Stops and Goes of Traffic Signals

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Introduction

- Commissioned by Transfund
- Objective
  - Contribute to improving the efficiency and safety of the network
- Purpose
  - Assist and advise practitioners

Overview

- Background
- LTSA crash analysis for signals
- Photos showing good and bad practice

- Recommendations for each major issue
- Conclusions

Disclaimer

- You may recognise some photos!
  - Some might be from your "patch"
  - You may have designed/implemented the features in question
  - You may have had good reasons to do so
  - Some might have been fixed/modified since
- The aim is to learn from all of them
  - Discussion please!

Background

- Representative number of existing traffic signals has been audited
  - Covering some 12 TLAs
  - Including Transit installations
- “Stops and Goes” summarises common trends and themes

Content of “Stops & Goes”

- Draws attention to items frequently compromising safety and efficiency
- Presents ways how these deficiencies could be addressed
- Includes photos and illustrations showing
  - Good practice
  - Not so good practice

Crashes at Traffic Signals

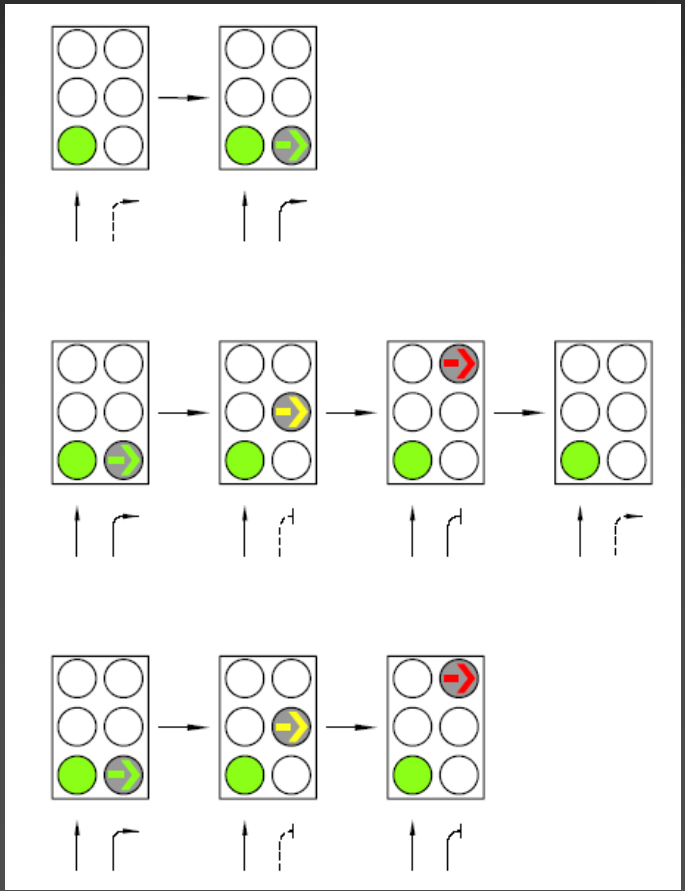
- Based on Tim Hughes' analysis
  - Presented at previous SNUG meeting
- Main safety issues
  - Right-turn-against crashes 32%
  - Failed to stop for red 30%
  - Pedestrians 14%
  - Cyclists 8%

Crashes at Traffic Signals cont'd

- Factors contributing to RT against and red light running crashes listed
  - Different turn philosophies have different crash rates
  - See next slide
- Observations on pedestrian and cycle crashes offered
  - A simplification of Give Way rules would help both groups

Typical crash rate reductions

- Compared to full filtering



- 30% for lag right turns
- 68% for lead RT, then filtering
- 90% for lead RT w/o filtering

Common deficiencies

- Right turn lanes
- Captive turn lanes
- Slip lane design
- Signal conspicuity
- Sufficient number of displays
- Turn arrow operation
- Turn arrow logic
- Ped phase issues
- Push button location
- Cyclist issues


