

# **Zenith Model Establishment and Validation Report**

**Prepared as a Contribution to the Victorian  
Transport Plan and the Victorian Government's  
Infrastructure Australia Submission**

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## Zenith Model Establishment and Validation Report

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## 1.0 Introduction

### 1.1 Background

This report has been prepared by Veitch Lister Consulting Pty Ltd (VLC) as part of its contribution to the development of the Victorian Transport Plan and the Victorian Government's Infrastructure Australia submission.

The major analytical tool employed in the background analysis was VLC's Zenith travel demand model. The purpose of this report is to demonstrate the quality of the calibration of the Zenith model in the base year.

### 1.2 Scope of and Content of Report

The primary aim of this report is to describe the features of the version of the Zenith model used during the study, to document the model validation procedures that have been adopted as part of the establishment of the model, and to present the model validation results.

The specific capabilities (or strengths) of the model have been highlighted, as well as areas where the model's predictive capabilities are limited. The balance of this report is structured as follows:

- **Section 2:** Description of the Zenith Travel Forecasting Model
- **Section 3:** Validation of the Model
- **Section 4:** Travel Demand Modelling Limitations

## 2.0 Description of the Zenith Travel Forecasting Model

### 2.1 Introduction

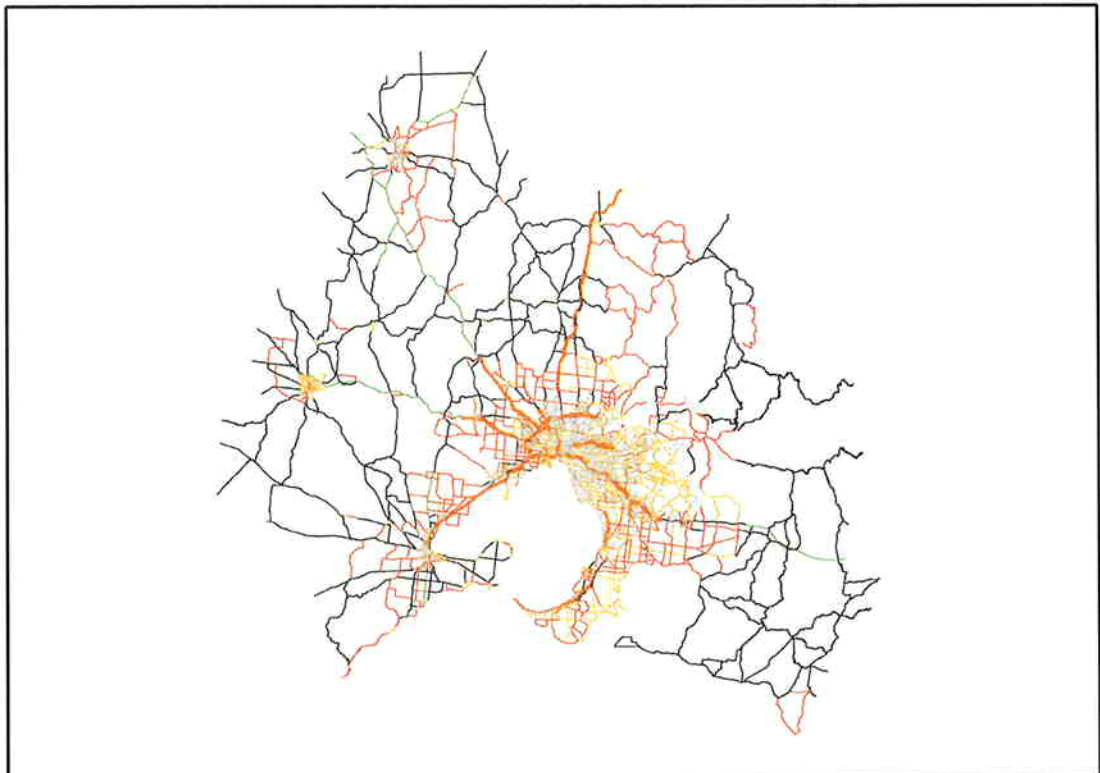
This Section of the report describes the current extent of the Zenith model, its structure and capabilities, and the nature of the outputs it can produce.

In simple terms, the Zenith model can be described as a strategic travel forecasting model with multi-modal and time-period predictive capabilities.

### 2.2 Current Extent of the Model

The Zenith Travel Forecasting Model simulates the travel demands and patterns of the entire travel market in Metropolitan Melbourne, Geelong, Ballarat and Bendigo, as well as in the surrounding rural areas. This includes travel made by non-motorised modes (walking and cycling), public transport and private car, as well as commercial vehicle travel. The footprint of the model is shown in Figure 1.

**Figure 1: The Footprint of the Zenith Model**



The transport network within the modelled area is specified in some detail. All freeway, arterial, sub-arterial and collector roads are included in the simulation network, as well as every train line, train station, tram route, bus route and tram/bus stop. The public transport network includes both V-Line and suburban train services.

The large area covered by the model results in a transport network comprising of some 60,000 links (i.e. sections of road or railway line, ferry links, etc.), for which link attributes (such as free-flow speed and capacity) have to be specified.

Travel demands and patterns are generated at a fairly fine-grained travel zone level. In other words, the model predicts travel demands from each of 2,519 discrete areas of the region (called travel zones) to every other discrete area. Travel made for a range of purposes is separately forecast - i.e. work, education, shopping, recreation, etc. - and travel demand varies by time of day.

The two main "drivers" of the model's travel predictions are the land use structure of the region (i.e. the distribution and intensity of various land uses) and the configuration and characteristics of the transport system (i.e. travel speed, capacity, frequency of public transport services, etc.). However, the model's predictions are also influenced to some degree by transport pricing - such as parking charges, petrol price, tolls and public transport fares.

## 2.3 Outline of the Zenith Model's Structure

The Zenith model has the following basic components:

- Road and rail infrastructure networks (including system capacities and operating speeds).
- Dedicated tram and bus right-of-ways.
- Transit service networks (routes), service frequency and fare details.
- Details of the various land uses in discrete areas of the city - called travel zones.
- Dedicated pedestrian routes/facilities.
- Travel patterns (expressed as numbers of trips made between origin and destination travel zone pairs by travel mode and journey purpose). The tables reflecting these travel desires are called trip matrices.
- Details of parking charges, tolls and vehicle operating costs (including petrol price).
- Model calibration parameters derived from household travel surveys that require survey participants to submit travel diaries.
- Algorithms to interrogate the model's forecasts and produce a wide range of graphical outputs and transport system performance indicators.

The running of the Zenith model involves four key steps (or program modules) that are executed sequentially, and quantify the following for a specific land use/transport scenario that has been submitted to the model.

1. How many trips will people resident in each travel zone make each weekday - and for what journey purposes? - ***Trip Generation***
2. To which travel zones will they travel to satisfy their travel needs, and at what time of day? - ***Trip Distribution***
3. What mode(s) of travel will they choose? - ***Mode Choice***