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MICROSIMULATION, MOVA AND SPEED-FLOW IN THE FAR SOUTH WEST

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AIM

This paper focuses on a section of the A30 trunk road on the approach to Penzance in Cornwall in the far South West. The brief requested production of design options to improve an un-signalised cross-roads in a village on the A30 trunk road that suffers from acute community severance.

The village is called Crowlas. The village has a population of approximately 1000 and is located on a rural based single 4.5 mile / 6 km link of the A30 which runs between Hayle and Penzance. A significant summer peak exists. August traffic volumes in 2014 were 27% higher than average daily volumes recorded throughout the year and 61% higher than those recorded in January.

A by-pass was consulted on in July 1975 and May 1993 however other regional needs took precedence at these times.

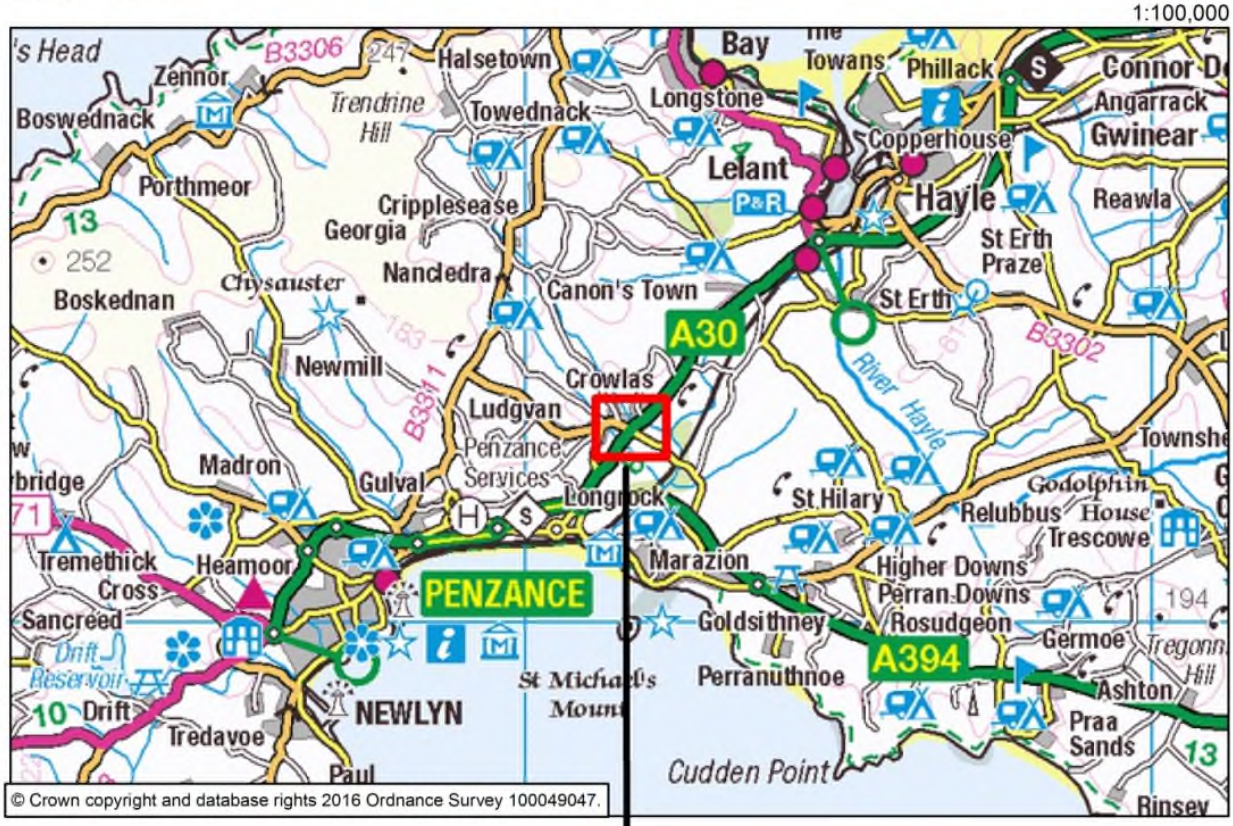
For this project the client (Highways England) requested:-

- Traffic signal designs for Crowlas cross-roads using Microsimulation incorporating MOVA.
- Examination of platoon behaviour in relation to the proposed signals along the entire 4.5 mile / 6 km link of the A30.
- The design focus be on pedestrians. Cyclists also received specific attention, including those using the A30 trunk road on the 'Lands End to John O' Groats' journey.
- Possibilities for right turn arrows be examined and a proposed reduction in speed limit to 30mph through the village be tested.

