The Effects of Pedestrian Signals at Multi-Lane Roundabouts

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Background

Proposed ADA Guidelines Recommendation

"Traffic signals shall be placed at crosswalks on all multi-lane approaches to roundabouts."

Background

We all agree that this will improve safety for the visually impaired.

How will implementation of this recommendation affect traffic operations of multi-lane roundabouts?

Literature Review

Pedestrian Crosswalks Signals at Roundabouts: Where Are They Applicable by Bill Baranowski, P.E., Roundabouts USA

Discusses UK methodology of establishing a traffic volume threshold for installing signalized crosswalks at roundabouts

UK Policy

Signalized crossing at roundabout is warranted when $PV^2 > 10^8$

P = pedestrian volume

V = peak-hour entering volume

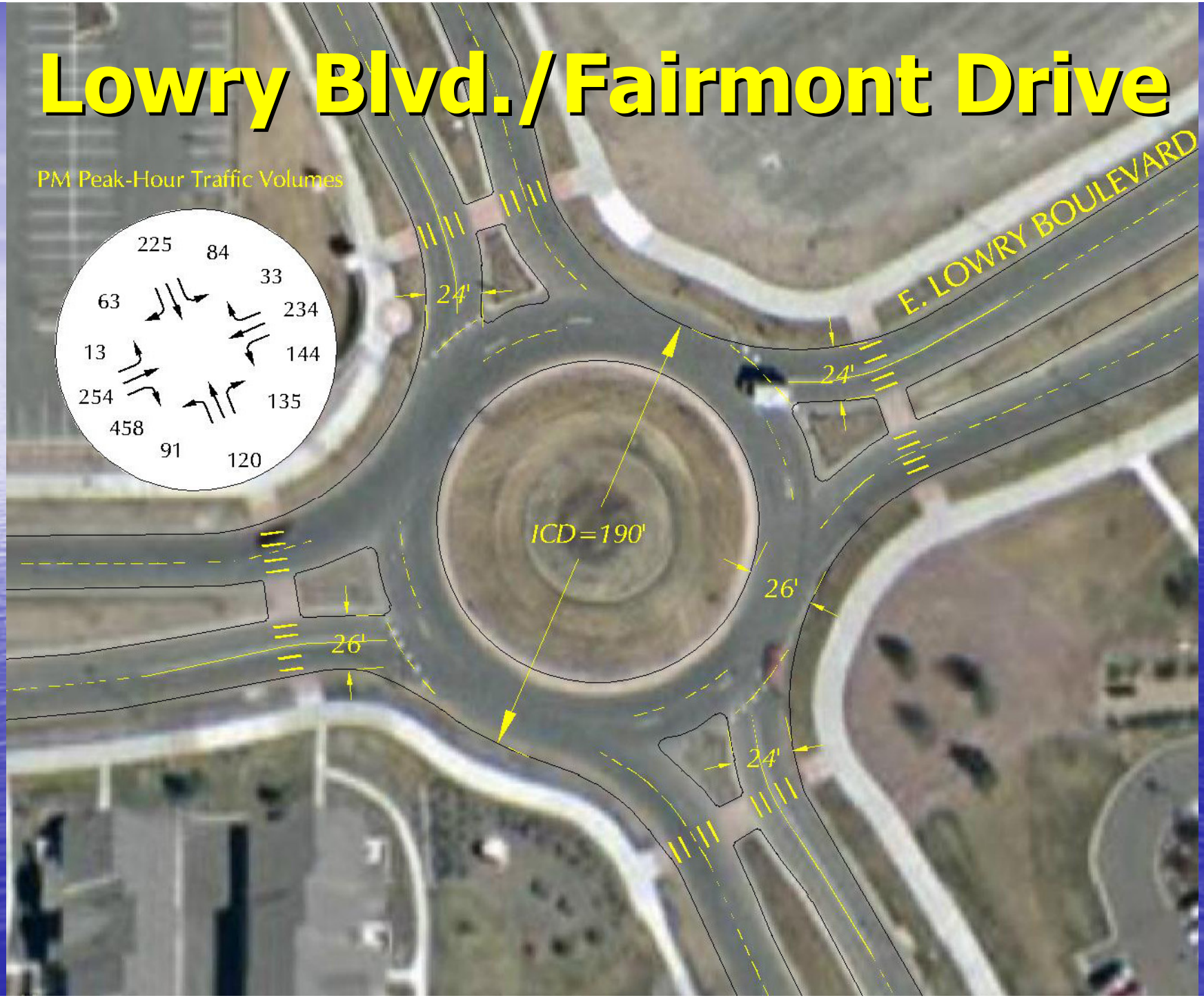
Methodology

1. Calibrate VISSIM model of Lowry Blvd./ Fairmont Drive 2-Lane Roundabout
2. Add pedestrian crosswalk signals on one approach
3. Simulate various pedestrian volumes at signalized pedestrian crosswalks
4. Compare MOE's such as
   - Vehicular delay
   - Pedestrian delay
   - Vehicular queues

