Gleadell Street

Canopy Cover, Aerial Thermal Images, Shade Studies and Heat Mapping

Canopy Cover

Tree canopy cover has been measured for the whole municipality. Tree canopy cover is the measure of tree leaf canopy that shades the ground when viewed from above.
Tree canopy cover includes all trees within the municipality from street and park trees to those in backyards, in private carparks, on commercial and industrial land and along waterways.

Tree canopy cover is one of the strongest measurements in representing the objectives of the Urban Forest Strategy as it can measurably quantify the benefits of the urban forest such as shade, stormwater interception and carbon storage.

Achieving a significant number of larger canopy trees in an inner-urban setting can be challenging due to competition for growing space, therefore more small-medium heights are common in most areas, with taller trees left to flourish in wide streets or open space.

Planting the right tree for the right location therefore becomes the vital objective.

Aerial Thermal Image

Aerial thermal imaging of the city provides a more detailed view of the heat island by showing where in Yarra heat is most being retained.

A thermal image of Yarra taken at night time in summer during an extreme heat event. The picture highlights the areas that retain more heat (dark red = hotter) versus those that are cooler (the whiter areas). Roads (especially major roads) stand out as the key source of heat retention in Yarra.

To minimise the impact of The Urban Heat Island effect means trees, and canopy cover, is vital in areas where people may be more affected to extreme heat conditions.

Urban Forest Strategy;

- Shade trees reduce daytime temperatures between 5-20º (Adams and Smith, 2014).
- To reduce urban heat island by 1ºC in an extreme heat event, there needs to be a 10% increase in vegetation (Norton et al, 2013).
- A 1-2ºC temperature reduction can significantly reduce heat mortality rates for old and frail people (Coutts et al, 2012).
- Economic benefits Reducing energy use in buildings: a 10% increase in deciduous tree cover can reduce heating and cooling costs in houses by 5-10% (Simpson and McPherson, 1996; Akbari et al., 2001)
- High pedestrian activity zones are prevalent across Yarra due to its inner city locale, array of public transport offerings and breadth of commercial/ retail areas that align with the transport network.
- Schools and commercial zones have also been mapped to identify areas where people are most likely to walk to and within. These pedestrian activity zones present opportunities for tree planting which will improve micro-climatic moderation for people using the area.

City of Yarra Canopy Cover Mapping 2017

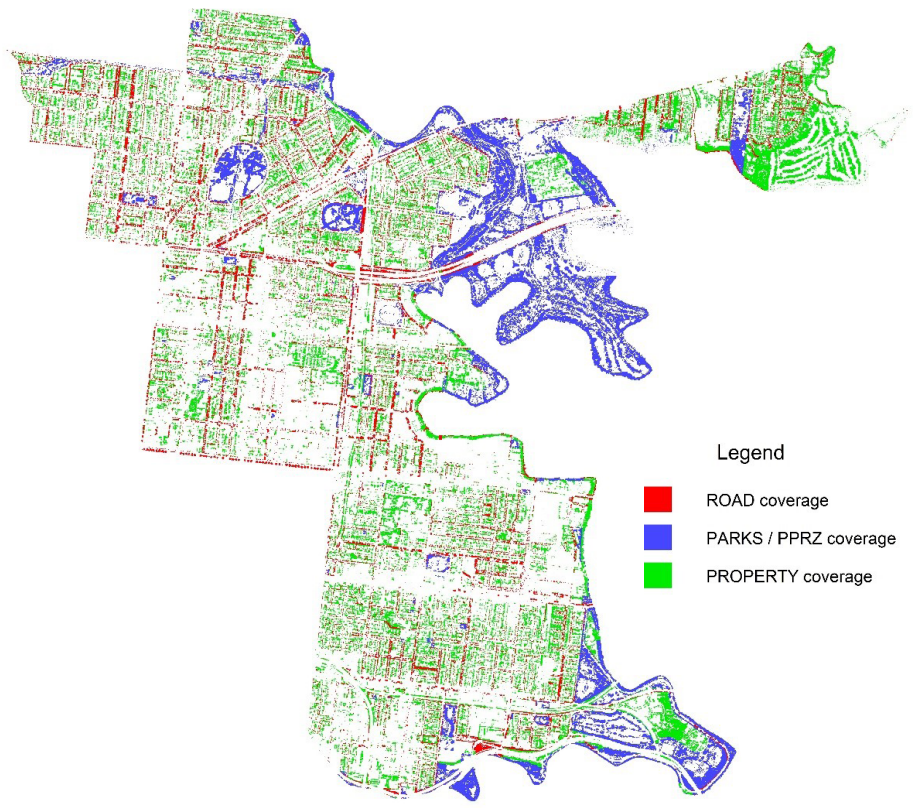


Figure 1 - Tree canopy cover for the City of Yarra
(Urban Forest Strategy 2017)

