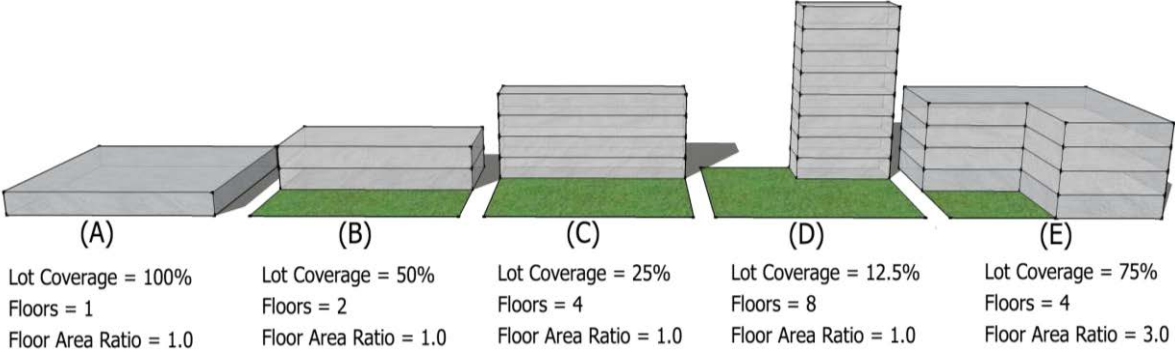


**Supplementary Material**

**S1. Further model concepts**

Figure S1 illustrates how floor-area-ratio relates to lot coverage and the number of floors in five different conceptualised examples.



*Figure S1. Illustrating the relationship between lot area, number of floors, lot coverage (i.e. building footprint) and floor-area ratio (FAR) to better understand the link in residential planning parameters*

**S2. Case study data acquisition and pre-processing**

Existing land use zoning maps (for Yarra Estuary and Troups Creek case studies) and elevation contours for all three case studies were obtained from the Victorian Government’s Open Data repository (Victorian Government, 2015) and reclassified into the model’s classification system (guidance for which is provided in Bach et al., 2015). Population density for Yarra Estuary and Troups Creek were obtained from the latest Australian census (Australian Bureau of Statistics, 2016). For Toolern Precinct, the proposed development plan and projected population densities were obtained from the Metropolitan Planning Authority in the form of a georeferenced drawing and translated into the required raster map and land uses. To aid the translation of this data into the appropriate maps, we also consulted the Precinct Structure Plan (PSP), which prescribes planning ordinances for the precinct (GAA, 2011).

Figure S2 illustrates the two different spatial data used for calibration of impervious areas for Troups Creek Catchment and the Yarra Estuary Catchment.

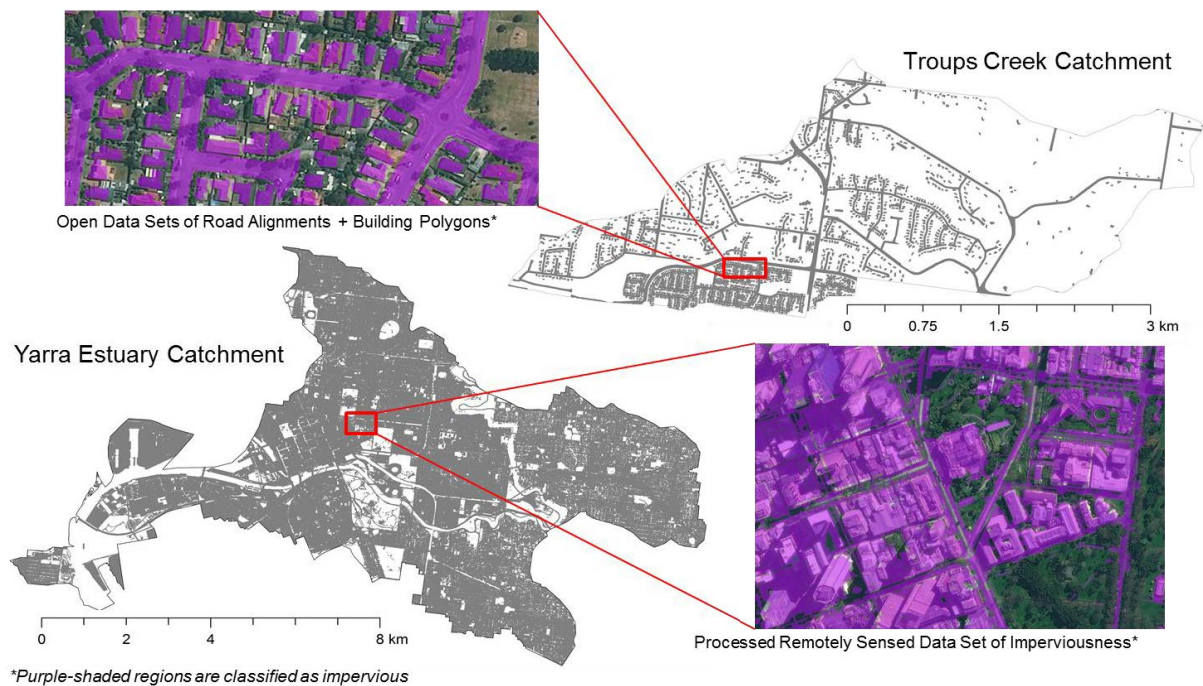


Figure S2. Different spatial reference data sets of impervious areas for model calibration; Troups Ck Catchment uses merged layers of building footprints and road alignments and can have notable errors in the delineation of the impervious road area and exclusion of other paved surfaces; Yarra Estuary Catchment's impervious area was determined from remotely sensed imagery and is more accurate in depicting the majority of areas, but can potentially show errors due to misinterpretation by the automatic image classification algorithm.

## References

- Australian Bureau of Statistics (2016) *Australian Bureau of Statistics*. Available at: <http://www.abs.gov.au> (Accessed: 30 March 2015).
- Bach, P. M., Staalesen, S., McCarthy, D. T. and Deletic, A. (2015) 'Revisiting Land Use Classification and Spatial Aggregation for Modelling Integrated Urban Water Systems', *Landscape and Urban Planning*, 143, pp. 43-55.
- GAA (2011) *Toolern - Precinct Structure Plan (Including Toolern Native Vegetation Precinct Plan)*, Victoria, Australia: prepared by Melton Shire Council and Growth Area AuthoritiesSM20110810 3:26).
- Victorian Government (2015) *Victorian Government Data Directory*. Melbourne, Australia. Available at: <https://www.data.vic.gov.au/> (Accessed: 30th March 2015).