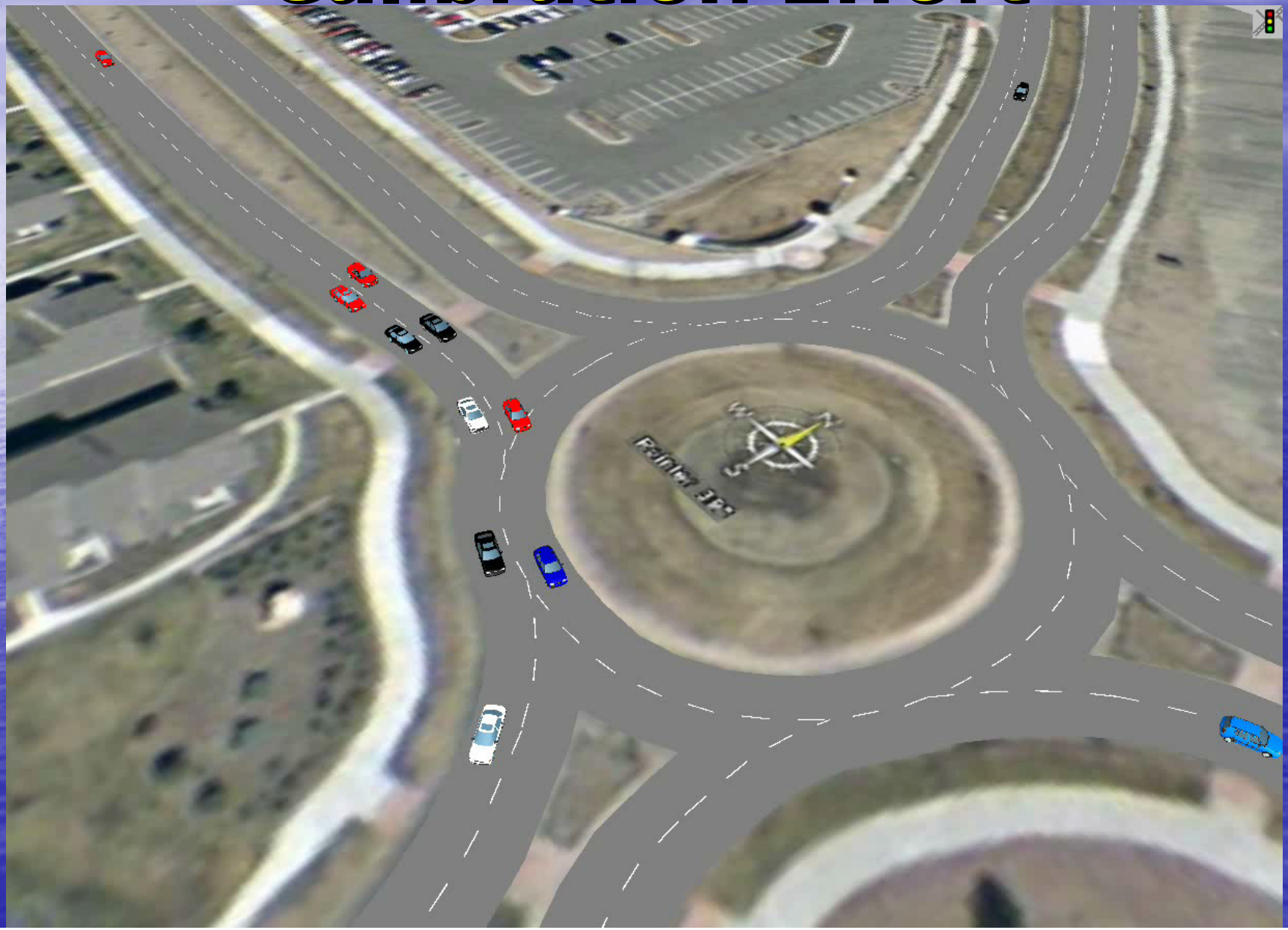
Lowry Blvd./Fairmont Drive


Lowry Blvd./Fairmont Drive
COMMERCIAL
COMMERCIAL
ROUNDABOUT
TRAFFIC SIGNAL
TOWNHOMES
SUBJECT ROUNDABOUT
APARTMENTS
TRAFFIC SIGNAL
N

Lowry Blvd./Fairmont Drive



Calibration Effort



Calibration Effort

Calibration Effort

Calibration Effort

Table 1: Comparison of Field Observations vs. Simulation Results

