

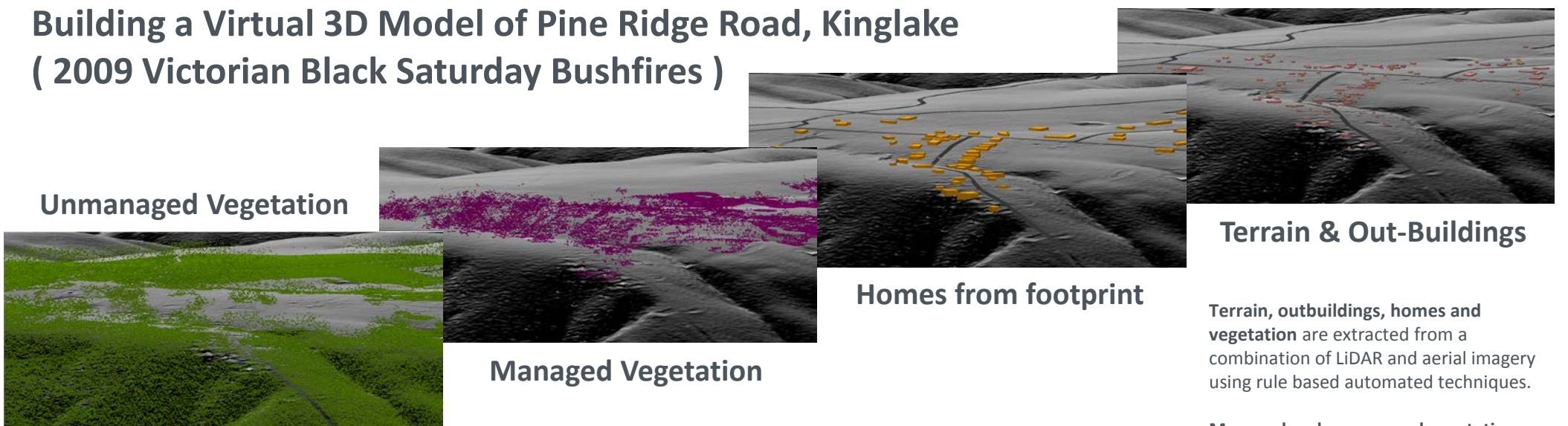
VULNERABILITY AND IMPACT MODELING

Fire Impact & Risk Evaluation - Decision Support Tool - FIRE-DST

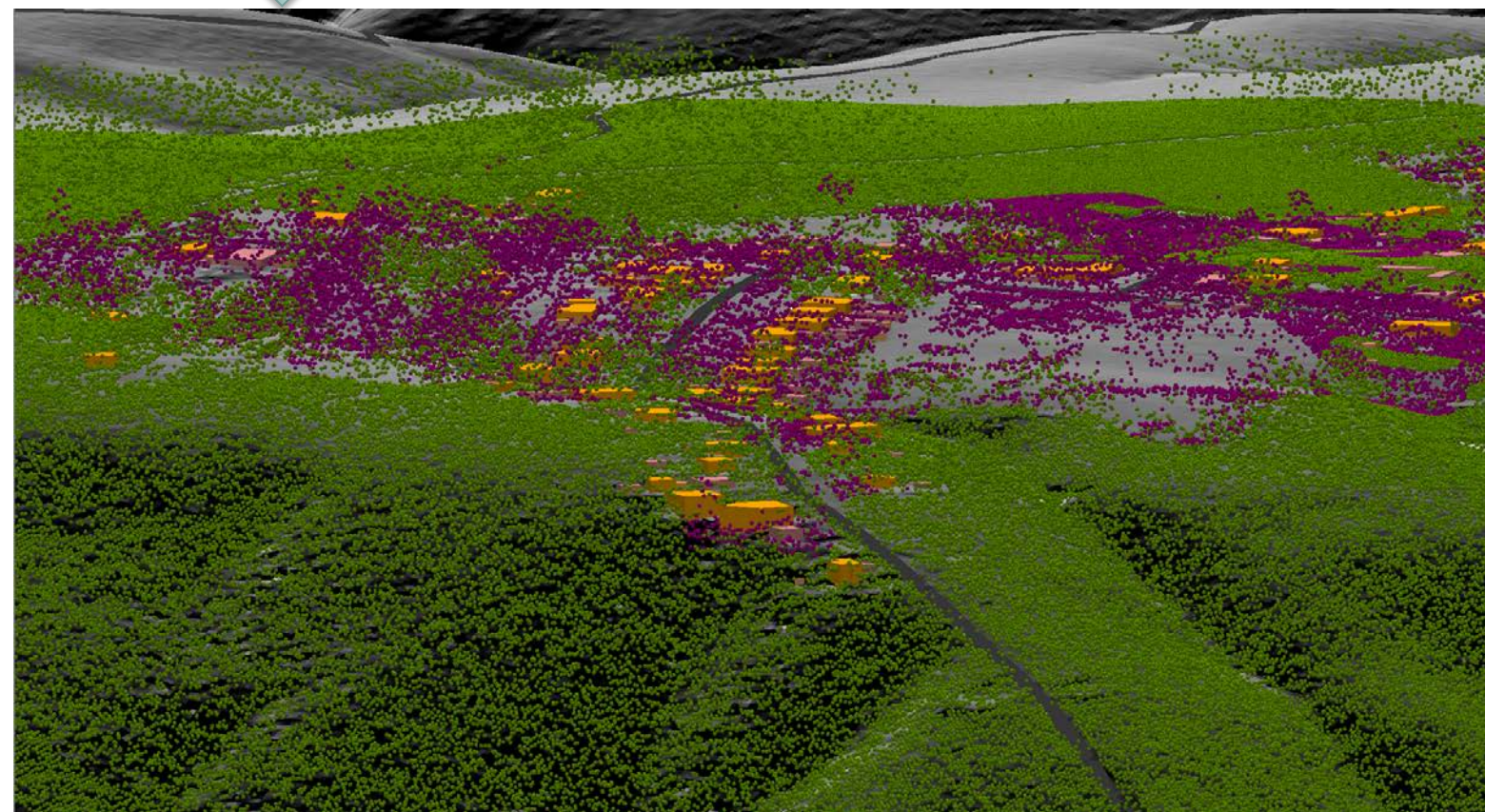
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Building a Virtual 3D Model of Pine Ridge Road, Kinglake (2009 Victorian Black Saturday Bushfires)