City of Yarra Aerial Thermal Image 2017

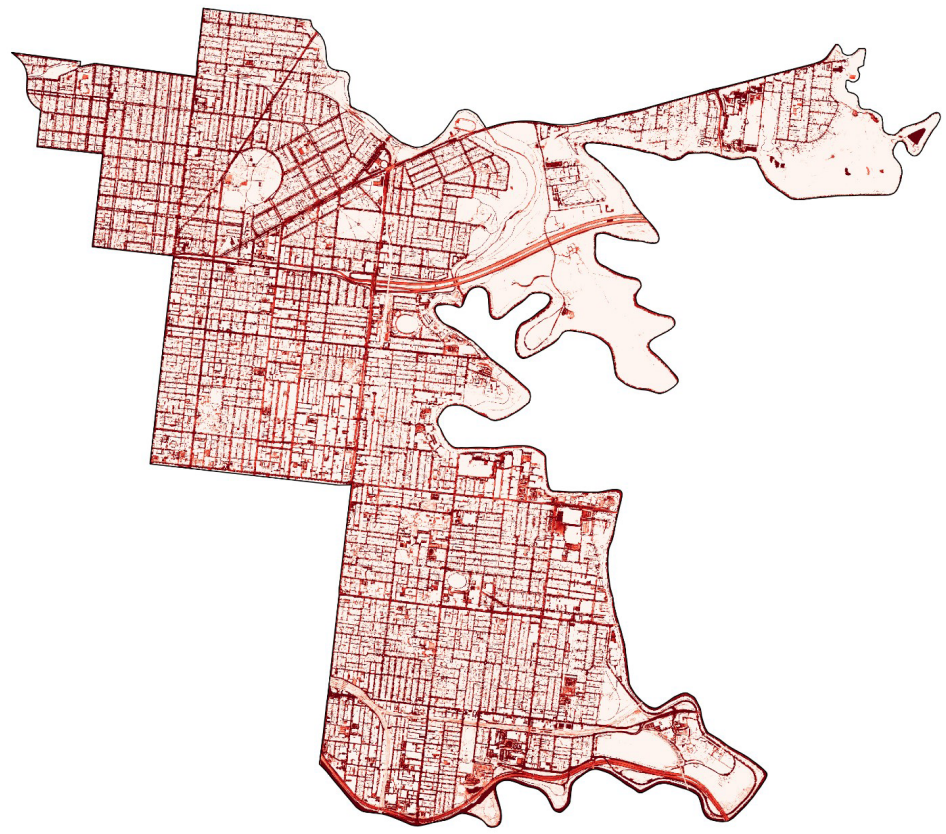


Figure 3 - Aerial thermal imaging of the City of Yarra showing thermal hotspots (dark red)
(Urban Forest Strategy 2017)

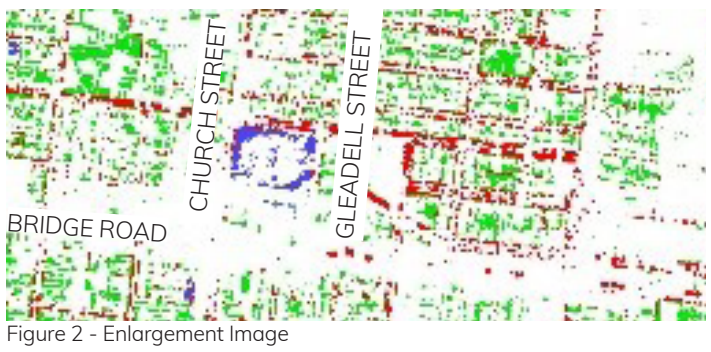


Figure 2 - Enlargement Image

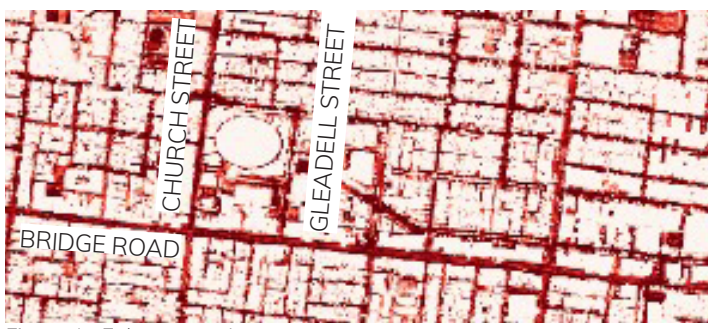


Figure 4 - Enlargement Image

Base Model

A site specific model was generated showing the existing built form as soild mass and trees were identified and modelled to approximate size and simulations factor in deciduous and evergreen.