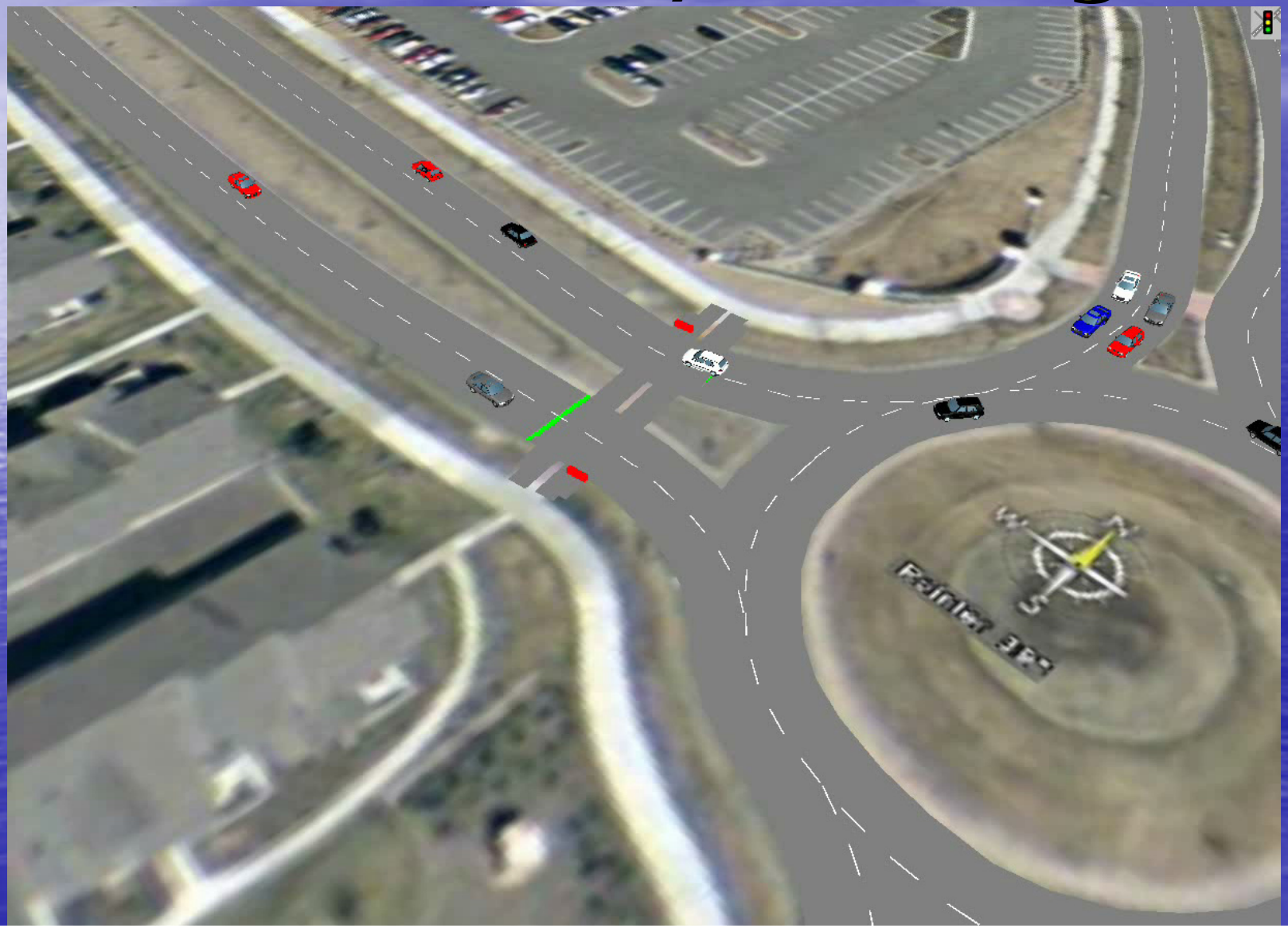
Measure of Effectiveness	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach		
	FO	UC	C	FO	UC	C	FO	UC	C	FO	UC	C
Average Delay (sec./veh.)	6.2	2.3	8.9	2.5	0.4	0.4	2.2	0.5	0.4	2.9	0.4	0.7
Maximum Delay (sec./veh.)	44.0	20.4	59.4	18.0	13.8	10.6	17.0	12.8	9.2	23.0	15.2	21.0
Average Queue (veh.)	1	1	1	0	0	0	0	0	0	0	0	0
Maximum Queue (veh.)	10	5	9	4	2	2	3	2	2	3	3	3

