Urban VMS Guidelines

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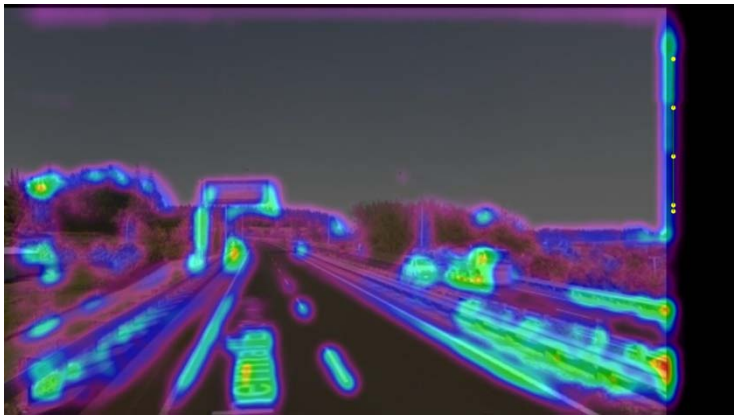
Why the need?

RURAL

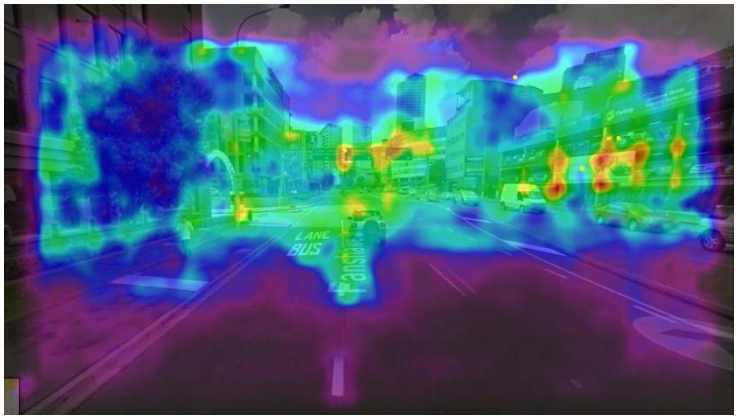
URBAN

Saliency analysis

RURAL



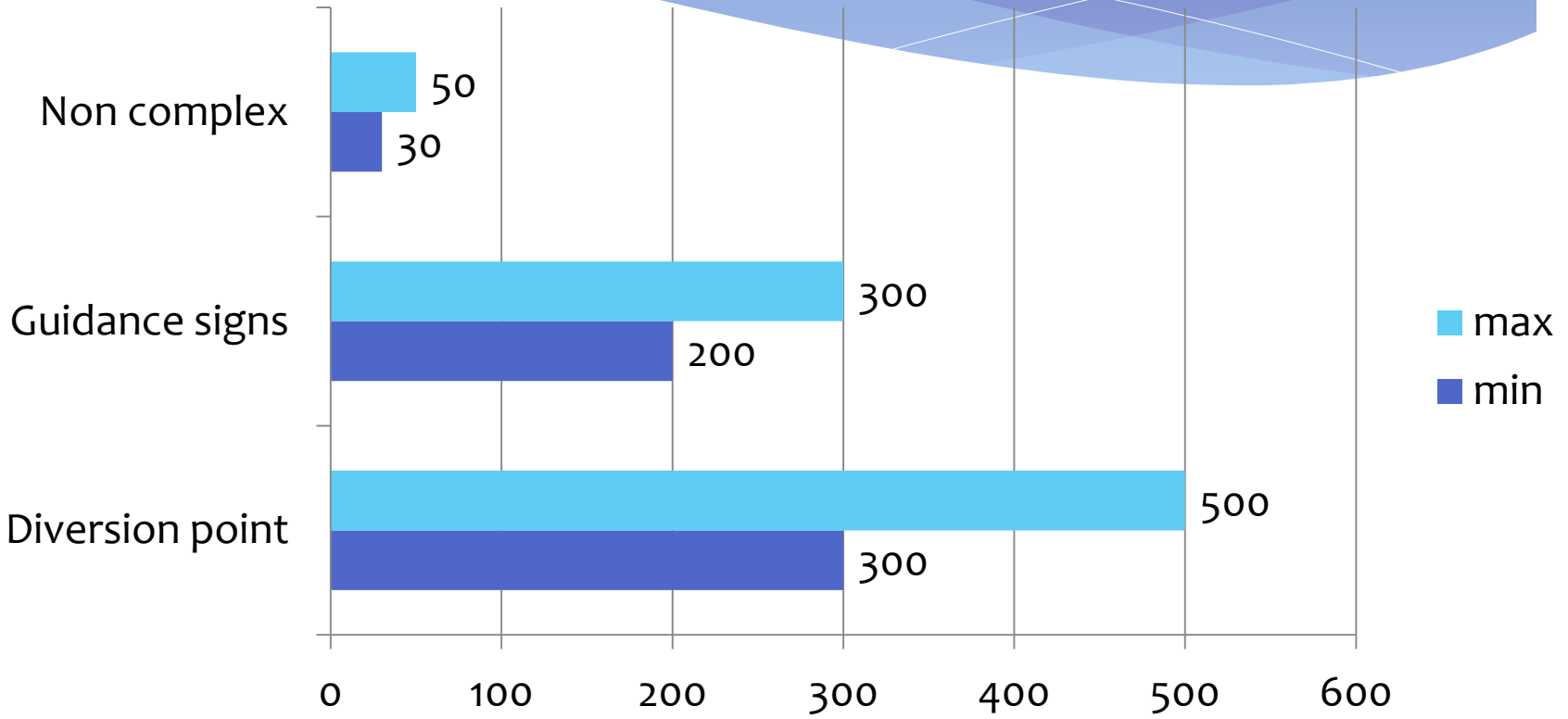
