Christchurch City Council

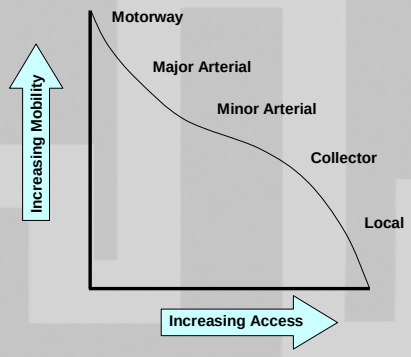
A Strategy to Preserve the Road Hierarchy

Paul Durdin
Abley Transportation Engineers
5th November 2008

Access Management

- Balancing the stated function of roads against effects of adjacent land use activities
- Conflicting demand – retailers prefer frontage to 'busy' roads.
- Busy roads intended to provide mobility ahead of access
- Balance of 'Mobility' and 'Access'

Road Hierarchy Relationship with Access and Mobility



Christchurch City Council Study

- Rapid increase in prevalence of signalised site access points in Christchurch
- Identify and assess the resultant effects of signalised site access points on the arterial road network
- Develop a suite of techniques to determine when signalised site access points are likely to be acceptable / unacceptable

Study Sites

Colombo Street (Countdown)

Study Sites

Main North Road (Northlands Shopping Centre)

Study Sites

Marshland Road (The Palms)

Study Sites

Riccarton Ave (Public Hospital)

Study Sites

Wainoni Road (Pak n'Save)

Study Sites

Whiteleigh Ave (Tower Junction)

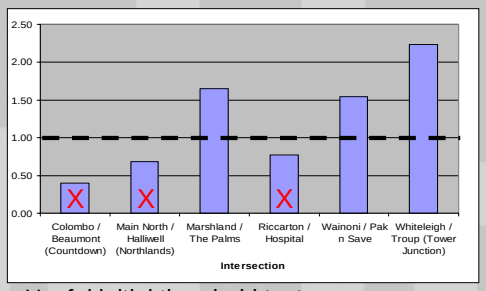
Comparison to Priority Controls

- Assessed each study site as priority control
- Critical movement as priority is "right turn out"
- Reassigned demand in excess of capacity
- Only 2 of 6 intersections generate less average delay as signals

Technique A – Queued Vehicles

- Roads at the top of the hierarchy have a greater mobility function … therefore …
- # of queued vehicles < number of turning vehicles
- Determine from site observations (existing sites) or SIDRA Intersection model (proposed sites)

Technique A – Queued Vehicles
Ratio of Turning Vehicles to Queued Vehicles



- Useful initial threshold test
- Not a definitive tool for acceptance in isolation

Technique B – Intersection LoS

Priority Control
- No delay to through traffic on main road
  (if turning traffic is in separate lanes)
- Large delays to traffic on side leg

Signalised Control
- Small delays to some through traffic on main road
- Reduced but acceptable delays to traffic on side leg

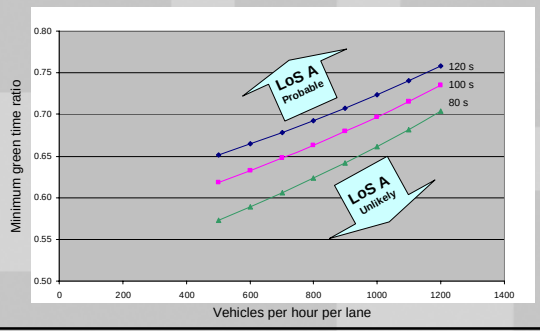
When do delays to arterial road through traffic become unacceptable?

Technique B – Intersection LoS

- Observation in isolation
- Delays of <10 seconds per vehicle probably OK
- 10 seconds is LoS A / B threshold
- No geometric delay

Technique B – Intersection LoS

Minimum green time ratio to provide LoS A



Technique C –
Traffic Signal Coordination

- Coordination from upstream traffic signals
  - Improve progression
  - Minimise proportion of queued vehicles
  - Maximise capacity of a corridor
- When does coordination work best?
  - Intersections have the same cycle time
  - Little separation between intersections
  - Low number of turning vehicles from adjacent legs of upstream intersection
  - Few access points between intersections

Technique C –
Traffic Signal Coordination

	OBSERVED	ESTIMATED	
Whiteleigh / Troup	% Stopped	% Stopped	Coordination
Whiteleigh Ave (N) *	10%	24%	Very Good
Whiteleigh Ave (S)	16%	17%	Negligible

Tower Junction Coordination

Technique D – Corridor LoS

- What about cumulative effects over a corridor?
- When is it one signalised intersection too many?
- Highway Capacity Manual
  LoS Methodology for Urban Corridors

Technique D – Corridor LoS

- LoS based on speed – relative to free-flow speed.
- Speed is influenced by:
  - Frequency of signalised intersections
  - Intersection control delay
  - Signal timing
  - Progression or Coordination
  - Traffic volumes
- Methodology enables segment speeds to be calculated

Technique D – Corridor LoS

Delay Computation	
Uniform delay, d_1 (s) $d_1 = \frac{0.5C(1-g/C)^2}{1-[(g/C)\min(X,1.0)]}$	
Signal control adjustment factor, k (Exhibit 15-6)	
Upstream filtering/metering adjustment factor, I (Exhibit 15-7)	
Incremental delay, d_2 (s) $d_2 = 900T\left[(X-1)+\sqrt{(X-1)^2+\frac{8kIX}{cT}}\right]$	
Initial queue delay, d_3 (s) (Ch. 16 Appendix F)	
Progression adjustment factor, PF (Exhibit 15-5)	
Control delay, d (s) $d = (d_1 * PF) + d_2 + d_3$	

- Can use SIDRA outputs instead of first principle calculations

Discussion

- Best sites are taken
- Access Management needs Assessment Techniques
- Assessment Techniques enable effects of high traffic generating land uses accessing arterial roads to be identified and evaluated
- Preserve the road hierarchy

Where to from here ?

- Questionnaire to Local Authorities
  - How do others handle access management
  - Is it working?
- Development of a complete Access Management Strategy for Christchurch City Council to supplement the provisions of the City Plan.


Christchurch City Council
Questions or comments