Notes:
Simulation results based on micro-simulation runs performed in the VISSIM, version 4.0, software. A total of three runs were performed and averaged.
FO = Field Observed, UC = Uncalibrated Simulation, C = Calibrated Simulation

Avon Roundabout

50 Pedestrians, No Signal

50 Pedestrians, With Signal



100 Pedestrians, No Signal

100 Pedestrians, With Signal

200 Pedestrians, No Signal

200 Pedestrians, With Signal

Simulation Results

Table 2: Comparison of Effect of Pedestrian Signal Alternatives on Eastbound Approach

Measure of Effectiveness	50 Peds./Hour			100 Peds./Hour			200 Peds./Hour		
	UnS	Sig	% Diff.	UnS	Sig	% Diff.	UnS	Sig	% Diff.
Average Delay (sec./veh.)	16.9	31.6	87%	28.6	46.7	63%	49.8	41.5	-17%
Maximum Delay (sec./veh.)	62.8	105.9	69%	81.4	136.0	67%	136.2	121.5	-11%
Average Queue (veh.)	1	2	100%	2	4	100%	4	3	-25%
Maximum Queue (veh.)	8	11	38%	11	16	45%	18	14	-22%

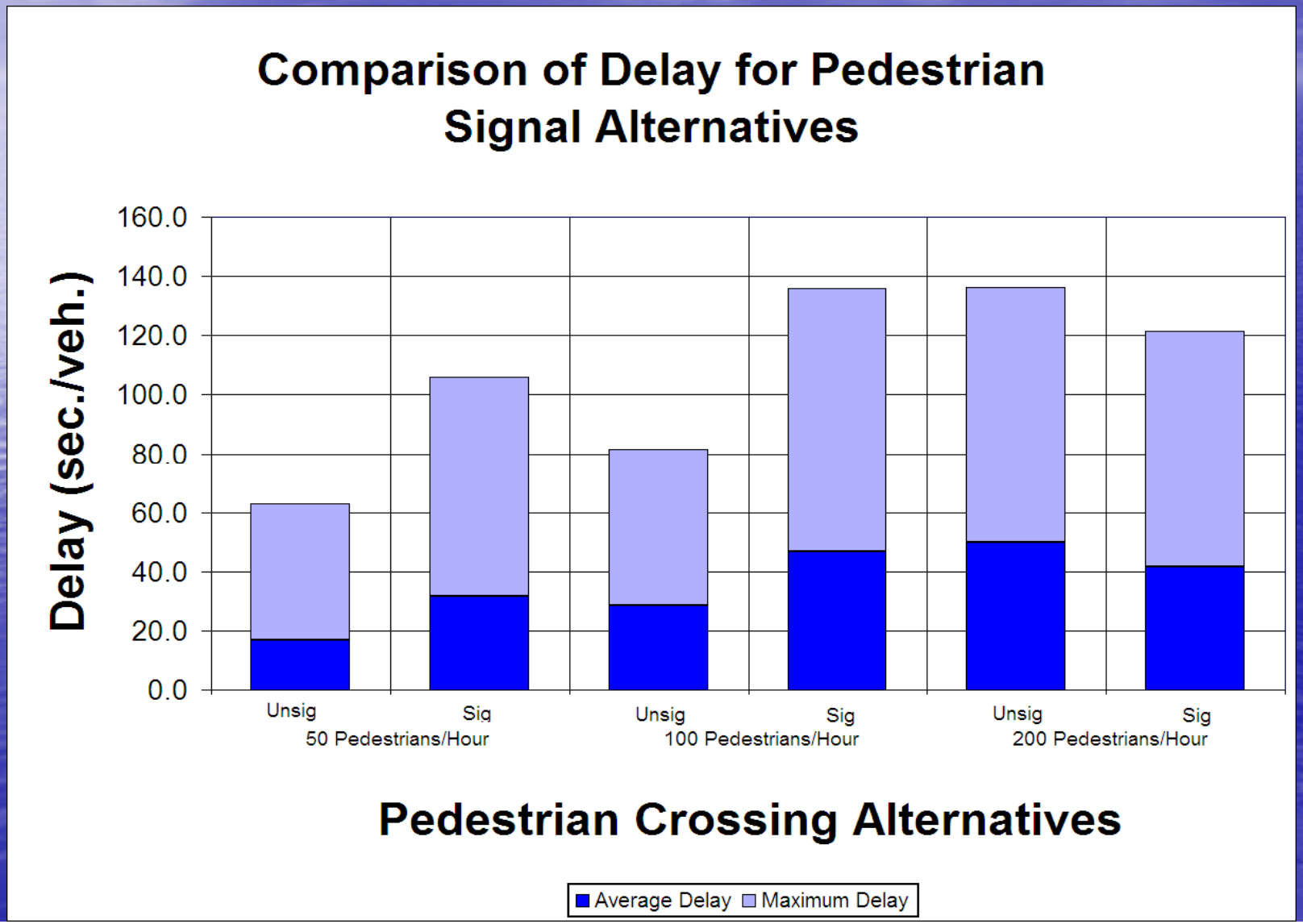
Notes:

Simulation results based on micro-simulation runs performed in the VISSIM, version 4.0, software