URBAN



Location advice – NZTA VMS guide

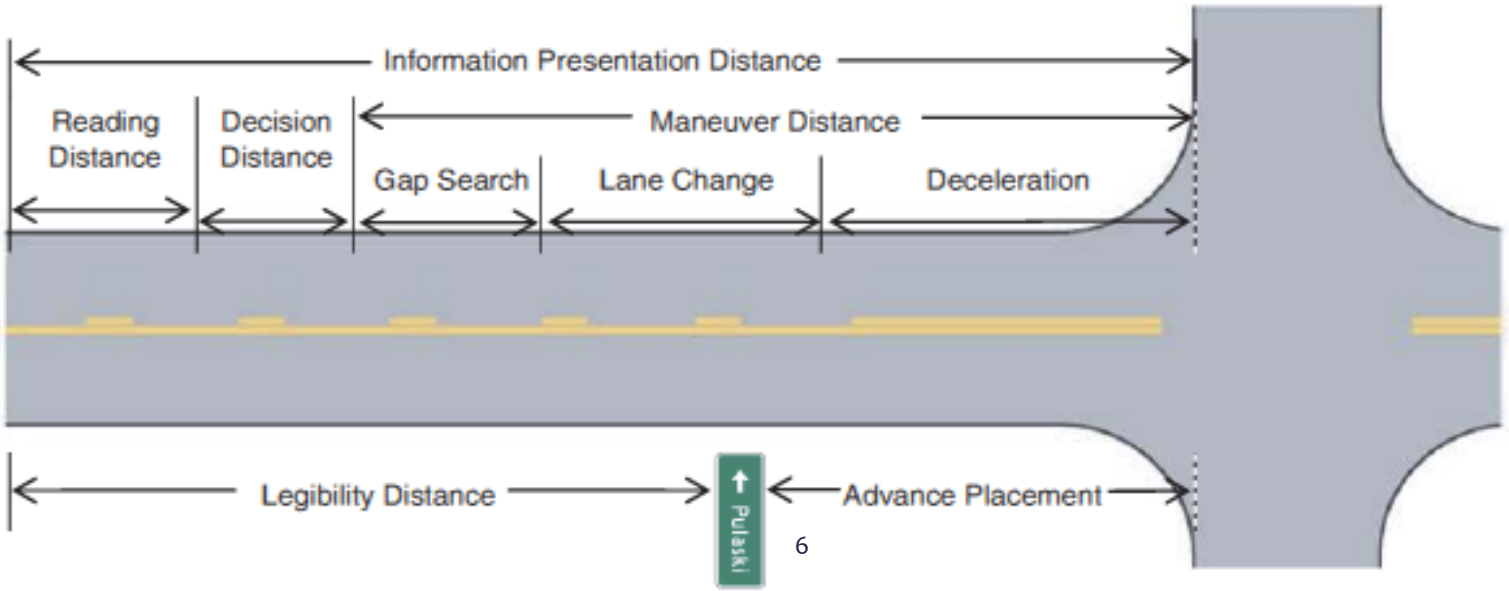
"On high volume urban (HVU) roads, the distance is dependent on considerations such as the speed limit, local factors, and right of way constraints"