Crowlas location map

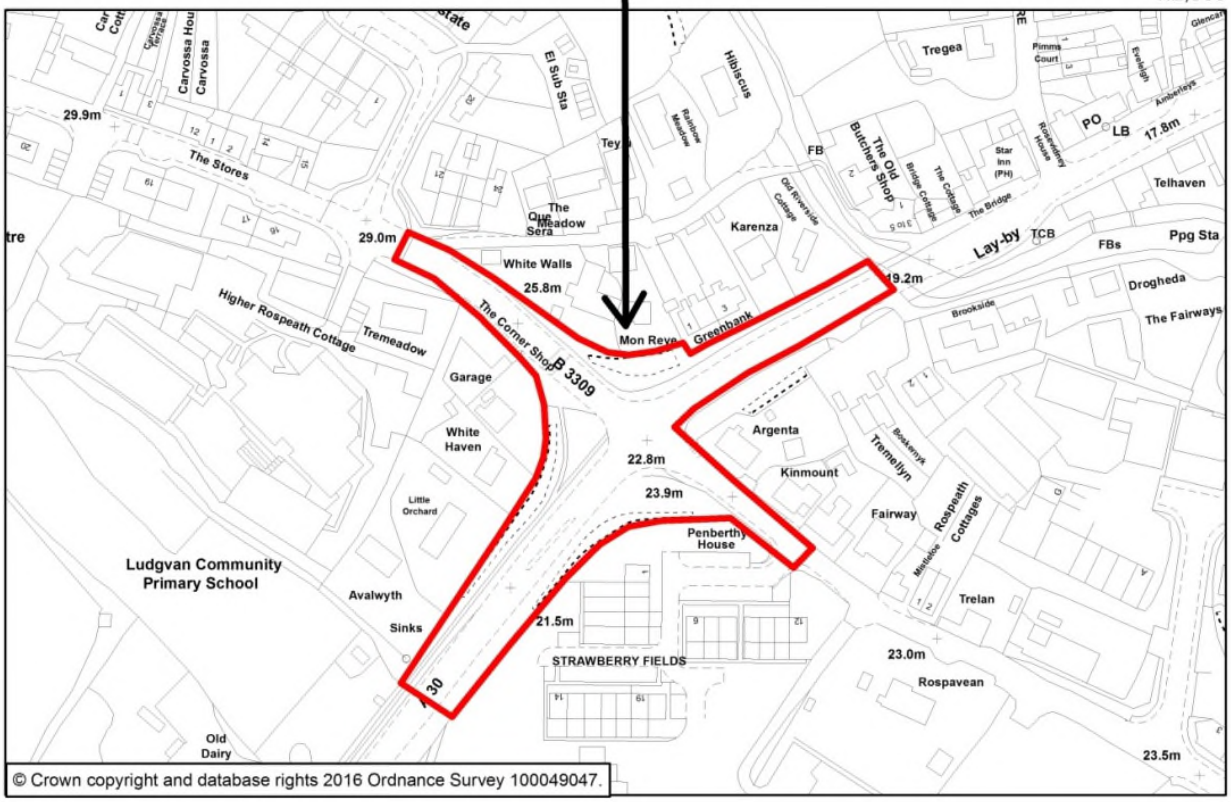
Crowlas Location

1:100,000



Crowlas Crossroads Location

1:2,000



A "nightmare" traffic junction on the A30 came under the personal scrutiny of Transport Secretary Chris Grayling as the general election campaign hit the road in West Cornwall.

The visit by the high profile member of the cabinet followed this week's whistlestop tour of a business in Helston by Prime Minister Theresa May which provoked widespread criticism for its handling of local press.

In contrast to that tightly controlled event, Mr Grayling met members of the community on the corner of a residential street in Crowlas and Ludgvan were people have long campaigned for a busy junction to be made safer.

