3.2 Heat effects

The Western Melbourne region, which includes Wyndham City Council and City of Greater Geelong, has a diverse range of urban environments. These include large, low-density, single use residential growth areas, established residential suburbs, dense mixed use and commercial areas, and industrial precincts. The urban heat risks to each of these urban environments are different and locally specific, and influenced by a range of factors.

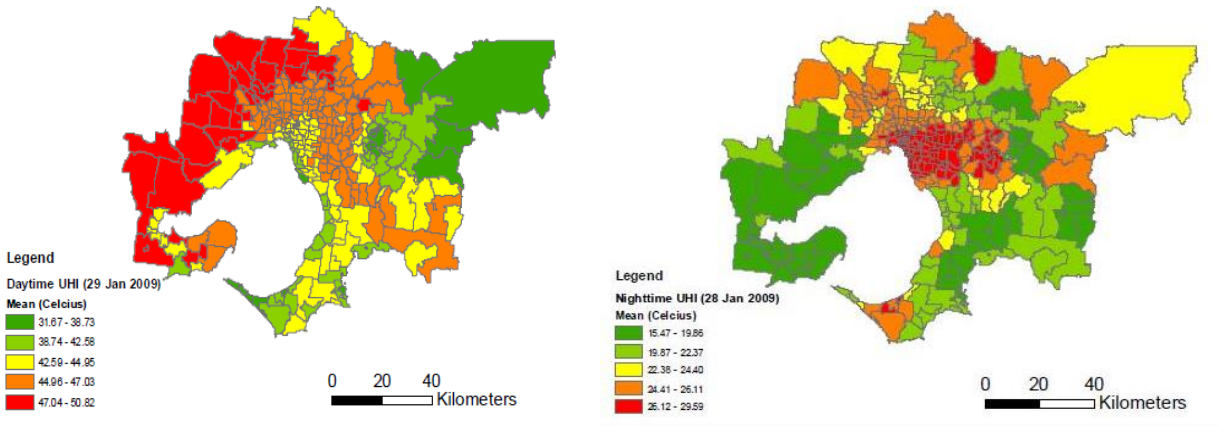


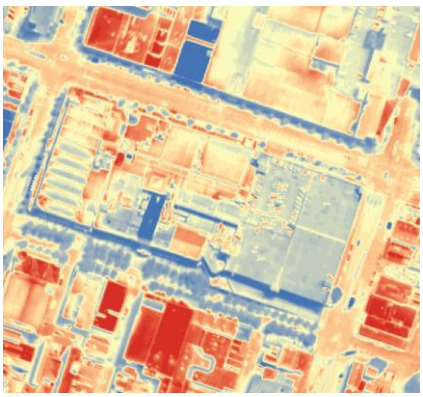
Figure 3: Land surface temperatures observed from MODIS satellite imagery on 28-29 Jan 2009 for daytime (left) and night time (right) (Loughnan et al. 2010)

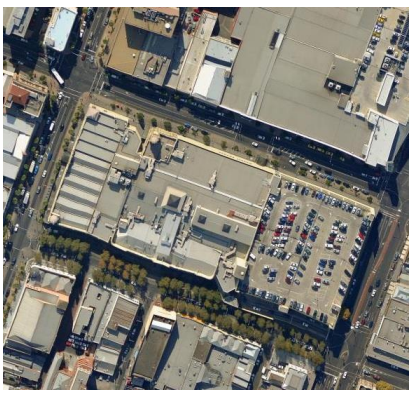
Thermal imagery has been reviewed for this study. A number of specific heat effects and suggested approaches for mitigation, based on the thermal imagery are set out in the sections below. The thermal flyover for Geelong was undertaken on 6 February 2013 and for Wyndham on 24 January 2012. Limitations in respect of the thermal data are set out in 5.1.1 however the imagery provides a good way to better understand a range of risks and to begin to consider appropriate responses.

3.2.1 City of Greater Geelong

Table 1 Urban heat risks and potential responses based on thermal imagery data collected on 6 February 2013

Street scene
– A comparison of two streets is presented below, one with trees (northern east-west street) and one without (southern east-west street). The cooling nature of the street trees is evident. – However, these street are designed for different purposes: the open street is for traffic, while the street with trees is designed for parking and pedestrians. **Location: 118-136 Little Malop St, Geelong**

