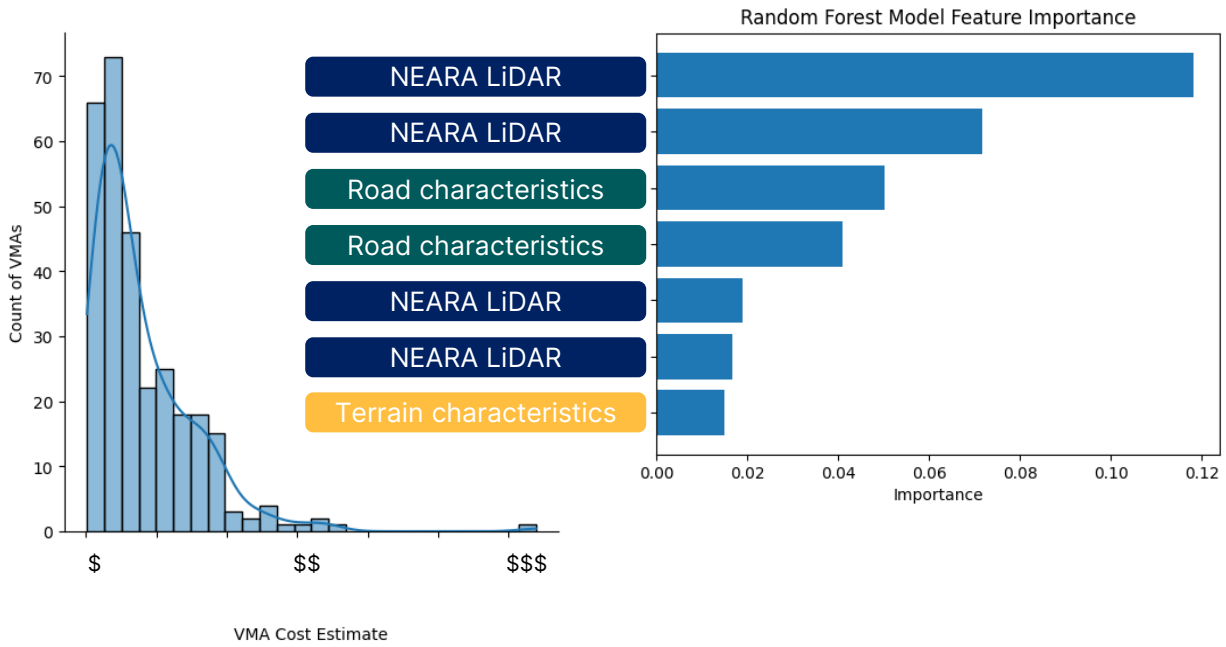
The factors which are used to calculate the treatment complexity score for each VMA are derived from NEARA analysis of LiDAR data (see bottom left)

Unit rate enhancement



- The modelling accuracy was improved by calculating a clearing rate per m rather than per span.
- This was achieved by plotting the LiDAR data in NEARA and measuring the number of slices within a span where overhang exists (as shown in diagram 2/8 slices with overhang ~ 10m each).
- The VMA cost was then divided by the summed length of slices containing vegetation points in the overhang space to produce a cost per m as opposed to a cost per span.

Cost model B



To estimate the CTS treatment cost (target) for the new P1 areas, a **machine learning approach** based on random forest regression was used.

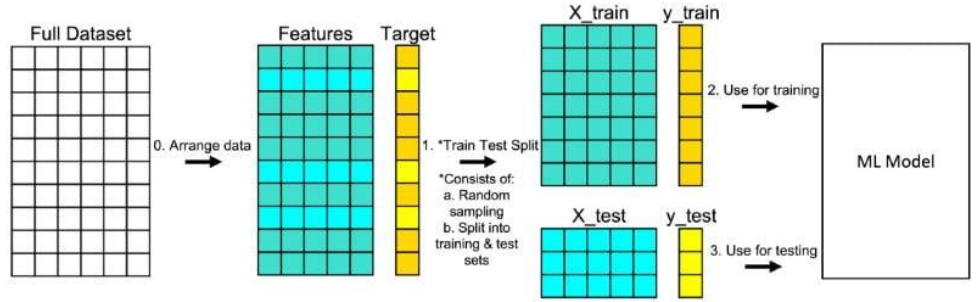
Random forest is a supervised learning method that can handle both **numerical and categorical data**, as well as nonlinear relationships and interactions between features.

