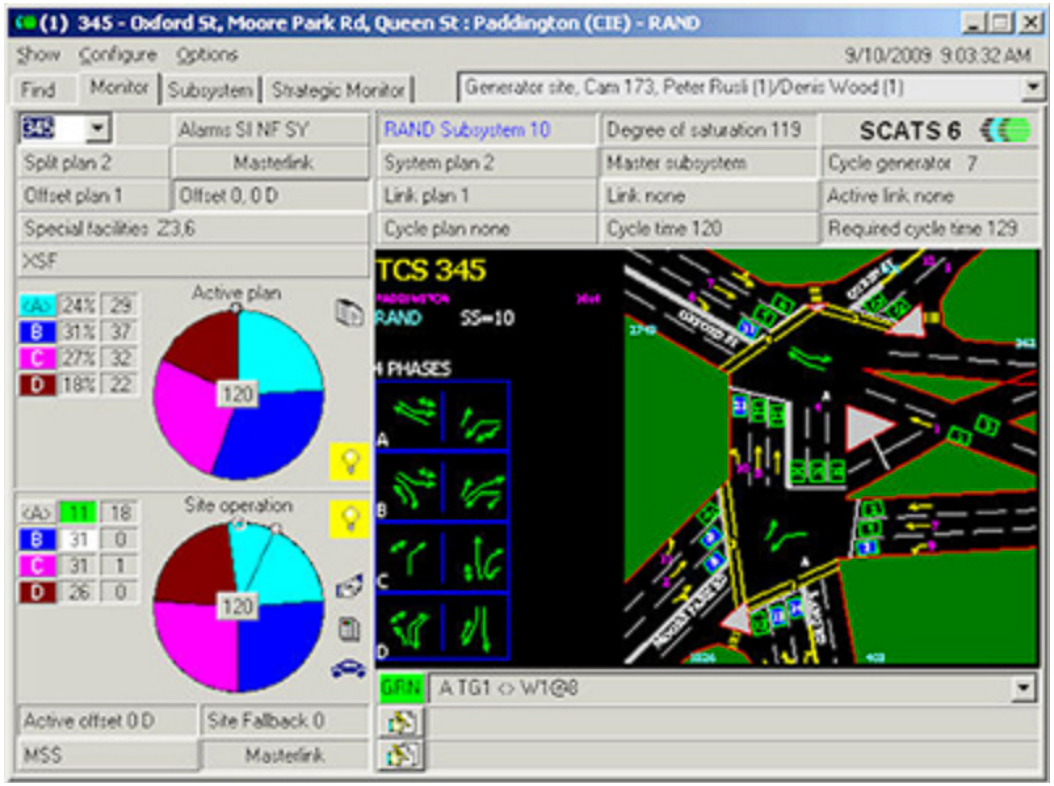
SCATS Management of loop faults and pedestrian reintroduction



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Rogan Parker
ATOC

Overview

With 1000+ signalised intersections and mid-block crossings, we are having issues with the time it takes to replace or repair loop faults. At some intersections we have loop faults that are unresolved after 12 months.

Pedestrian reintroduction is a standard treatment at fully protected pedestrian crossings, but we aren't managing it optimally. Our traditional approach does not maximise the service to pedestrians.