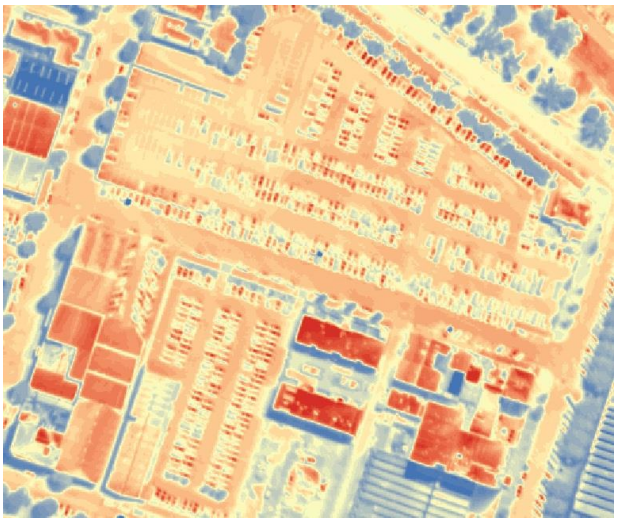




Car parks

- Unshaded car parks show high surface temperatures. Planting trees within the car park would be beneficial.
- This car park is close to the ocean, and there is likely to be sea breezes providing cooling effects despite the high surface temperatures. However, trees provide shading as well, which is important for improving human thermal comfort.

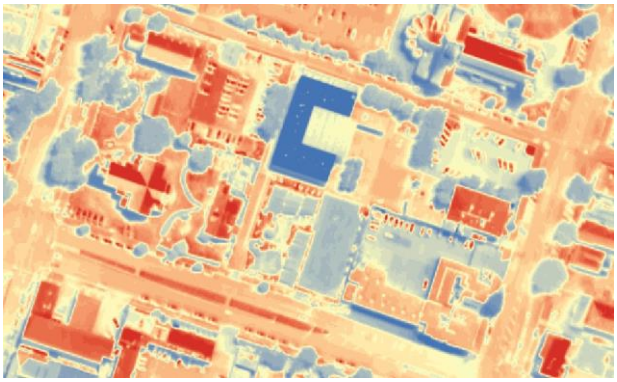
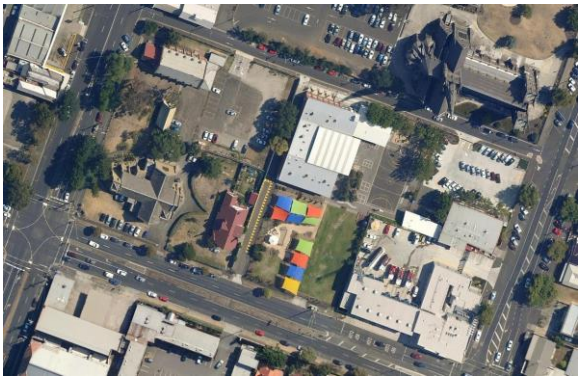
Location: Deakin University car park 68-92 Cavendish St, Geelong




Hot spots and mapping anomalies

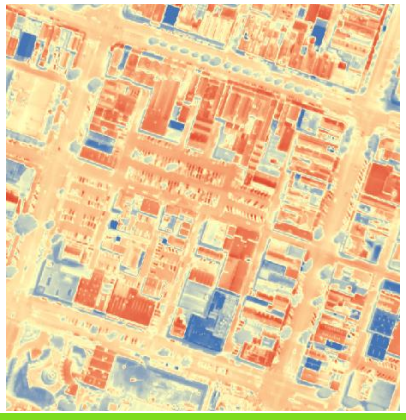
- Data can be used to identify hotspots surrounding areas with populations that are vulnerable to heat such as schools. The asphalt car park is a hot-spot, as is the unirrigated grass area. The effect of irrigation can be seen in the area to the east of the shade sails.
- The very cold (blue) roof is an artefact of the data collection process and is due to the low emissivity.
- The surrounding wide roads could also be targeted for vegetation to reduce surface heating.

Location: 275 Moorabool St, Geelong

– The block below is particularly devoid of vegetation and has a very high level of imperviousness, and shows very high ground level surface temperatures. This would be classed as a 'hot-spot'.

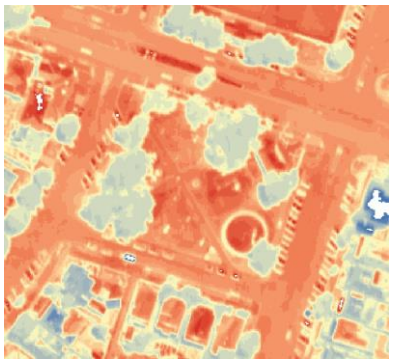
Location: 31 Little Ryrie St, Geelong



Public open space

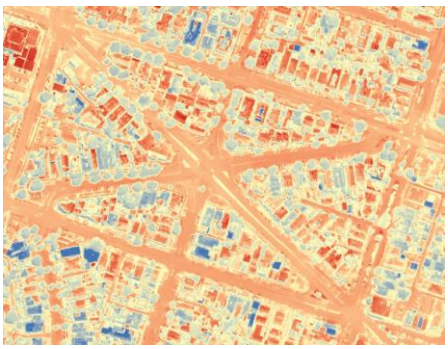
– Public open space can be irrigated to provide a more thermally comfortable environment. The surface here (dark tan bark) actually serves to increase the surface temperature and surfaces are as hot as the surrounding asphalt roads. This park does provide tree shade however, which is beneficial for human thermal comfort.