Right turn lanes

Right turn lanes

- Recommendations
  - Ensure RT bays line up (‘back to back’ design)
  - Reduce RT lane width
  - Where opposed RT lanes are not possible, consider different phasing operation or RT ban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Right turn lanes

Right turn lanes

Captive turn lanes

Captive turn lanes

- Recommendations
  - Channel drivers into through lanes whenever possible
  - Engineering plans to show tie-in into mid-block layout
  - Have sufficient pre-warning when captive lanes cannot be avoided


Captive turn lanes


Slip lane design

Slip lane design

- Recommendations
  - Appropriate size of islands
  - High-entry-angle type
  - Location of ped crossing point should provide sufficient intervisibility
  - Ped priority issues can be addressed using signalised slip lanes or a zebra crossing

Slip lane design


Signal conspicuity

Signal conspicuity

- Recommendations
  - Should have upgrading programme for conversion to tall posts
  - Locate posts close to kerb, and close to tangent point (minimise corner radii)
  - Use kerb extensions wherever possible
  - Make your signals visible (under-ground aerial services, use joint-use poles, don’t plant trees in front of posts, prune trees)

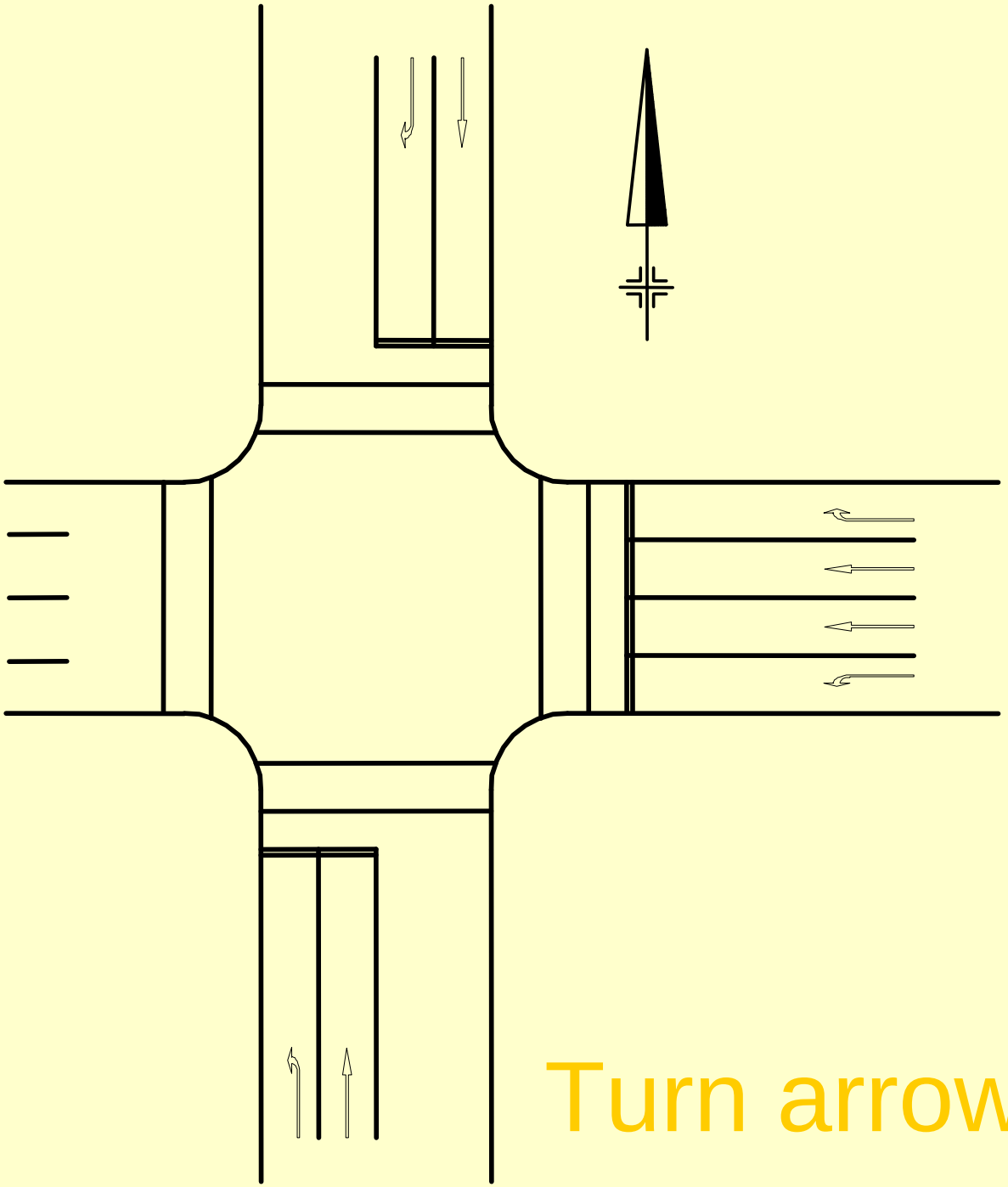

Signal conspicuity

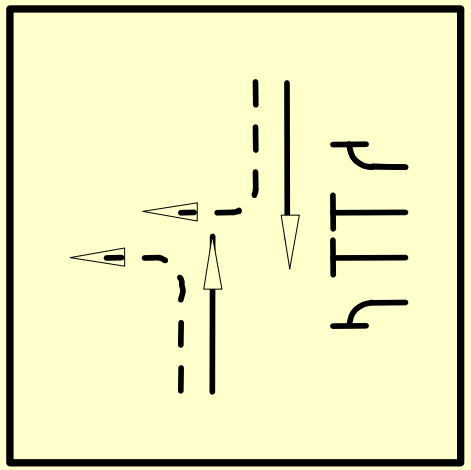

Sufficient number of displays

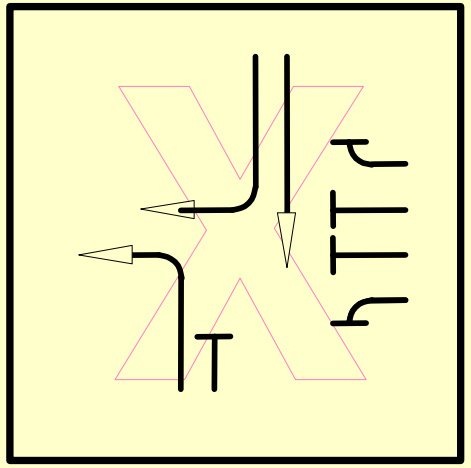
Sufficient number of displays

- Recommendations
  - All displays in primary or dual-primary location (including arrows)
  - Minimum number of displays for major movements is three
  - Minimum number of displays for minor movements is two
  - One display is sufficient for two approach lanes only
  - At least one aspect must be illuminated in any one signal face at any one time