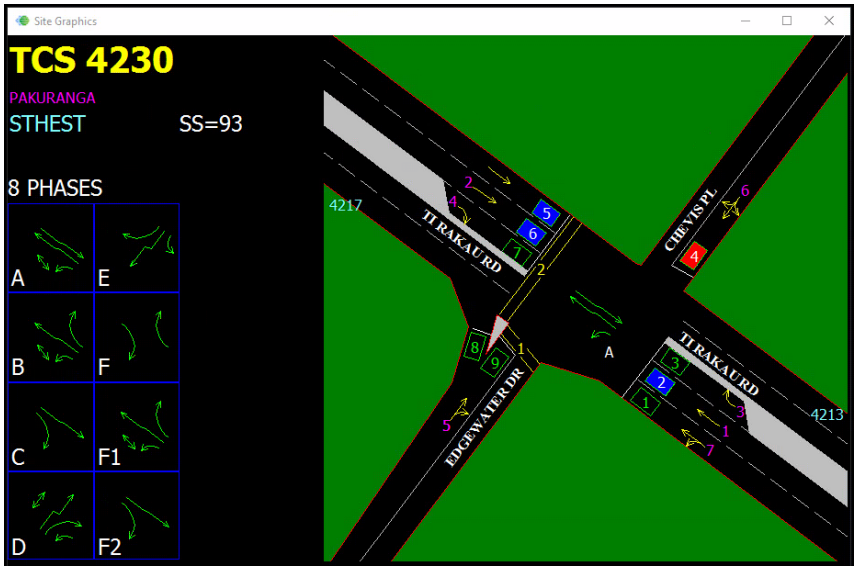
Goals

- Look at what we have done in the past.
- Explain what we are now doing.
- Understand what others in the rest of NZ are doing, and share that knowledge.

Topics

- Management of loop faults
- Pedestrian reintroduction and the XSF flag
- Measuring pedestrian delay
- Pedestrian inputs for fault diagnosis

Loop Faults case study



Ti Rakau Dr / Chevis Place / Edgewater Dr

Signalised crossroads on Ti Rakau Drive. Intersection will be changing as part of Ti Rakau Dr traffic flow improvements and signalisation will be removed. Sidestreets will be priority control left in / left out.

Chevis Place is a cul-de-sac with approx 22 houses so is a very minor road. The Chevis Place detector loop has been faulty in excess of 12 months and is a low priority to fix given the future changes.

Previously we would manage the fault through SCATS using fixed split plans in Action Lists triggered by the region Scheduler. This means that the intersection is essential running in Masterlink 24/7.

Recent approach

Variation routine 37 (composite test) contains a faulty detector test which we are now using to try a different approach. VR37 does the following:

- Test for a faulty loop
- Test for non-stretch phase demands
- Run intersection in Masterlink when no other demands
- Run intersection in Master isolated when other demands
- Half cycle the Chevis Place phase.

Note: there is no pedestrian crossing in The Chevis Place exit phase. Had there been, then VR37 could also test for no demand for the crossing.

The outcome is that we have a hybrid operational state. When busy, the intersection operates in Masterlink and the effect of the fault is mitigated through normal methods (Min Green only and ½ cycling). When quiet the intersection operates as Masterlink when no other demands but reverts to Master isolated as soon as another demand is detected.

Applications

- Faulty loops
- Low use alarms (v. minor roads, school driveways)
- Bus priority

Pedestrian reintroduction using the XSF flag

Legacy approach

Pedestrian reintroduction is used on most fully protected stretch phase pedestrian crossings in Auckland. We use it in non-stretch approaches where there are long phase times, or where there is the possibility of the phase being the stretch under certain traffic conditions. Pedestrian reintroduction allows a pedestrian crossing to start at any time during a specified phase

In masterlink, we use an XSF flag to inhibit the pedestrian reintroduction. This is done at a time during the phase when there is no longer sufficient time for the pedestrian crossing to complete prior to the next phase