Location:160-166 McKillop St, Geelong



– Some of the hottest areas during the day are wide open streets where there is little shading from buildings or vegetation.
– High amounts of solar radiation reach the surface here, resulting in intense heating.
– Vegetation is most effective during the day in wide open streets where solar access is high.

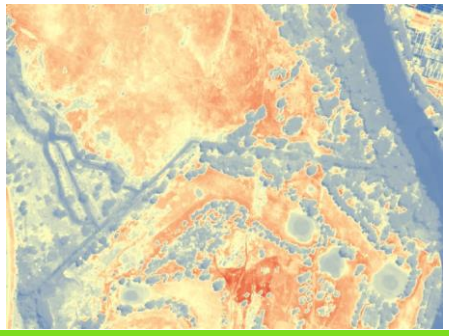
Location: 16 Sydney Ave, Geelong



Soil moisture

– The role of soil moisture can also be seen in this image. Along the river, and the depression on the west of the image, grass surface temperatures are lower as moisture drains to these areas.

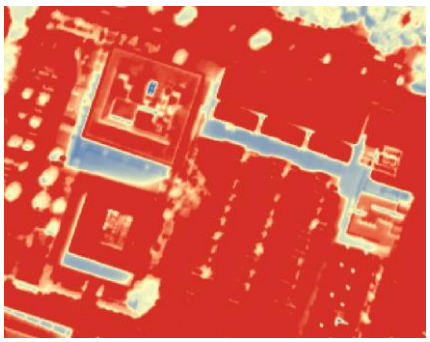
Location: La Trobe Terrace, Belmont

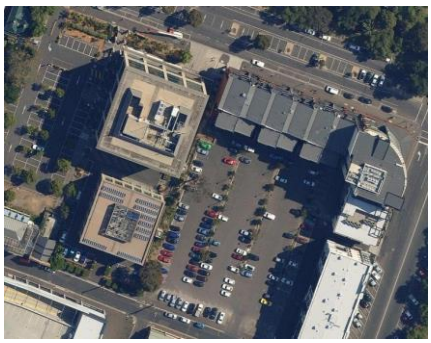


Building shade

– The colour palette has been changed in this image to emphasise the effects of building shade on surface temperatures. Surface temperatures were some 25 degrees cooler when shaded. Of course, this shade will move throughout the day, but in designing streets for pedestrians and public space, solar access should be considered.
– Shading patterns in the thermal image are slightly different form the aerial image because of the different times of the day.

Location: 4 Corio St, Geelong

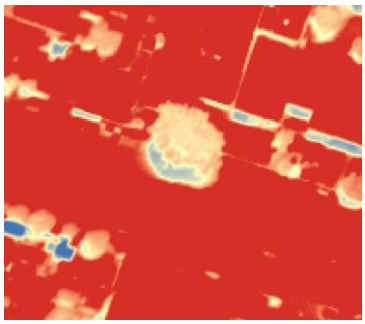




Tree shade

- Again to emphasise the cooling effect the colour palette was changed. In the image below the tree canopy temperature is lower than surrounding urban materials because trees absorb and reflect solar energy, and also transpire. Plus, the shading effect of this large canopy tree can be seen. Large shade trees should be protected and promoted.
- Again, shade patterns will change throughout the day, so designing spaces should consider solar access and strategically place trees

Location: 283 Ryrie St, Geelong



- In another example to emphasis tree effects: the tree canopy temperatures in the irrigated park appear cooler than in the adjacent park to the south-east. This could possibly be due to the different amounts of irrigation in the parks (it could also be a result of different tree species)
- Irrigation provides more moisture to the root zone for trees to draw on for photosynthesis and transpiration.
- Tree canopy temperatures did vary and this can also be a result of the micro-climate these trees are exposed to. Trees surrounded by urban surfaces must endure higher surface temperatures (from the ground and walls) and warmer, drier conditions. Providing soil moisture can help trees endure urban conditions.

Location: 6 Bellerine St