Summary Shade Study

Shadow studies were undertaken for the street at the following periods;

- Summer Solstice
- Equinox
- Winter Solstice

At the following times respectivley;

- 9am
- 12pm
- 3pm

The cumulative mapping reveals how much direct sunlight hits the ground during a full day.

Red indicates the highest exposure to sunlight. The colours do not represent heat in any way, though there would be some incidental correlation.

CUMULATIVE SUNLIGHT LEGEND

0hr 3hr 6+hr

Gleadell Street - Shade During Summer Solstice

9am | 12pm | 3pm | Summer Solstice Cumulative

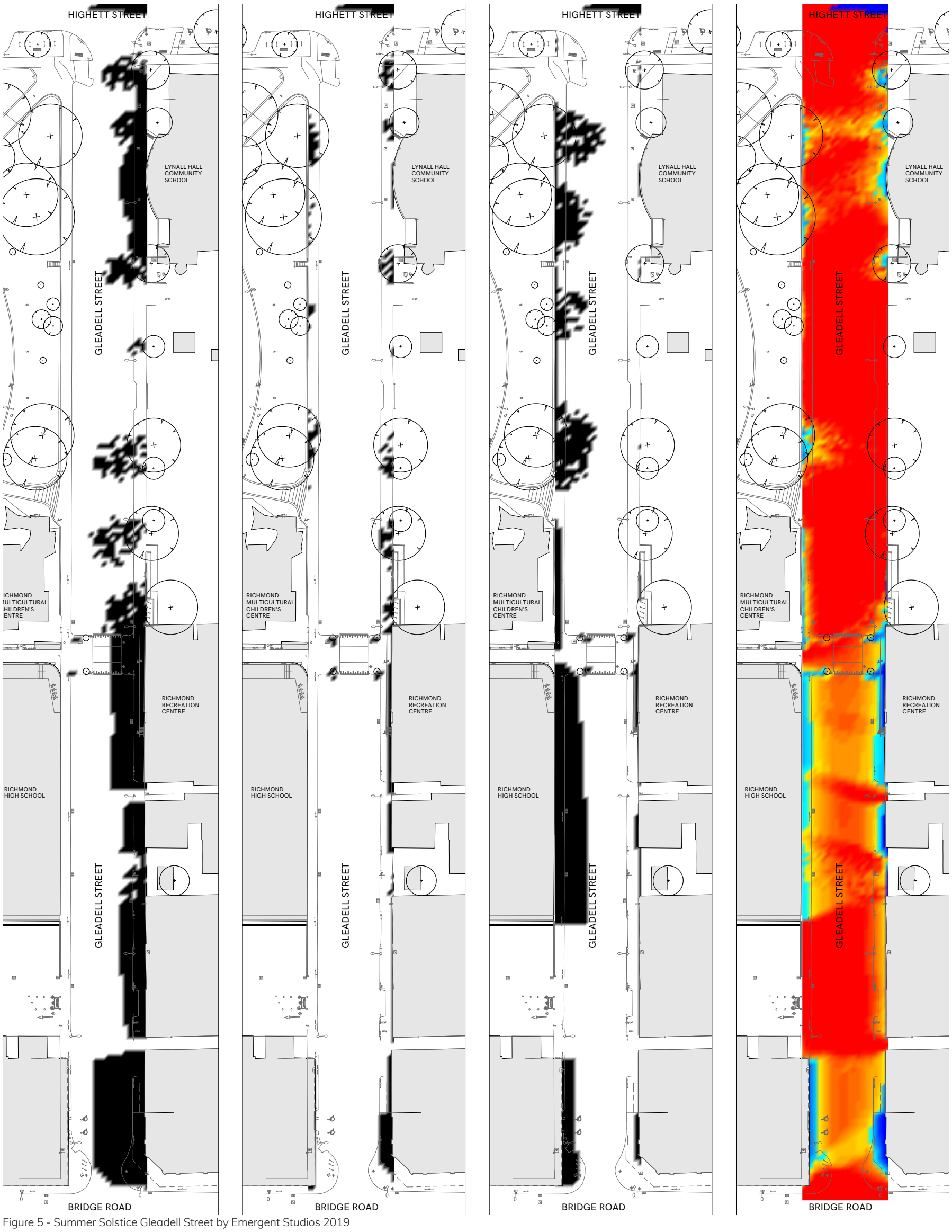


Figure 5 - Summer Solstice Gleadell Street by Emergent Studios 2019