Issue

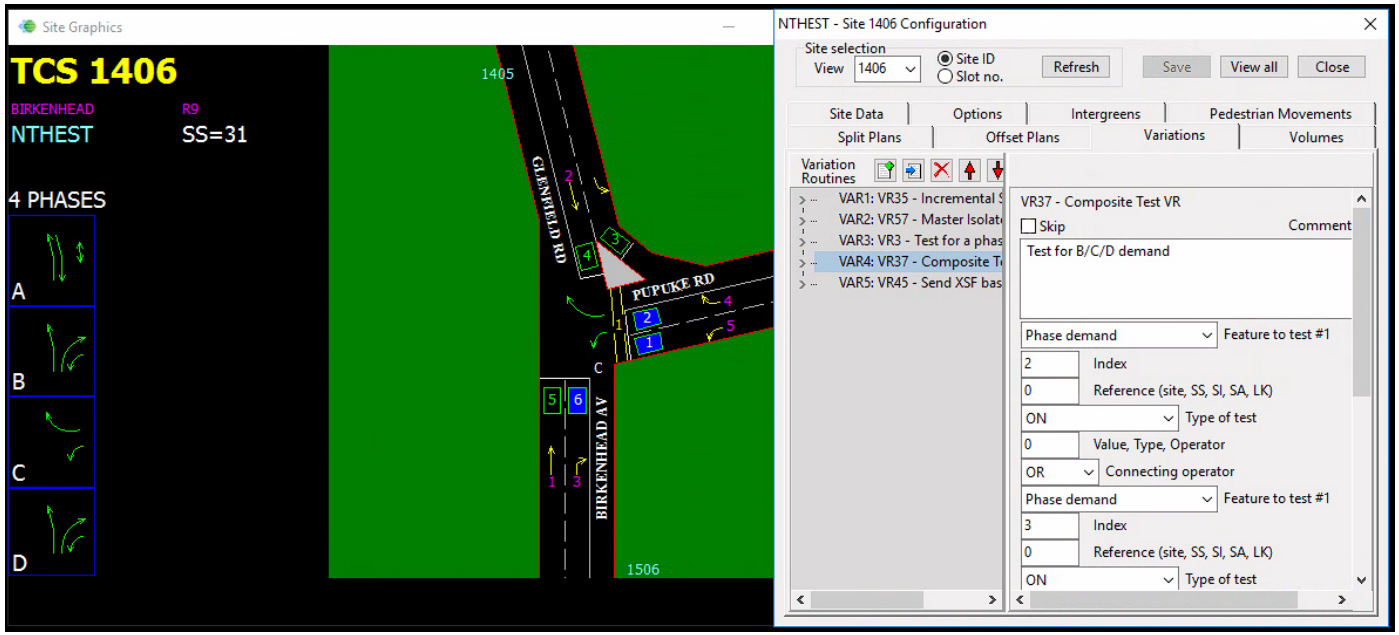
While this works well when the phase is followed by another phase where the same pedestrian crossing can not run, there are lost pedestrian opportunities when the intersection is either:

- Resting in the stretch phase
- Time gaining when the next phase is skipped
- Following phase allows the same pedestrian crossing to introduce.

Approaches to a solution

The solution can either be tackled at a software level, or at an operational level. My proposal does not look into the software side approach due to lack of expertise in that field. Suffice it to say that the issue can be improved within the software. It makes sense to approach from an operational level as the rewrite of existing software is a long term process.

To fix the resting intersection issue is fairly simple. Conditions can be added to the XSF variation routine to only activate the flag when there is a demand for another phase. This can be done in a single variation routine on intersections with 5 or less phases: use VR37 to test for a demand for each phase using boolean OR operator, or use VR37 to test for no demand for each other phase using boolean AND operator.