A model was trained using (features) the pilot VMA scope data, road characteristics, terrain characteristics, and vegetation characteristics of each bay.

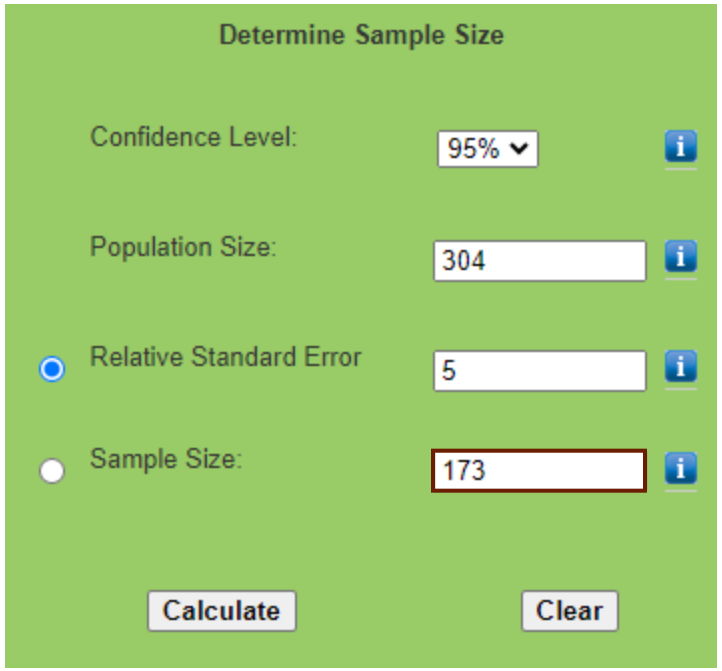
The **model learned to predict the cost** of vegetation management for any given span bay, based on its features.

Key inputs (features)

- NEARA LiDAR
- Road characteristics
- Terrain characteristics



Sample size and relative standard error



Calculated

There are 304 new P1 VMAs within the cost modelling.

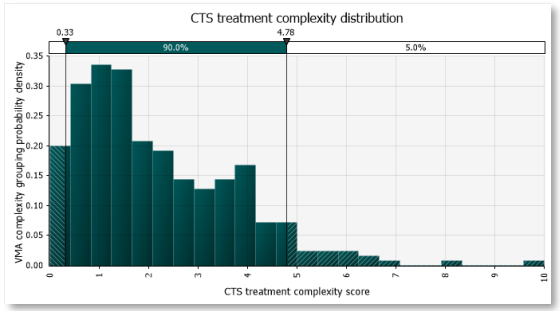
According to the ABS, to obtain a relative standard error of 5% 95 out of 100 times - from a population of 304 - 173 samples would need to be taken (click ABS logo for more detail).

Due to the labour-intensive nature of sampling the cost to treat a VMA clear-to-sky (a single VMA can take 2-3 weeks to sample), a total of 4 VMAs were sampled to inform the cost modelling, and model validation.

It is estimated that the target of 173 samples will be reached in the second half of the CTS program (in the 2029-34 regulatory period).

Model validation

Cost model A



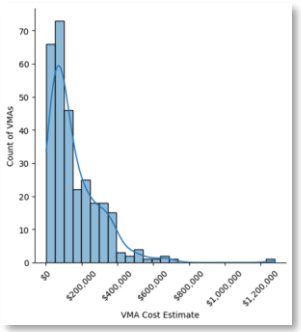
A

$58.4M

$51.0M

B

Model outputs within 15%



Cost model B

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