AITPM Victorian Branch Technical Forum

**Practical uses of traffic microsimulation modelling**

Tuesday 30th June 2009, 4:45pm – 6:30pm

Department of Transport Theatrette, 121 Exhibition Street, Melbourne

Our speakers today are...

- **Julian Laufer**  
  Principal Transport Planner, PTV Asia-Pacific

- **Reece Humphreys**  
  Associate Director, GTA Consultants

- **Pete Kelly**  
  Principal Traffic Engineer, Parsons Brinckerhoff

- **Mike Broekman**  
  Senior Traffic Engineer, Hyder Consulting
Putting the fun back into traffic fundamentals

AITPM technical forum, Melbourne, June 2009

Traffic Engineering

- Context
- Planning vs. Engineering
- Heterogeneity
- Network Assessment
- Local Applications

PTV: company facts

- Based in Karlsruhe, Germany
- Employees: c. 800 in PTV Group worldwide
- Approx 50% team in product research and development

International branches and partners

PTV Vision: Sustainable Investment

With more than 2,000 clients and 7,000 users in over 90 countries
PTV Vision has become the leading transportation planning software
**Traffic Engineering**

- Vehicle by Vehicle Characteristics
  - Speeds
  - Accelerations
  - Vehicle Dimensions
  - Power to Mass
  - Reaction to Car in front
  - Response to Surrounds
    - Familiarity

**Behaviour!**

- Site Specific
- Class Specific

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**Traffic Engineering**

- Analytical Results
  - Intersection Delay
  - Queuing
  - Merging and Weaving
  - Highway Density
  - Public Transport Operations
  - Travel Times/Vehicle Speeds
  - Delays
  - Localised Network Performance

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**Traffic Engineering**

- Assessment of Schemes
  - Signal Coordination
  - Additional Lanes/Short turn bays
  - Bus/Tram Priority Schemes
  - Public Transport Impact Schemes/Station Design
  - Corridor/Network Performance
  - Design Assessment
  - Town Centre Management
  - On-street Parking Schemes
  - Development Assessment
KingsWay

- Prepared by VicRoads Metro NorthWest
- Use of Vehicle Actuation Programming to model signal personality
- Review traffic operations following M1/ WestGate Freeway Project
- Simulator simulation model 6AM-11AM
- Future Year model allows for variation in
  - Traffic Signal operations
  - Cycle Times
  - Signal Co-ordination
  - Tram operations
- Response for Pedestrian Crossing
KingsWay
DETECTOR MAP

KingsWay

Princes Hwy East
- Prepared by VicRoads Technical Consulting and Metro SouthEast
- Corridor analysis
  - Five signalised intersections linked together
  - Future Year Growth - Investigation
- Can the existing landscape manage for additional traffic
- Use of SCATS interface to read signal personality
- External Application to simulate traffic operations
  - Programs read minimum green times, maximum green times, call for pedestrians, master slave relationship
- Further management of existing infrastructure

Two Quick Lessons For Scoping Investigations
- Scope to Scale
  - Don’t push traffic through one intersection and ignore next downstream location
  - Provide appropriate geography for operations at start of project
- Predict and Provide issues
  - Overprovision of infrastructure entices traffic to corridor
  - Reduced impedance and enhances traffic flow
  - Application of integrated VISION solution
West Gate Freeway Upgrade

Micro-simulation Modelling
June 2009

Background

Two Streams of Modelling

1. West Gate Freeway Model
   - Purpose:
     - to assess the performance of the Base Design, under the forecast traffic volumes
     - to identify opportunities for improvement

2. Arterial Road Network Model
   - Purpose:
     - to assess the impact of construction staging on the arterial road network
Background

Two Streams of Modelling

1. **West Gate Freeway Model**

   Model Periods:
   - AM and PM Peak Periods
   - Other periods of interest

2. **Arterial Road Network Model**

**West Gate Freeway Model**

Traffic Data Collection Methods

- Boring but important
- Key lesson - benefits of Video Surveys – TMC, OD

Benefits of OD Video Surveys

- 3 days of footage
- Select an incident free period
- Sample size of 90% +
- Improved quality (full number plates)

Existing Conditions Model

- To establish sound platform, to assess Base Design
- Model based on a very strong set of traffic data

- 2007 OD survey (video)
- TMC (Video)
- ATC
- MMS
West Gate Freeway Model

Existing Conditions Model - Extents

- Western Link
- Tunnels
- West Gate Bridge

Calibration & Validation

- Process to ensure model replicates reality reasonably well
- Adopted standard criteria
- Detailed analysis using MMS volume and speed profiles

Calibration – MMS Profiles

- Volume and speed profiles were assessed at key sites along the corridor

Existing Conditions Model – AM Peak

Visual Assessment

Gneve Parade

Calibration – MMS Profiles
West Gate Freeway Model

Existing Conditions Model – Part B

Calibration – MMS Profiles

EC Model Summary
- The existing conditions AM and PM peak models have been calibrated well
- Robust model to assess Base Design
**Base Design Model**

**Background**
- Built from EC Models
- Purpose
  - To assess the performance of the Base Design under the future design traffic volumes
  - Refine design elements

**Traffic Design Philosophy**
- Maximise capacity
- Design reduces weaves, merges
- “Separation by destination”
- Freeway management system – lane gains
- Key constraints – West Gate Bridge, CityLink tunnels

**Future Traffic Demand**
- Design volumes based on constrained demand - Freeway Management System
- Based on principle of providing approx. 2,100 pcu / hour / lane
- Developed several trip pattern sensitivities

**Model Setup**
- To Stress Test the design
- Design volumes - applied peak hour demands across 2 hours
- Removed gradient of West Gate Bridge (EB Only) to maximise traffic entering the system

**Key Elements of Design**

**Scheme Improvement Examples**
- WB Major Diverge
- Bolte Bridge Ramp
- Ramp Metering
**Base Design Model**

WB Major Diverge
- Relocating works from Kings Way to Montague Street
- Benefit of the Alliance Delivery Method

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**Base Design Model**

Bolte N to E - Ramp Improvement

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**Example of Innovation**

Possible Crossing Point

2 Options:
- Tunnel – very expensive, difficult
- Low level Swing Bridge

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**Example of Innovation**

Low Level Swing Bridge

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**Example of Innovation**

Low Level Swing Bridge – Inter Peak Period

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**Example of Innovation**

Impact on West Gate Freeway

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Freeway & Arterial Road Models

Traffic Management

Freeway
- KRAs
- Key Stages
  - Boite Structure
  - Ramps A and C
  - Mainline metering

Temporary Mainline Metering

Traffic Management

Arterial Network
- KRAs
- Key Stages
  - Lane reductions – Normanby Road
  - Montague Street Interchange

West Gate Freeway Upgrade Study

Conclusion
- Well calibrated models
- Adopted to critique design, improve schemes
- Model traffic management stages
- Lessons learnt
  - Timing
  - Data Collection
  - Merging of Models
  - MBO
  - Cannot model everything
  - Intellectual Property
  - Is an engineering tool