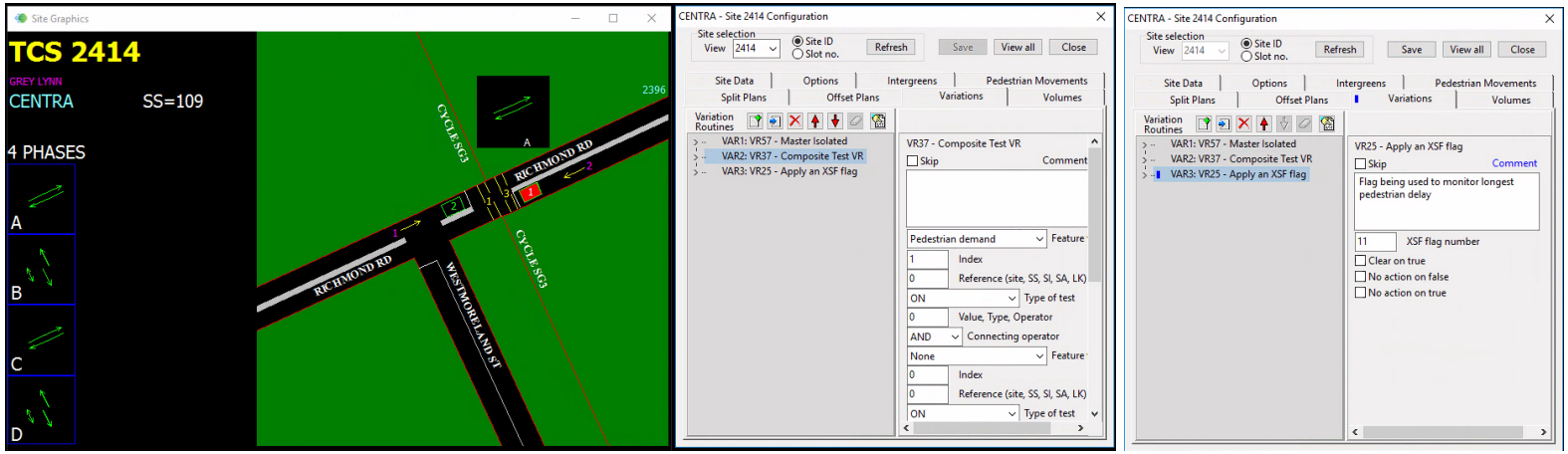
The second issue of the XSF flag during a phase that is gaining time from the undemanded next phase is complex and I do not have a proposed solution.

The third issue can be solved operationally but it requires a set of variations and the use of a dummy flag. VR13 is a singular test for a next phase and cannot test for multiple next phases. Using multiple VR13s with the OR operator means that you cannot then add other tests to that logic. So a possible solution is to use multiple VR13s to trigger a dummy flag and then test for that dummy flag in the body of the XSF reintroduction flag logic.

