

This page of the ARCAM dashboard helps you pick a **VicEmergency incident** and see, at a glance, how exposed your **site** may be based on **distance** and **wind direction/speed**. It does **not** predict fire behaviour perfectly; it provides a fast, conservative “situational awareness” estimate that’s useful for decision-making.

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## 1) Site Coordinates

These are the coordinates the system uses as “home/site” and can be obtained from Google Maps.

- **Site Latitude / Longitude** are the fixed coordinates you’ve entered.
- **Use site coordinates** selects whether calculations use the fixed site coordinates or the `zone.home` coordinates.  
If `zone.home` has been set to the same location, the toggle won’t change anything (both sources match).
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## 2) Wind (BOM Aireys Inlet)

This is the local weather input that drives the model.

- **Wind speed** is the “open wind” speed (km/h) used for spread calculations.
- **Wind gust** is shown for awareness (gusts can worsen conditions).
- **Wind direction** is shown as cardinal (e.g., NW) plus degrees:
  - **Wind FROM:** where the wind is coming from.
  - **Wind TOWARDS:** where the wind is pushing smoke/embers/fire spread *towards*.
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## 3) Fire Selection (VicEmergency)

- **Fire of interest** is a dropdown list of nearby VicEmergency incidents within your chosen radii.
- **Auto-select WATCH bushfire (latched)** can automatically select the nearest “Watch & Act” bushfire (if available).
- **Watch zone radius / Max relevant radius / Non-bushfire max** control which incidents appear in the list.
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## 4) Selected Fire Details

Once you select an incident, the system copies its key details into the “current fire” inputs:

- **Fire name** (headline/label from the feed)
- **VicEmergency ID**
- **Fire lat/lon** (incident location used for distance/bearing)

If these show “unknown” or -90/-180, it usually means no valid incident is selected.

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## 5) Fire → Home Geometry

These are the basic geometry calculations:

- **Distance (km):** straight-line distance from the selected fire to your site.
- **Bearing to home (deg):** the compass direction from the fire to your site.
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## 6) Downwind / Exposure

This is the key “am I in the path?” test.

- **Downwind cone half-angle** sets how wide the “downwind danger corridor” is (e.g., 40° means a total cone of 80°).
- **Downwind offset** is how far off-centre your site is from the wind’s downwind line.
- **Home downwind?** becomes **YES** when your site lies within the downwind cone.

If **Home downwind = NO**, the ETA outputs are suppressed (shown as blank/unknown) because the simple wind-driven spread model is not appropriate when you’re crosswind or upwind.

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## 7) Threat Model (Wind-driven): fire front and embers

This model produces two arrival estimates:

### A) Fire front rate of spread (ROS)

The model approximates how fast the **main fire front** could advance in the downwind direction. In eucalypt fuels, a useful rule of thumb is that forward spread can be around **8% of open wind speed** at high winds.

To reflect the way fire behaviour changes with wind, the model uses three phases:

- **Phase I (0–15 km/h):** low intensity; wind has limited effect.  
The model increases slowly with wind but is clamped to stay realistic.
- **Phase II (15–25 km/h):** transition zone; fires become harder to control.  
The model ramps up more strongly.
- **Phase III (25+ km/h):** very high intensity; wind-driven spread dominates.  
The model uses the “~8% of wind speed” rule.

Outputs:

Spread phase (I/II/III)  
Fire front ROS (km/h)

### B) Ember (spotting) attack

Embers can arrive **before** the fire front and ignite new fires closer to the site. A common approximation for medium-distance spotting is:

**Maximum spotting distance  $\approx 3 \times$  fire ROS** (“Rule of 3”)

We convert that into a simple “ember arrival speed”:

**Ember attack speed =  $3 \times$  fire front ROS**

So, if the front ROS is about **8% of wind**, embers behave like roughly **24% of wind** in the high-wind phase.

Outputs:

Ember attack speed (km/h)

ETA embers (hr) = distance  $\div$  ember attack speed

ETA fire front (hr) = distance  $\div$  fire front ROS

Interpretation:

ETA embers **is the earlier “first serious risk” estimate (spotting/ember attack).**

ETA fire front **is the later “main front arrival” estimate.**

### **Important caveats**

These estimates are deliberately simplified. Real fire spread depends heavily on: fuel dryness and type, terrain slope, suppression activity, spotting behaviour and convection, local wind variation and gusts. These figures can only thus provide a rough guide at best, but may be helpful in considering feasible threats and their progression as fires move in the environment.