Sufficient number of displays



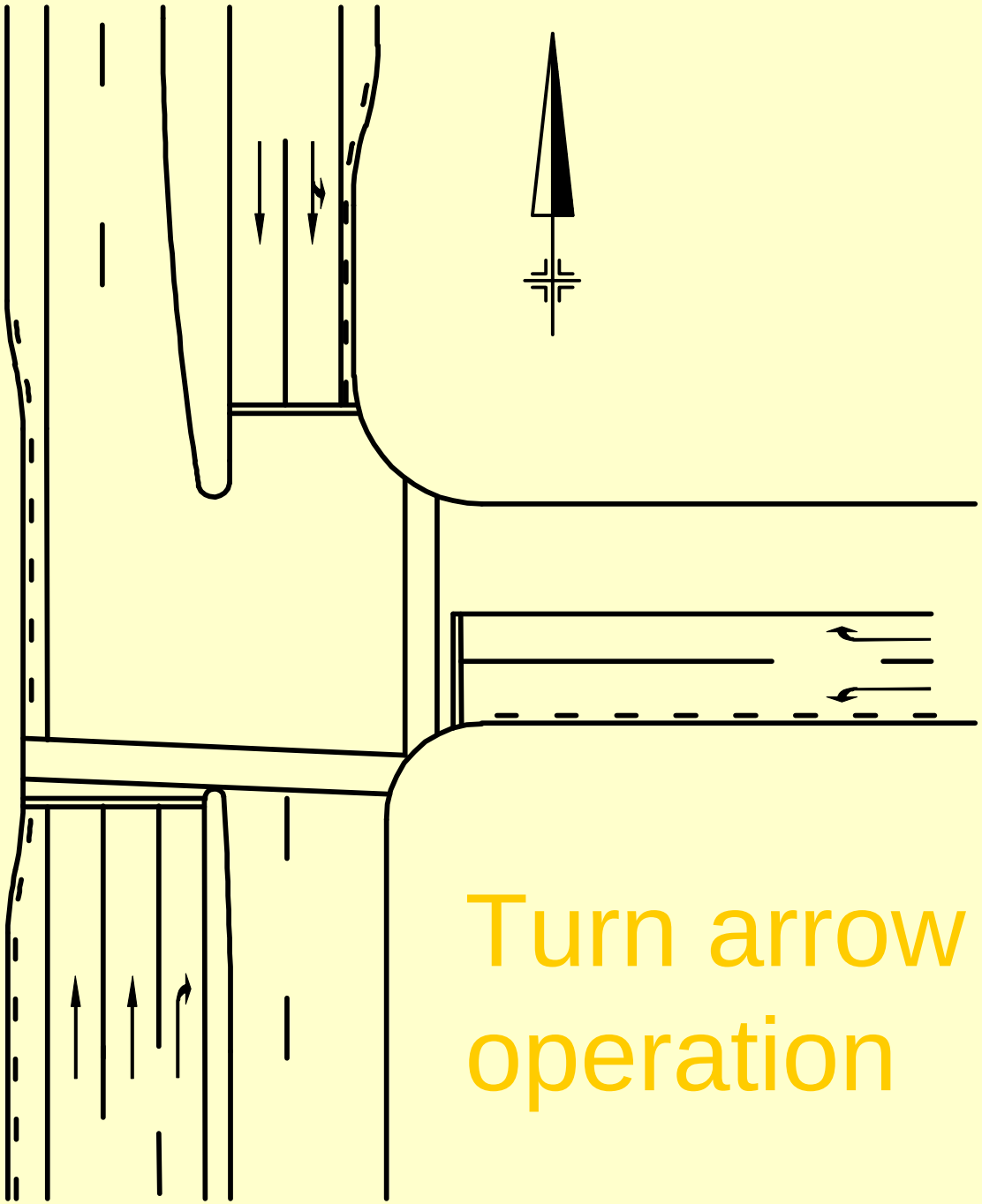


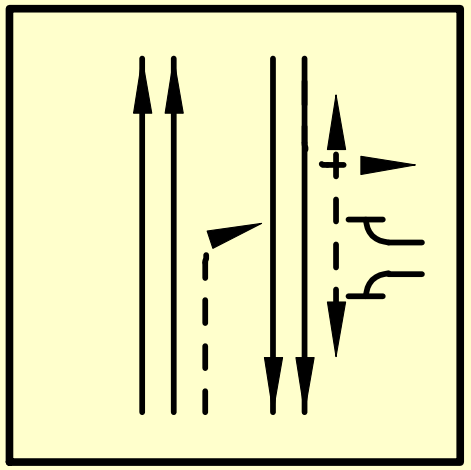


Turn arrow operation

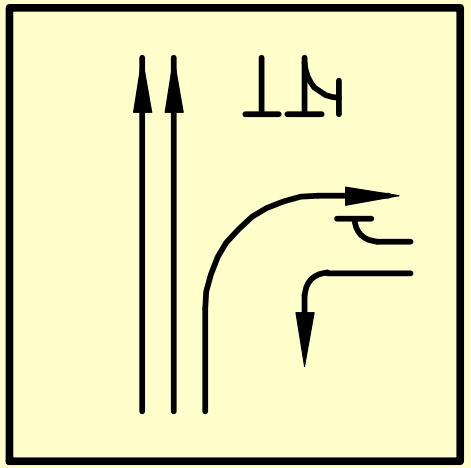
Turn arrow operation

- Recommendations
  - Where present, use arrow displays for (at least) partial pedestrian protection
  - Controller programmed so that unintentional lag right turning sequence not possible
  - Ensure turning traffic doesn’t call side street phases