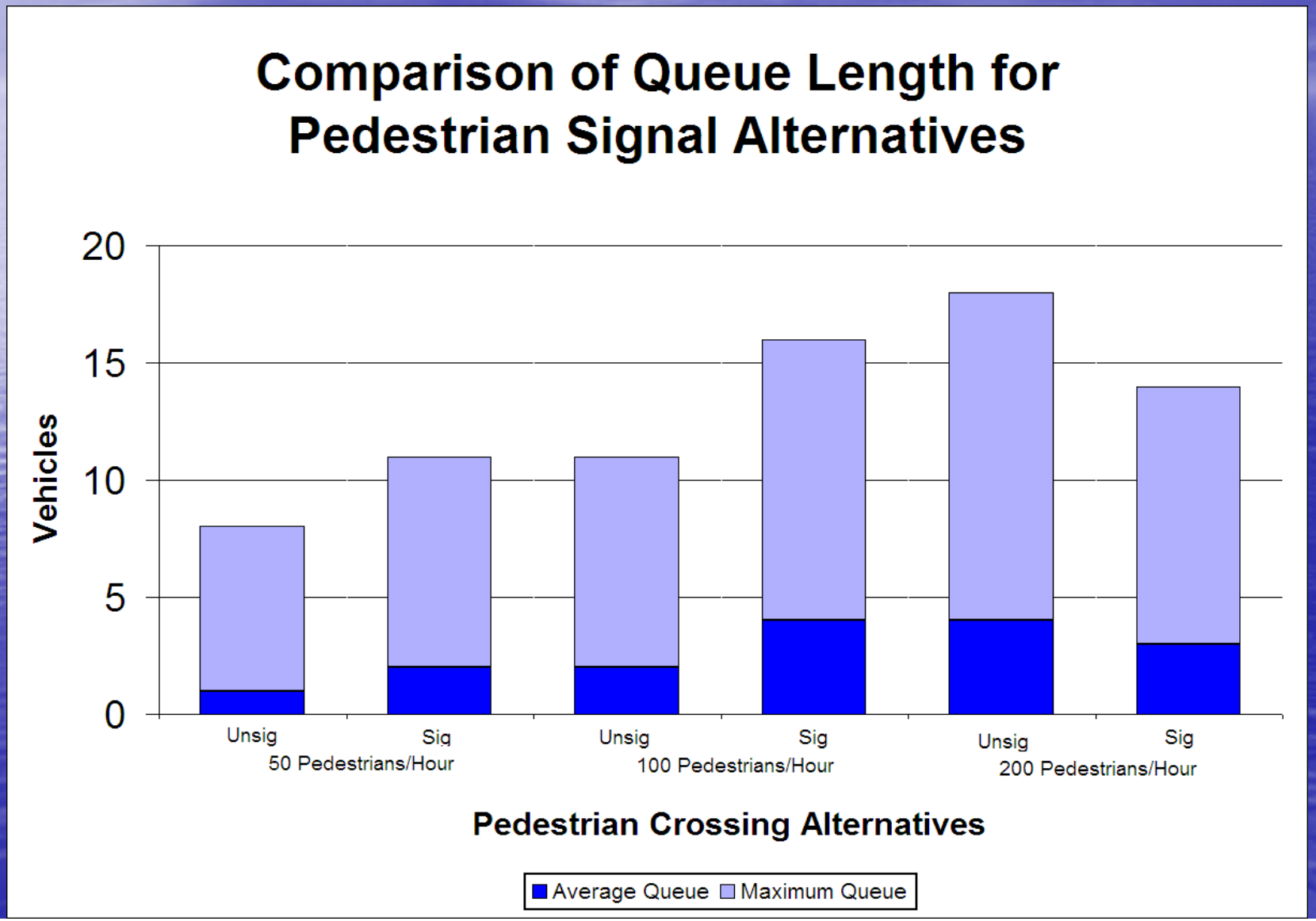
A total of three runs were performed and averaged.

UnS = Unsignalized Pedestrian Crossing, Sig = Signalized Pedestrian Crossing

Simulation Results



Simulation Results



Summary of Results

- For low to medium pedestrian volumes (50 to 100 pedestrians per hour) the simulation model showed that adding a pedestrian crossing signal results in increased delay and increased queues

Summary of Results

- For very high pedestrian volumes (200 pedestrians per volume) the simulation model showed that adding a pedestrian crossing signal reduces both delay and queues.

Summary of Results

- These results appears to be consistent with the UK's traffic threshold for installing a signalized crosswalk at roundabouts where if $PV^2 > 10^8$ a signalized crossing is warranted to help traffic operations. In this case

  $P = 200$ and $V = 750$

  $PV^2 = 10.5^8$

Future Research

Examine many more pedestrian and vehicular volume scenarios in order to further understand the effects of pedestrian crossing signals to multi-lane roundabouts traffic operations.

Future Research

Determine with more certainty whether the UK's traffic threshold for installing a signalized crosswalk on an approach to a roundabout ($PV^2 > 10^8$) is valid in the US.

Questions

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