Virtual 3D scene of Pine Ridge Road Case Study



Terrain, outbuildings, homes and vegetation are extracted from a combination of LiDAR and aerial imagery using rule based automated techniques.

Managed and unmanaged vegetation are derived using rules for fuel structure and density. They are represented as a 3D cloud of spheres of varying size to emulate the obscuration that leaves, branches and trunks provide to radiant heat transfer from advancing flame bodies.

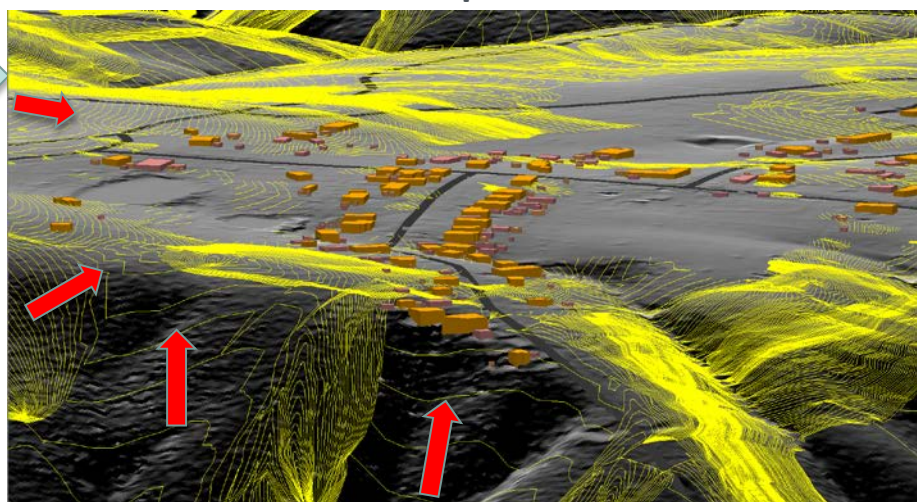
Flame body simulation is derived from a range of assumptions and is informed by multiple simulations from Phoenix Rapid-fire. Predicted flame front locations over time have the following interpretation:

- Large line spacing indicate high fire spread rates and severity
- Small line spacing indicate lower fire spread rates and severity
- Red arrows show fire approach directions

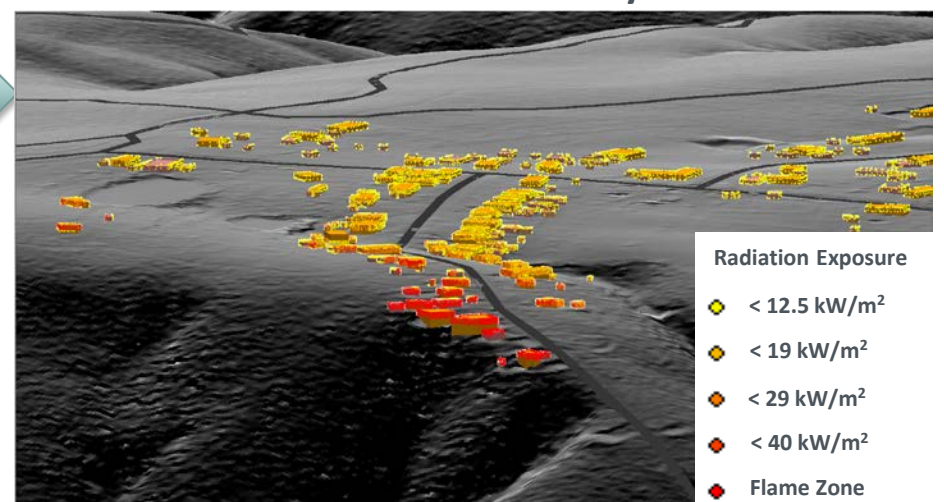
Radiant heat analysis is provided through 3D analysis of heat transfer between the flame bodies and buildings using:

- View factor – how much of a building field of view the flame front represents given that vegetation and terrain partially obscure this view.
- The flame bodies temperature and emissivity.

Phoenix Fire-Spread Simulation



Radiant Heat Analysis



- Radiation Exposure
- < 12.5 kW/m²
 - < 19 kW/m²
 - < 29 kW/m²
 - < 40 kW/m²
 - Flame Zone