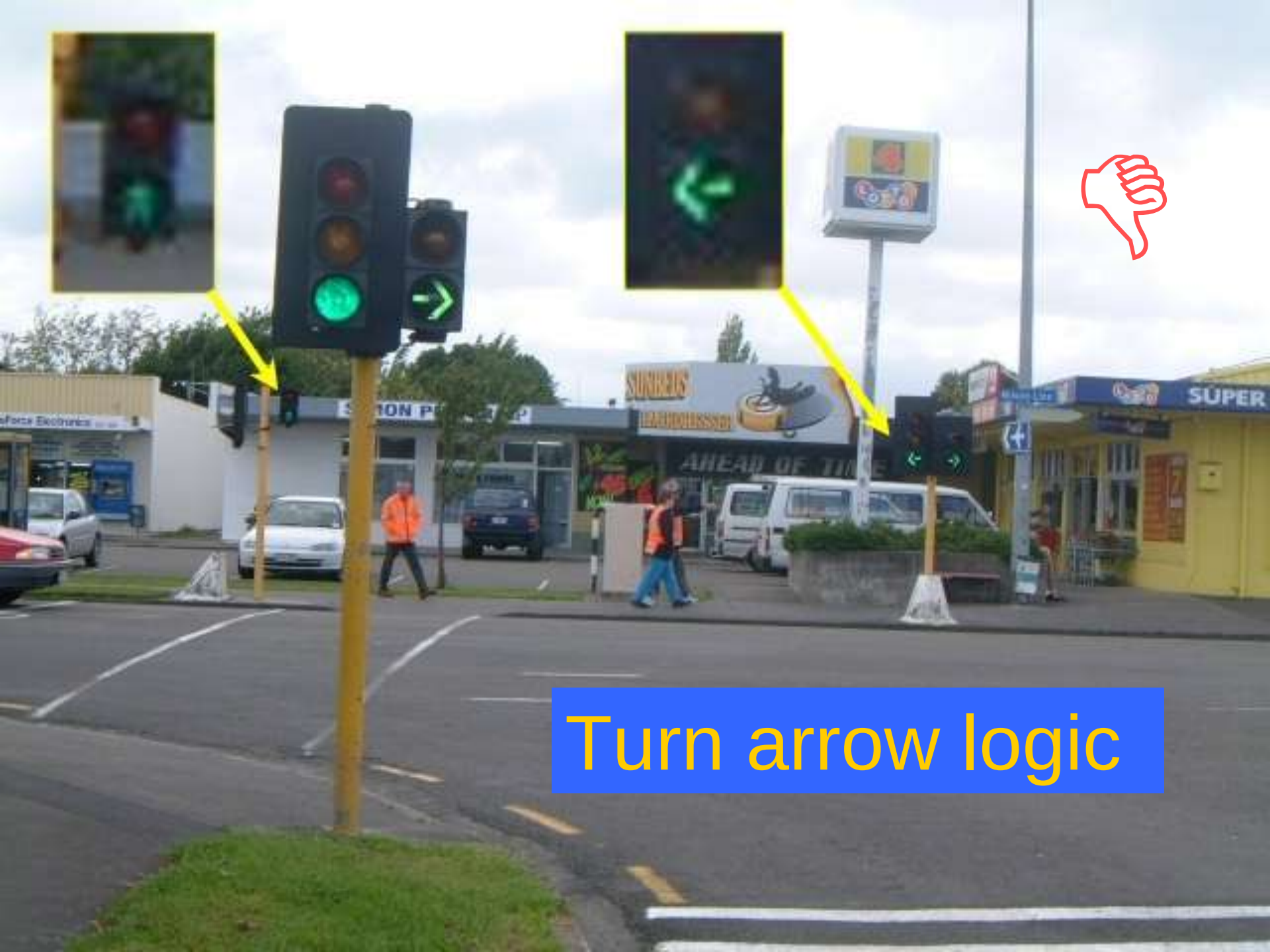


A PHASE



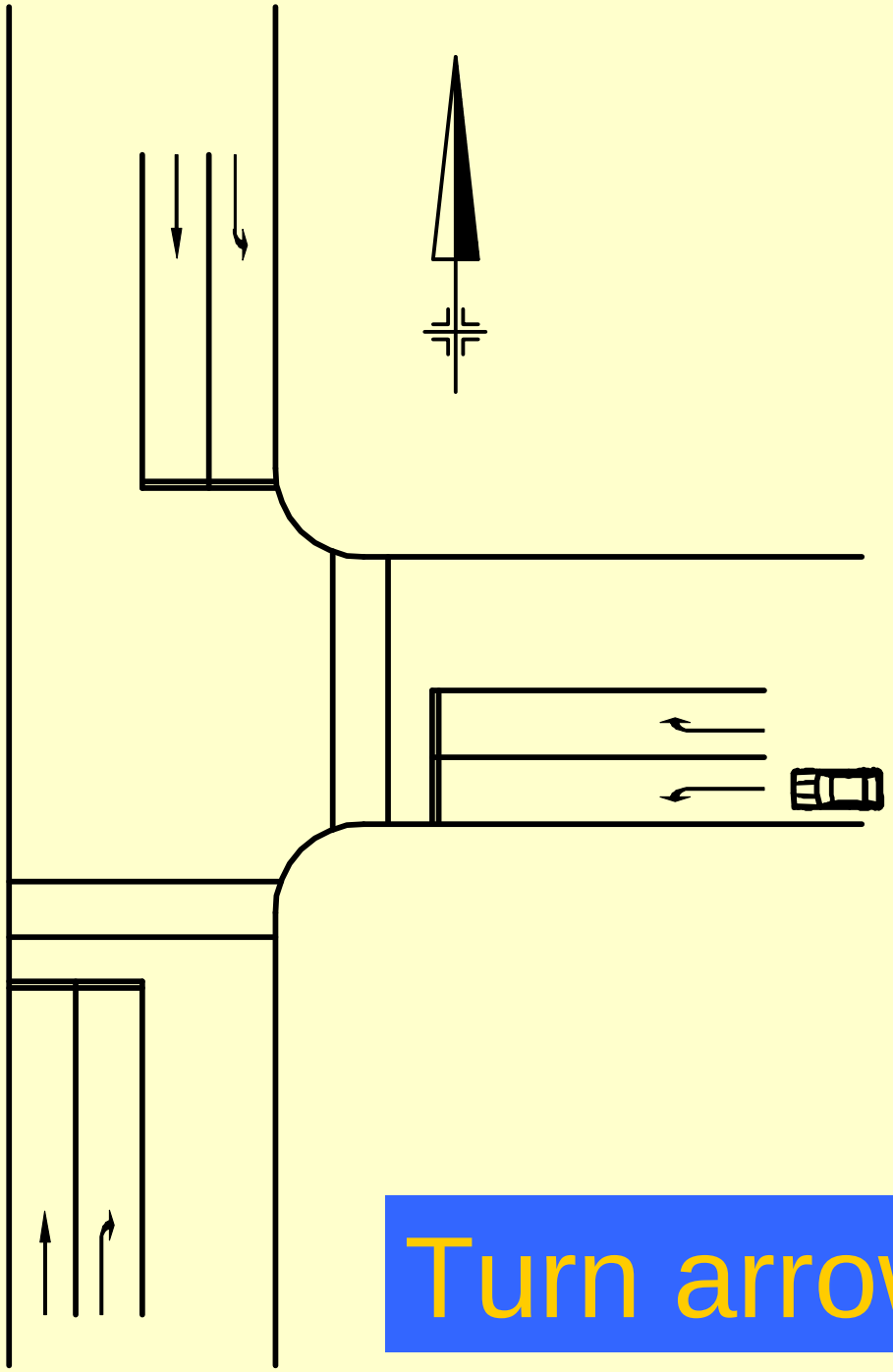
B PHASE

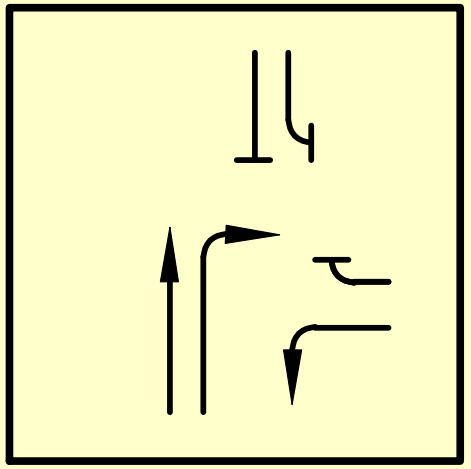
Turn arrow operation

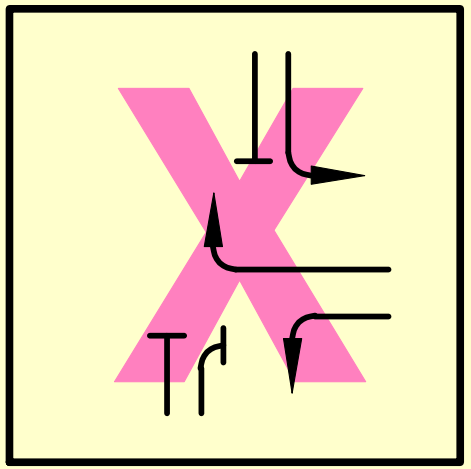

Turn arrow logic

Turn arrow logic

- Recommendations
  - Correct sequence for transition from protected RT to filter involves holding the red arrow for 5 sec
  - Green LT arrows should be operated whenever that movement is unopposed
  - LT loop should call an associated RT movement (see next slide)
  - Use standard operating sequences
  - Seek expert help and insist on peer reviews







