# DEECA Bushfire Risk Assessment Metadata Statement Wimmera CMA

Metadata Statement for External Clients

## Bushfire Hazard and Risk Assessment

The Department of Energy, Environment and Climate Action (DEECA) assesses and quantifies bushfire hazard and bushfire risk using a sophisticated modelling framework. The framework uses multiple data inputs, processed data, data models, bushfire simulations and subsequent analysis. There are a range of outputs from the framework with an unlimited number of potential applications. This report provides information about one of those outputs, the 'bushfire hazard assessment', which may be used by external stakeholders and clients to undertake their own risk assessment against specific assets or values of interest. The 'bushfire hazard assessment' can be used to identify the relative hazard of bushfire in different locations. This product does not consider the likelihood of fires starting, or the exposure and vulnerability of assets that may be exposed to bushfires. This product represents the 'hazard' element in the risk equation and can be combined with asset exposure and vulnerability data to produce a risk assessment.

## Assessment Settings

The fire behaviour simulations were conducted using Phoenix RapidFire, a computerised bushfire model used by Victorian and other state fire agencies including DEECA and the Country Fire Authority (CFA) to model the behaviour of actual and potential fires. To look at potential bushfire impacts, fires are simulated across Victoria from ignitions within each cell of a 2km grid across the state, which equates to more than 70,000 standard ignition locations across Victoria. Phoenix is used to run simulations and provides outputs at a 180-metre resolution.

The simulations use the worst-case weather and fuel scenario for your specific area. This includes local weather conditions of the worst fire danger day in the last 50 years (spatially interpolated from actual weather records). Local weather information is applied to each ignition location (one ignition within every cell of a 2km grid over the study area). The highest potential fuel load scenario was also used, which assumes no fuel management or wildfires have occurred, i.e., that all fuels are at their maximum load, therefore producing the most intense fire behaviour possible. Fuel type information is derived from Ecological Vegetation Class mapping. A summary of input parameters is available in Table 1.

**Table 1. Summary of input parameters for bushfire hazard assessment**

| Parameters | Analysis Settings |
|---|---|
| Topography | Digital Elevation Model at 10m resolution |
| Ignitions | One ignition within each cell of a 2km grid |
| Specified Weather Scenario | Worst Forest Fire Danger Index (FFDI) day in the last 50 years for each ignition location |
| Fuel Type | Fuel type derived from Ecological Vegetation Class data |
| Fuel Status | Maximum fuel load (no fire history) |
| Simulation Resolution | 180m grid |
| Simulation Extent | Statewide Victoria, no buffer. Clipped to CMA region. |
| Outputs | Geodatabase containing 2 rasters:<br>- max_intensity (use attribute = Value) |

| | |
|---|---|
| | - count_intensity (use attribute = Value)<br>- Shapefile standard_products_nfh_r1_cell_impact_vic with original data<br>  o max_intens (maximum intensity)<br>  o avg_intens (average intensity)<br>  o sum_intens (sum of intensities)<br>  o count_inte (count of intensities)<br>  o intensity_ (count of intensities above 10,000kW/m) |

Phoenix Rapidfire runs all ignitions simultaneously, with the assumption that none of these individual fires interact with each other and occur all at once. The sum of ignitions is therefore not a real measure of bushfire hazard but can be used to provide a crude ranking of locations that are more 'hazardous' that others, i.e., where the sum is highest. This measure is provided as the count of intensity (or processed quantile or other measure).

# Outputs

Outputs from the bushfire hazard assessment are produced at a resolution of 180 metres and include a range of attributed detailed in 'Outputs' in the table above, related to fireline intensity.

## Fire Intensity

Fire intensity is the radiant heat energy released by fire and is measured in kilowatts per metre (kW/m).

There are broad categories of fire intensity that relate to expected fire behaviour and suppression effectiveness:

- 3,000kW/m is the approximate upper limit where direct attack suppression can be successful, i.e., using equipment to directly attack the fire.
- 10,000kW/m is the approximate upper limit where a person sheltering in a vehicle could survive. Flames are typically up to 6m high. For intensities in this range (3,000-10,000), passive protection is possible, e.g., creating dozer lines, backburning/burning out away from the fire front.
- Between 10,000kW/m and 30,000kW/m, flames are typically 6-20m high. At this level, you could expect crown fires to occur.
- Above 30,000kW/m, a fully developed, intense crown fire is likely, with flames more than 20m high. Fuels, terrain, and weather can begin to combine and interact to reinforce intense fire behaviour.

DEECA considers a fire intensity of at least 10,000kW/m to be an intense fire; where damage to the tree canopy and impact to houses and other infrastructure is likely. Generally, grassfires have lower intensities and are unlikely to reach 10,000kW/m. Forest fires can exceed this threshold significantly, depending on the Forest Fire Danger Index, fuel loads, topography and other factors.

The value of maximum intensity can be used as a 'worst-case' option for a conservative risk assessment. This value represents the worst modelled fireline intensity from any of the 70,000+ simulations used in the analysis, if using the worst-case fuel and weather scenario.

# Uncertainties and Limitations

Due to the unpredictable occurrence of bushfires, it is difficult to quantify the risks that they represent. DEECA has adopted a system that allows the simulation and assessment of many thousands of potential bushfires, without having to wait for real bushfires to occur. While this is useful, it is important to understand some of the assumptions and limitations of such a system. Some examples are described below:

- The outputs of Phoenix RapidFire simulations are modelled and may not reflect actual fire spread or intensity. Phoenix is one of several bushfire models currently available, each with its own strengths and weaknesses. Like all models, Phoenix gives only an approximation of reality. Phoenix is considered the most appropriate tool for bushfire modelling and analysis in Victoria at this time. Beyond bushfire simulations, there are multiple input layers and sub-models within the program, each of which can introduce errors and uncertainty in the modelled outputs. The model is sensitive to minor variations in inputs. Small shifts in the weather, fuel accumulation functions, or time of ignition can cause variations in the results.
- Modelled bushfires are restricted to those that do their most damaging runs in a single day. The risk posed by multi-day bushfires ("campaign fires") is explicitly excluded from the current analysis. The greatest losses of life and property in Victorian bushfires have historically been caused by severe single-day bushfires.

- Fires are ignited and simulated individually on a 2km grid across the State. That is, they are modelled to run independently of each other and do not interact.
- A full understanding of bushfire risk requires consideration of both the likelihood and consequence of bushfire impacts on human life, property and other values. The approach presented here considers the 'hazard' element of bushfire risk, and the likelihood of ignitions is explicitly ignored. In other words, in this analysis, all ignitions are equally likely to occur. We know historically this is not the case, with ignitions close to major roads and towns more likely to occur than remote areas. The likelihood of the weather scenario occurring, and the probability of suppression success are also not considered in the modelling. In built-up areas with early ignition reporting and short response times by emergency services, likelihood of suppression success may be much higher.
- The weather conditions used in this model are based on historic records of bad fire days. Thus, the outputs do not consider future climate scenarios where fire weather conditions are likely to differ from historic conditions.

## Recommended Use of this Data

Depending on the type of analysis you are undertaking, there are many ways in which this data can be used to assess risk.

Intersecting this bushfire hazard information with the location, density, or value of your assets of interest will add the necessary consequence measure to bushfire risk assessment.

**Please contact the Bushfire Risk, Engagement and Predictive Services team for more information or assistance with the data provided.**