Gleadell Street - Shade During Winter Solstice

9am

12pm

3pm

Winter Solstice Cumulative

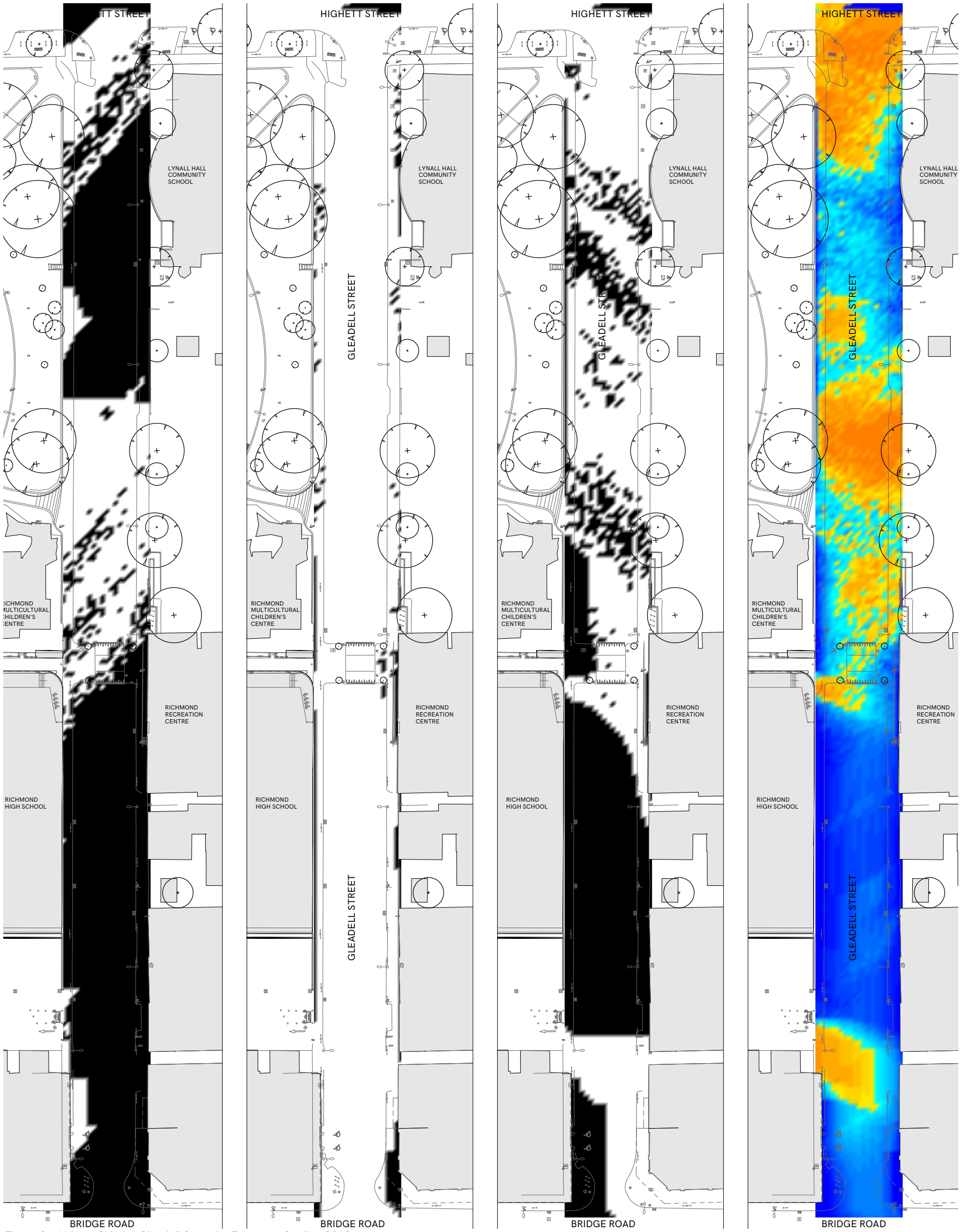


Figure 6 - Winter Solstice Gleadell Street by Emergent Studios 2019

Heat Mapping
Universal Thermal Climate Index (UTCI)

Spatial heat mappings of Universal Thermal Climate Index (UTCI) was undertaken that accounts only for MRT (Mean Radiant Temperature) as it relates to the human comfort.

UTCI mapping at 5PM on an average day in summer (15th January) using published weather statistics that is within the typical summer week.

The mappings generated illustrate the spatial effect of sun/ shade on comfort - a key driver of outdoor comfort during the daytime.