Location advice (RTA)



Urban driving manoeuvres

- Competing signage
- Short block lengths
- Visually complex
- Queues
- Pedestrians and cyclists



Driver Workload

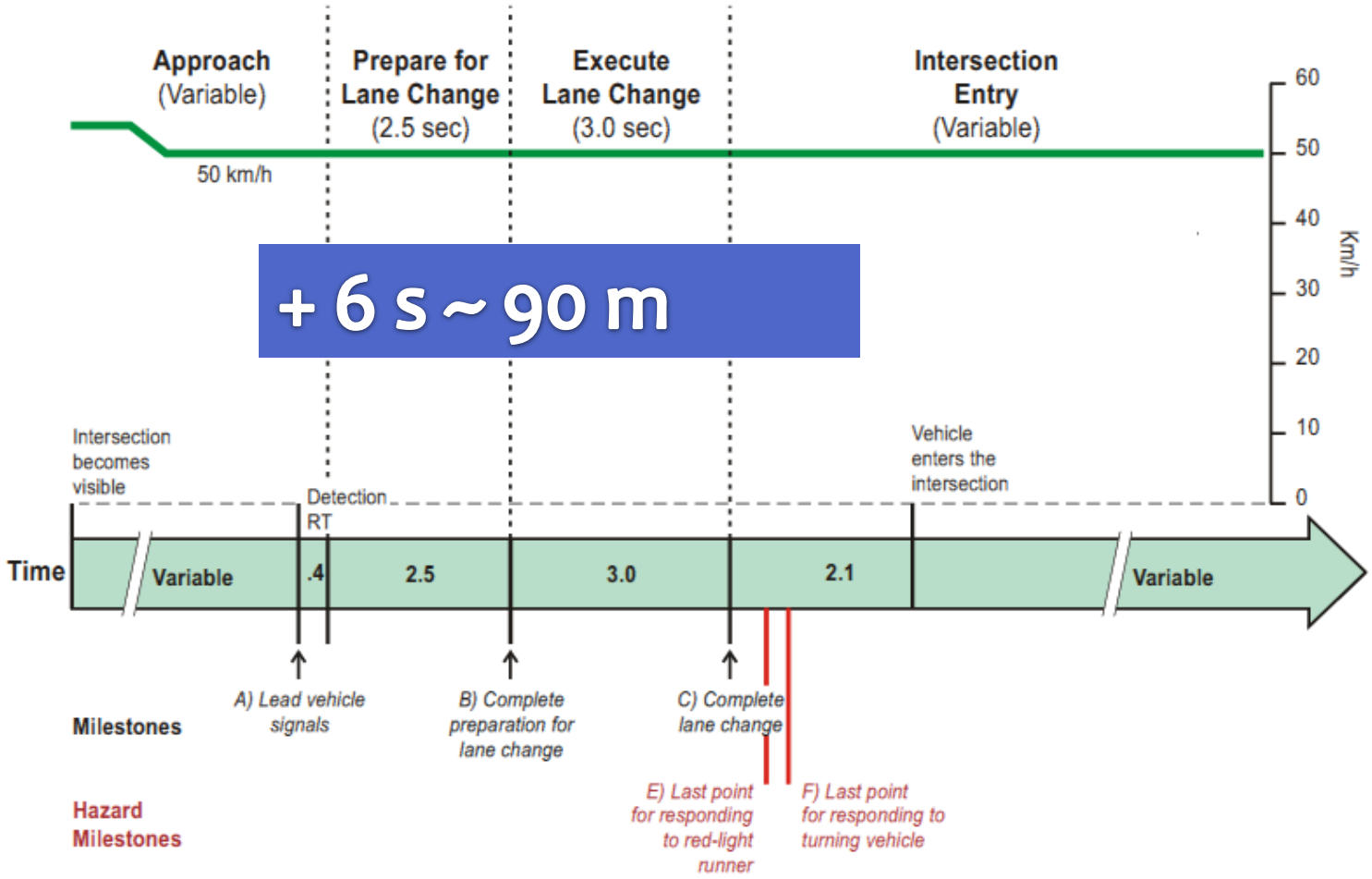
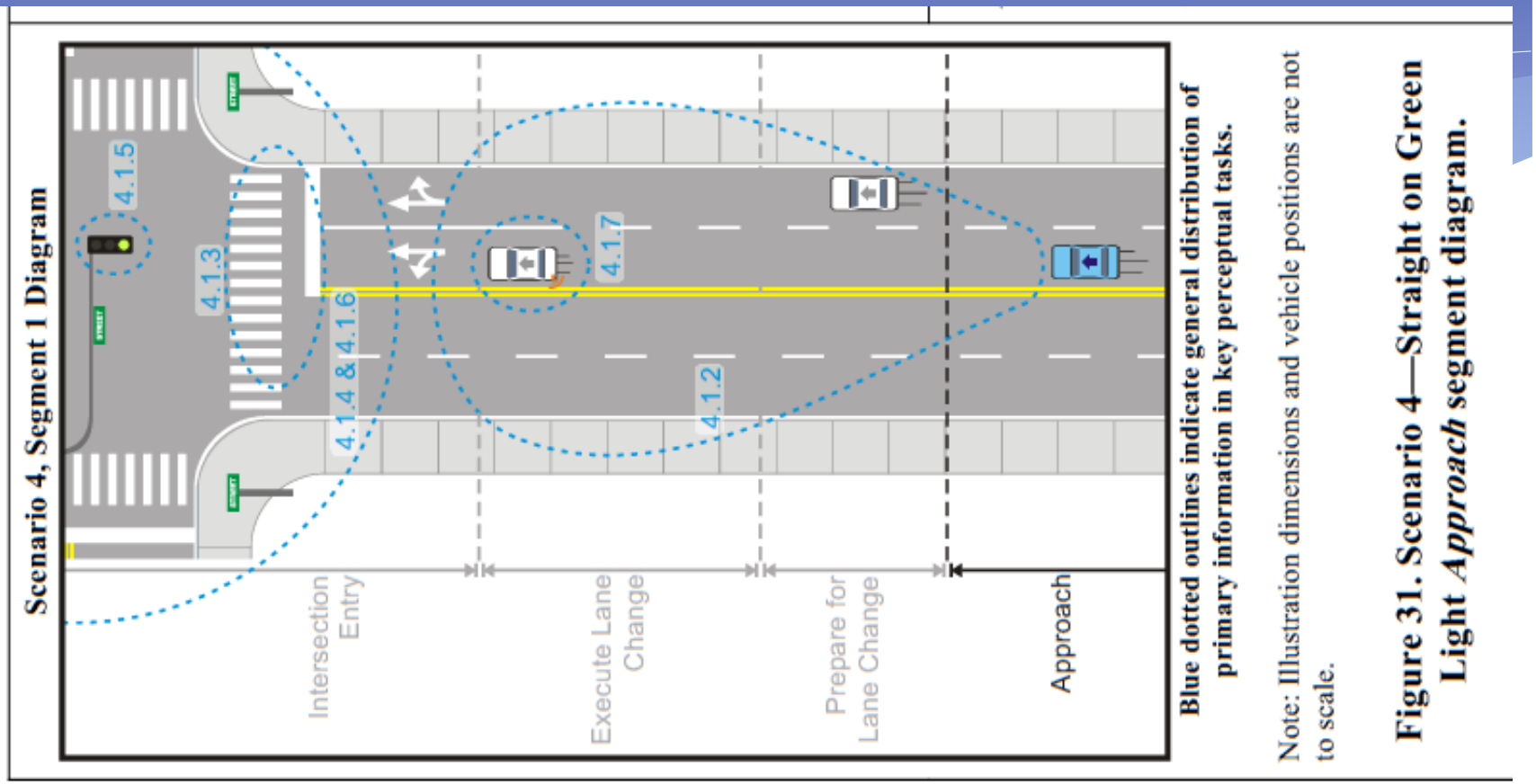