Turn arrow logic

Pedestrian phase issues

Pedestrian phase issues

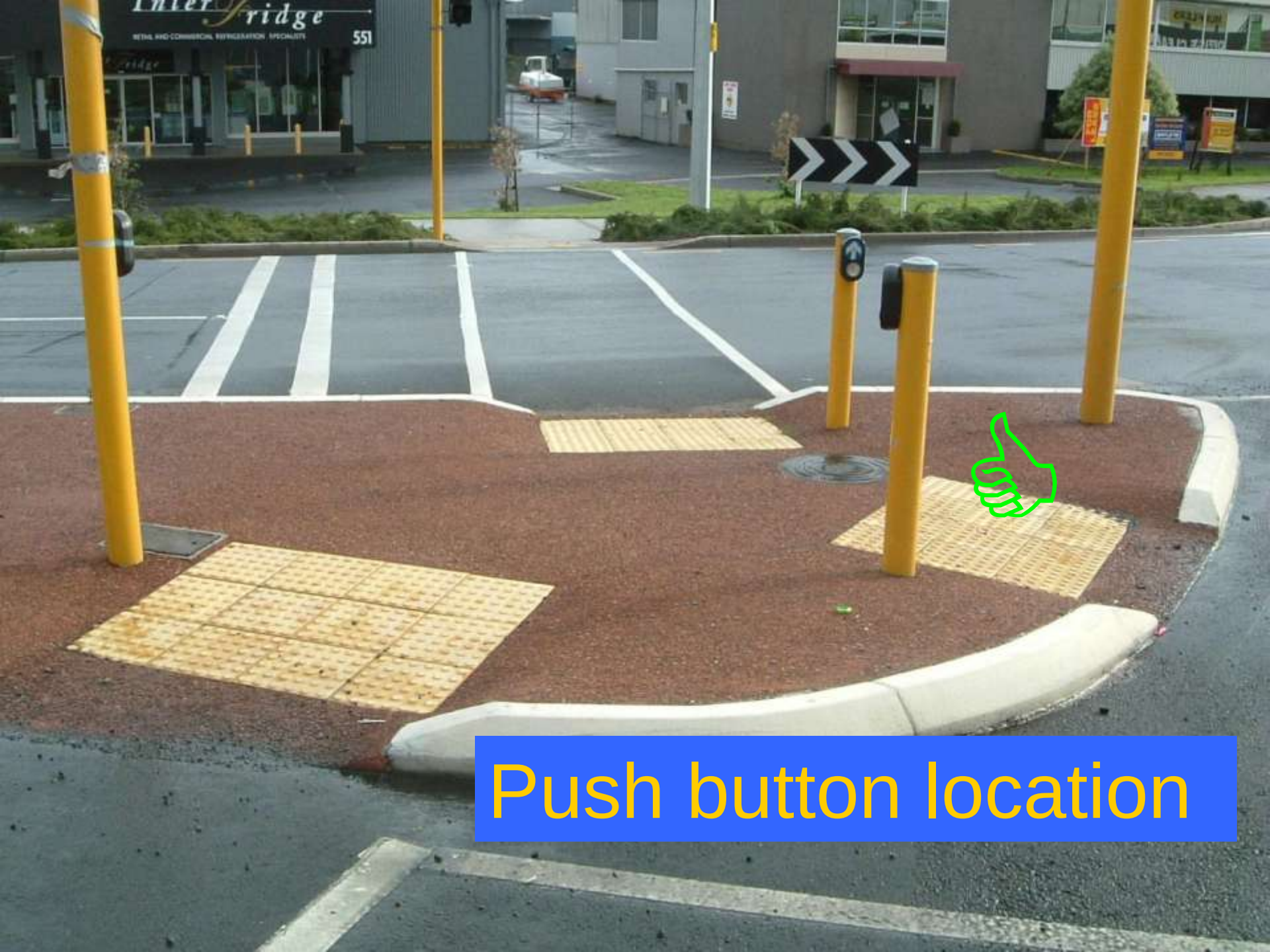
- Recommendations
  - Base clearance time settings on crossing geometry and user profile
  - Where present, use arrow displays for (at least) partial pedestrian protection
  - An alternative to arrow protection is a late start of the vehicle phase (generally 3 sec)
  - RT from stem of T should not face a ped crosswalk (unless full ped protection is used)
  - Don’t have late ped introduction or re-introduction with conflicting vehicle movements


Pedestrian
phase issues


Push button location

Push button location

- Recommendations
  - Install push buttons at the cut down
  - Make use of stub posts if required
  - Ensure embossed arrow and tactile paving are orientated correctly
  - Avoid safety rails obstructing push buttons
  - Ensure 3m minimum spacing of audio-tactile equipment
  - Comply with RTS 14


Push button location


Cyclist issues

Cyclist issues

- Consider the following factors
  - How safe is intersection for cyclists
  - What is the existing demand by cyclists
  - Are there reasonably alternative routes
  - Are there planned projects that could include improvements for cyclists
- Factors should determine the priority order
- Ultimately, all intersections should work for cyclists

Cyclist issues

- Recommendations
  - Aim for a treatment that is as far as possible suitable for cyclists with basic competence
  - All normal manoeuvres should be possible
  - Manage conflict between LT motorists and straight through cyclists (consider slip lanes)
  - Achieve a layout intuitive to all road users
  - Use coloured surfaces

Cyclist issues

Cyclist issues


Cyclist issues

Conclusions

- Engage competent signal engineer for the peer review of new designs
  - Road safety audit process is not sufficient
  - Signal peer review is separate
- Engage suitably experienced specialists for the auditing of SCATS set-ups

Conclusions cont'd

- Suitably qualified engineers
  - ask SNUG committee members for a list
  - www.ipenz.org.nz/snug
- Commission audits of your existing traffic signals
- Engage competent signal engineer for the peer review of new designs

Availability of “Stops and Goes”

- Get your copy here
- Order more copies from Transfund
  - contact Ian Appleton
- Online soon (LTNZ website)

- Thank you