Thermal comfort analysis was sampled 1.1m above ground level and expressed as a “feels like” temperature incorporating wind, relative humidity and radiant heat in a simplified model of the urban environment.

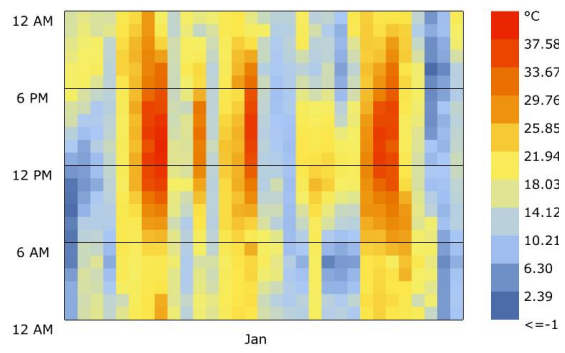
Tree canopy is simulated with a standard 77% shading characteristic and all hard surfaces are assumed to be of one material.

The heat simulations were performed using in conjunction the following software and data;

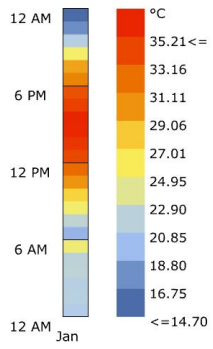
- Building energy simulation program Energy Plus
- 3d modelling software
- Weather data driving the simulation is publicly available online

The results of this study are indicative only and do not account for the evapotranspiration* associated with evaporation from surfaces and tree canopy which will likely have a more pronounced localised cooling effect than is currently shown.

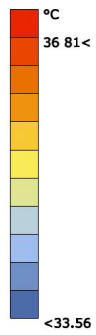
*Evapotranspiration is the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.



UTCI Hourly - Melbourne
1 Jan - 31 Jan



UTCI Hourly - Melbourne
15 Jan - 24 Hours



UTCI Degrees Celcius - Melbourne
15 Jan - 5PM

Gleadell Street - Average Summer Day
15 January at 5pm

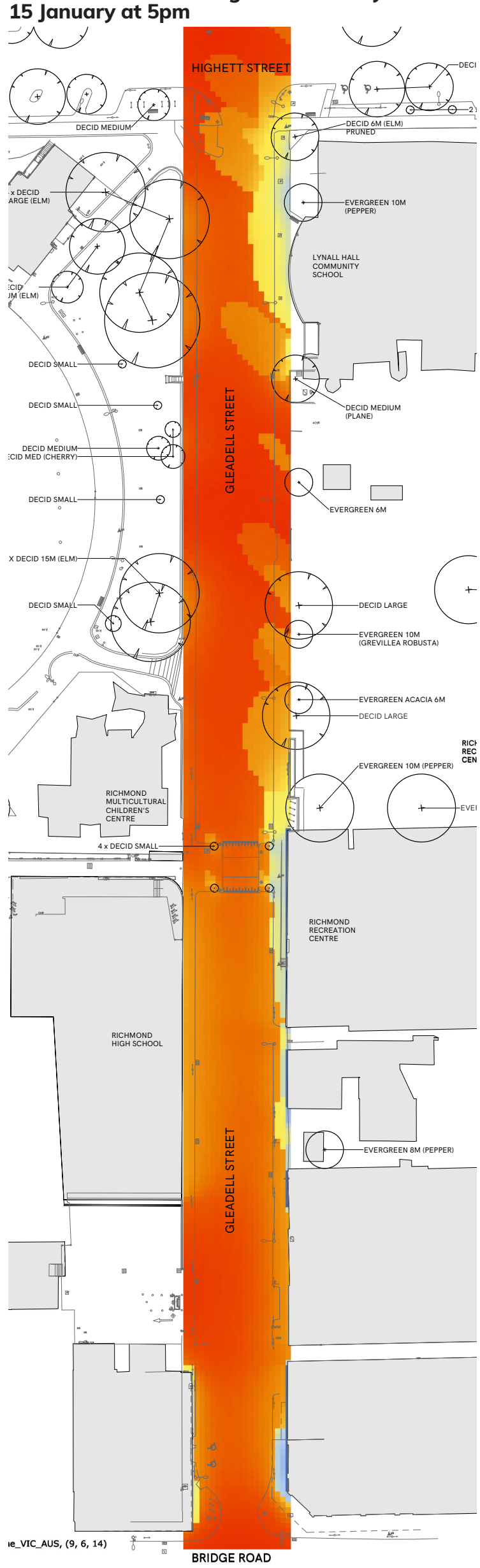


Figure 7 - Gleadell Street Heat Map
by Emergent Studios 2019