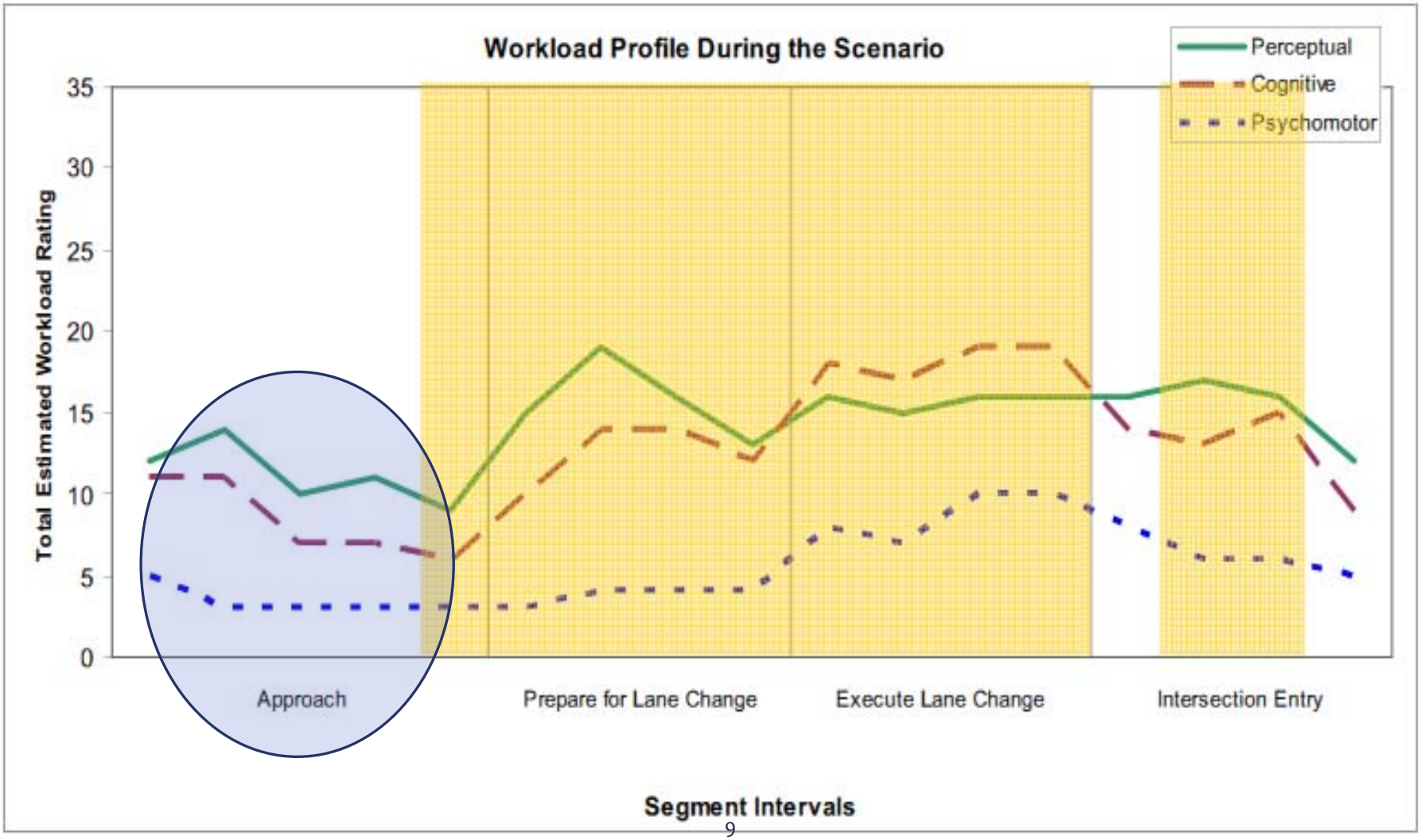
Figure 30. Scenario 4—Straight on Green Light