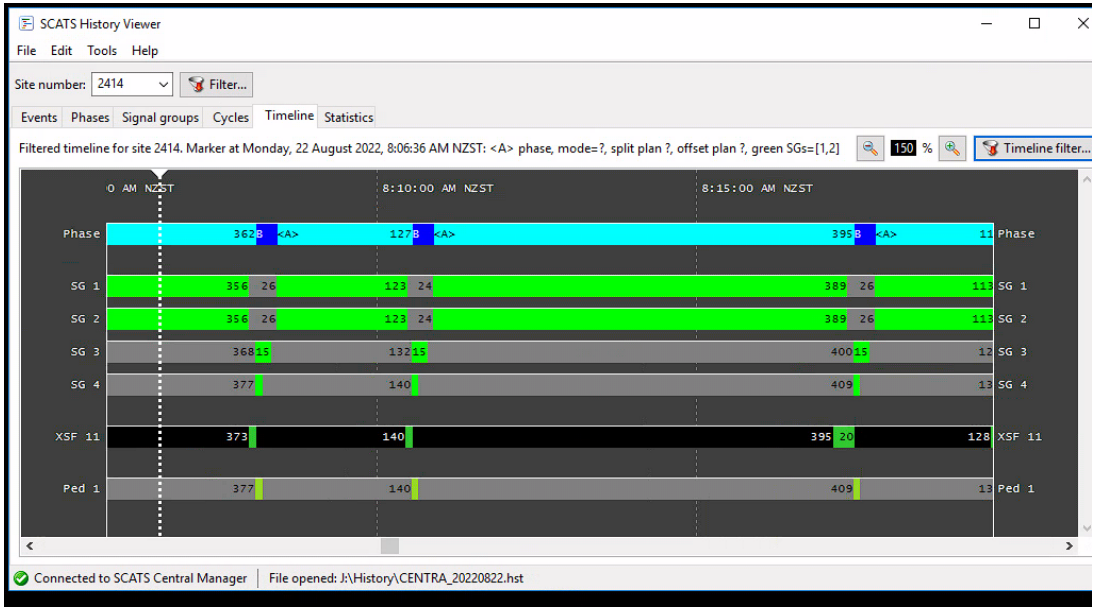
Measuring pedestrian delay

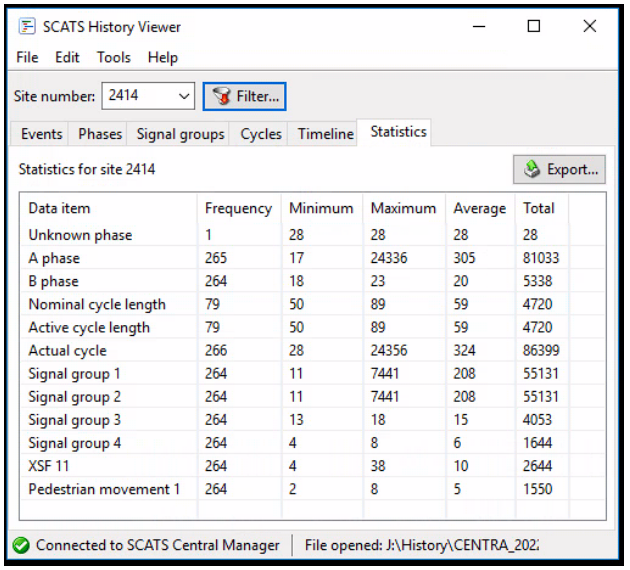
We currently do not have an easy way of measuring pedestrian delay. SCATS collects pedestrian demand data but it is not extractable in a viewable format. We have raised the issue with SCATS and they are looking into providing the data in future versions. Currently the data can be viewed in the Event log in SCATS history but it requires exporting and manipulation to get any usable data.

A simple site workaround is to use a variation routine to test for a pedestrian demand and then set a dummy XSF Flag while the demand is there. This flag can then be viewed in Statistics in SCATS history



The data from this flag can then be viewed in Timeline & Statistics in Scats History





Data item	Frequency	Minimum	Maximum	Average	Total
Unknown phase	1	28	28	28	28
A phase	265	17	24336	305	81033
B phase	264	18	23	20	5338
Nominal cycle length	79	50	89	59	4720
Active cycle length	79	50	89	59	4720
Actual cycle	266	28	24356	324	86399
Signal group 1	264	11	7441	208	55131
Signal group 2	264	11	7441	208	55131
Signal group 3	264	13	18	15	4053
Signal group 4	264	4	8	6	1644
XSF 11	264	4	38	10	2644
Pedestrian movement 1	264	2	8	5	1550

The data only measures the longest wait - ie from the first push of the button to the green man. It does not measure an average delay where there are multiple pedestrians arriving during the cycle, but it does give a reasonable insight into the time level of service for pedestrians.

This may also be used for 3 aspect bicycle crossings, but requires slightly different logic. XSF flag turned on by push button and then switched off by green aspect. We are currently measuring delays at a cycle crossing but are yet to analyse any data from the site.

Pedestrian inputs for fault diagnosis

Legacy

At Barnes dance of exclusive pedestrian crossings we currently use a single input into the controller for all the pedestrian push buttons. On a 4 leg intersection this can be 8 push buttons connected to one input.

When a button faults we have no way of narrowing down which is the faulty button so we dispatch a contractor and expect them to identify the faulty push button unit and repair.

For new sites, we suggest splitting the push buttons into multiple inputs so we can narrow the fault down to a smaller number of buttons. We propose to number each corner separately, so in the Customs / Albert example, there are 4 inputs.