Primary information field



* NZTA - Jeff Greenough

Task analysis - intersections



Driver perception

300 ms searching

330 ms read word

500 ms perceive

Reading time* (USA)

Unit of Information		
Question	Answer	Unit of Info
What happened?	ACCIDENT	1 unit
Where?	SH1 NB	1 unit
Who is advisory for?	FANSHAW STREET	1 unit
What is advised?	DIVERT TO SH16	1 unit

Reading time

	Length of Message			
	3-4 units	6-8 units	10-12 units	14-18 units
Duration of Each Glance	1.08 s	1.18 s	1.20 s	1.35 s
Number of Glances	3.8	6.9	9.6	15.5
Memory Recall	100%	97.5%	75.4%	52.4%

Legibility

* Font
* Stroke width
* Letter height
* UPPER CASE vs. Lower Case

* A simple TEST – READY?

WHEN USING UPPERCASE
LETTERS THE MESSAGE
TAKES MORE TIME TO READ
AND MPRND

The use of Mixed Case Letters the Message is Easier to Read and Comprehend

Reading time (Lab)

* Words of 6-8 letters = 1 glance

$$\mathbf{T = (0.32N - 0.2)\ s}$$

  * T=time
  * N= no. of words

  * 3 words /second
  * Word recognition and familiarity ~ 4/sec.
  * 7 chunks of information ± 2

Glance durations (Reality)

* 330 ms reading ~ 3 words/sec.

1.5 - 2 sec. max ~ glance away

1 sec. ~ glance at road

Distraction

	% Fully read message		
Operating Speed Range	0-55 km/h		
Percent	**500**	**1000**	**1500**
Trucks	vph	vph	vph
5	95	95	90
10	95	90	85
20	90	80	70
30	90	75	65
50	85	70	55

Wayfinding in Congestion

* **2.6 s** ~ lightly congested
* **0.9 s** ~ heavily congested

Information Bits*

Content	Bits
Words up to 8 letters	**1**
Words > 8 letters	**2**
Numbers to 4 digits	**0.5**
Numbers 5 – 8 digits	**1**
Symbol/Abbreviation	**0.5**
Logo/graphics	**2**

Including Distraction

$$T = (0.32N - 0.2)D$$

T = Reading time

N = Bits on signs

D = Distraction Factor

- ***1.00*** *straight roads, less than 5000 vpd (vehicles per day)*
- ***1.25*** *straight roads with 5000 – 30,000 vpd*
- ***1.50*** *freeways, roads in urban areas, more than 30,000 vpd*

Modified equation (glance)

$$T = \left\{(0.32N - 0.2)D + \frac{(0.32N - 0.2)D}{1.5}\right\}$$

SH1 Plimmerton closed detour via Pauatahanui

- Reading time goes from 2.8 s to 4.8s
- Distance increases from 40 m to 70 m

Spreadsheet tool*

SH	1
LOCATION	Plimmerton
INCIDENT TYPE	closed
ROAD STATUS	detour via
ACTION REQUIRED	Pauatahanui
Speed environment	50
Route numbers	1
Distance/Time	0

SH1 Plimmerton
closed
detour via
Pauatahanui

4 Line VMS

Column1	Groun	Overh
Info Bits	6.5	6.5
Reading time required (s)	4.8	4.8
Reading distance (m)	67	67
Legibility distance (m)	100	107
Letter height required (mm)	210	214

For 3 line signs the first and second lines should follow the 4 line sign guide as described above. The only accepted INCIDENT TYPE which is too long to fit is WINTER DRIVING CONDITIONS; if this is the only suitable message the operator will have to decide on a free format message which uses two pages.

SH1 Plimmerton
closed
detour via

⇔

SH1 Plimmerton
closed
Pauatahanui

3 Line VMS (alternating pages)

2 line sign has same format as 3 line sign except that line 1 is repeated on both pages.

SH1 Plimmerton
closed

⇔

SH1 Plimmerton
Pauatahanui

2 Line VMS (alternating pages)

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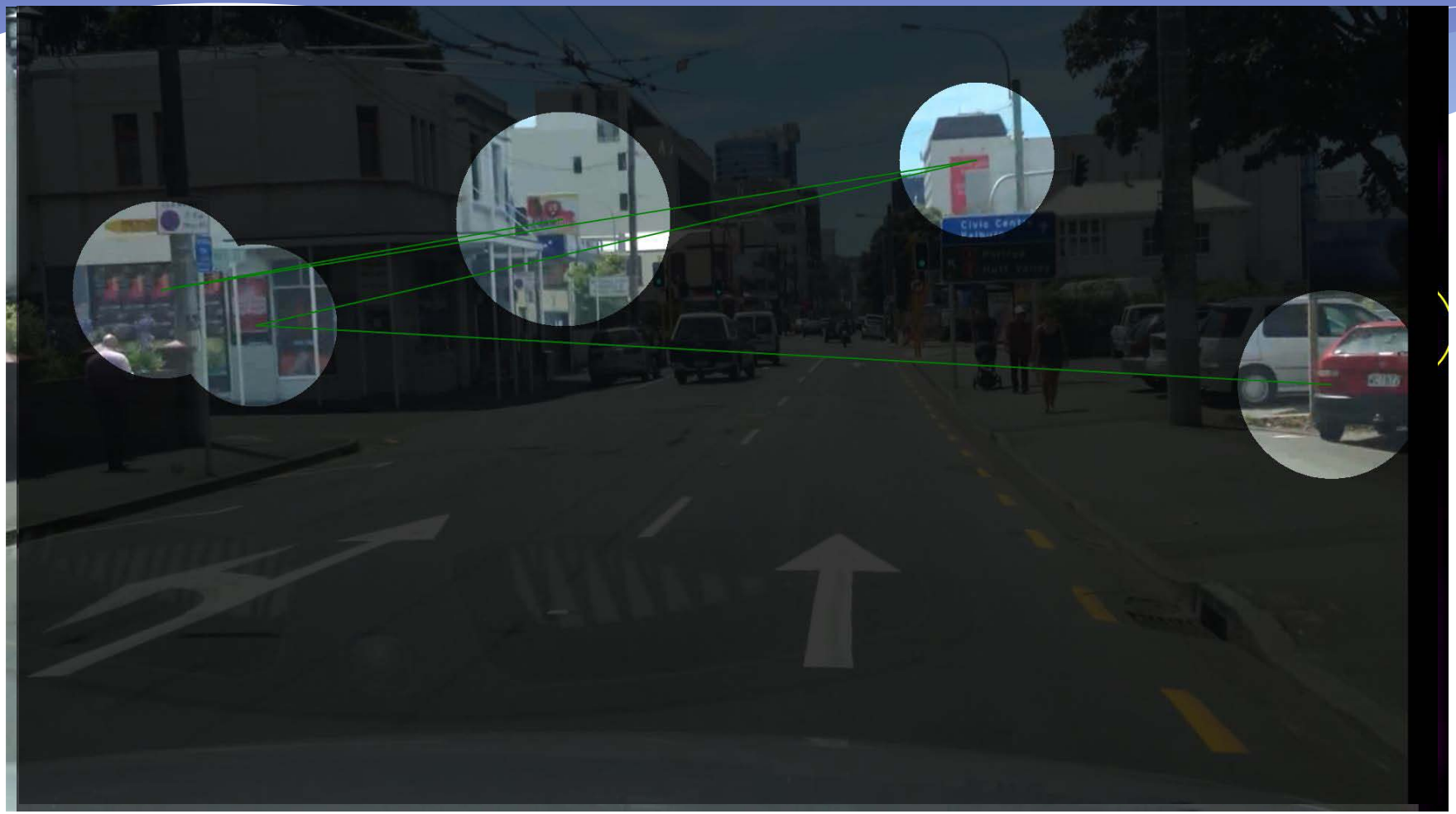
Machine vision analysis



Summary

* Urban clutter significantly **adds to reading time**
* Queues and congestion **erodes memory**
* **UPPER CASE** adds to reading time
* Info units **to broad a measure** ~ use bits equation
* Urban complexity requires **site specific evaluation**
* Distraction factor (D) can be calculated **using machine vision analytical tool**
* **Eye tracking analysis** can be used to validate complex sites