Read more: How Theresa May's visit to Cornwall sparked a national debate around press freedom and control

The minister said Derek Thomas, the Conservative prospective Parliamentary candidate for St Ives, had been "badgering" him to see what a dangerous road it was.

image: http://www.cornwalllive.com/images/localworld/ugc-images/276391/binaries/cg4.jpg

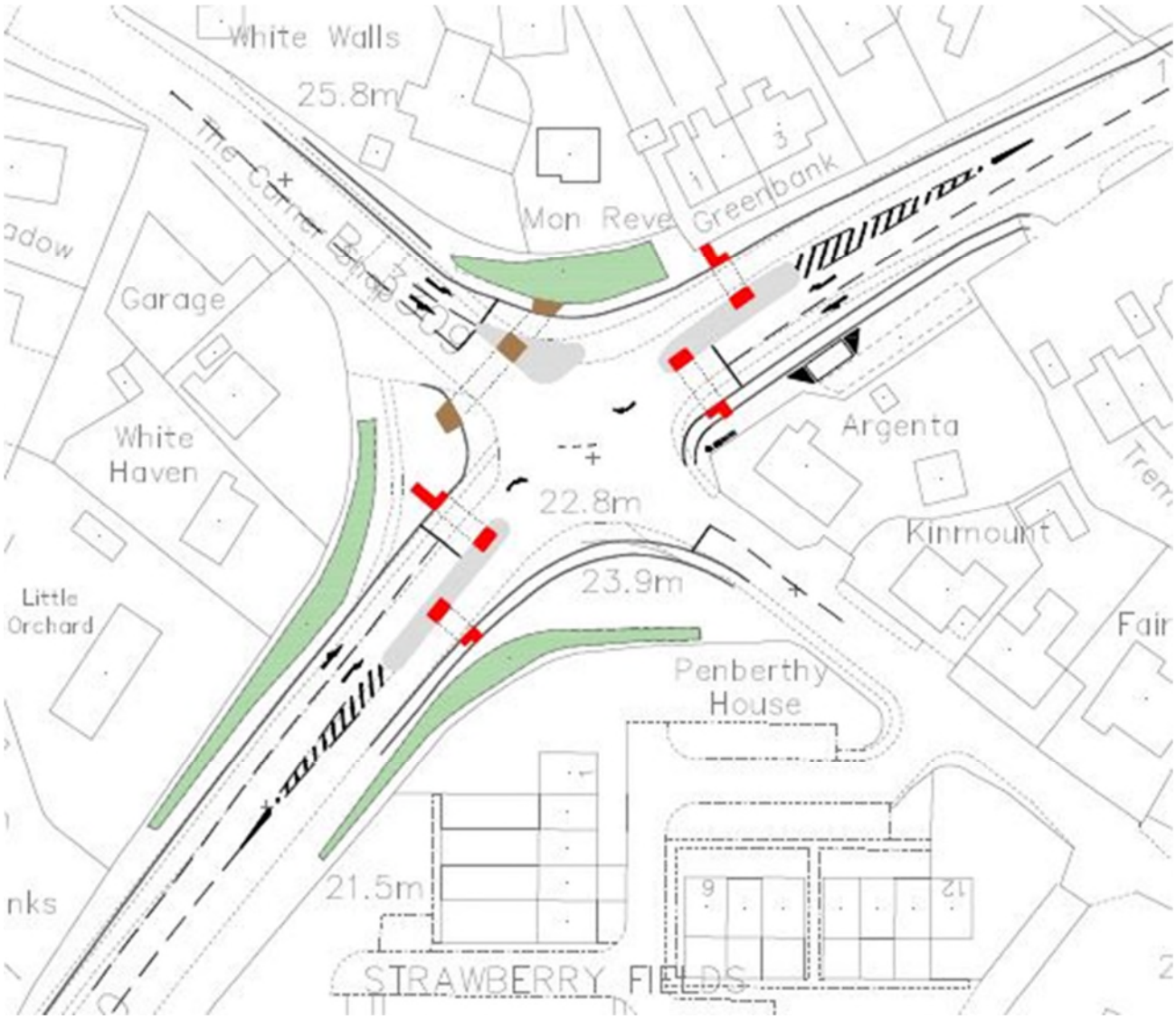
Transport minister Chris Grayling was in West Cornwall today

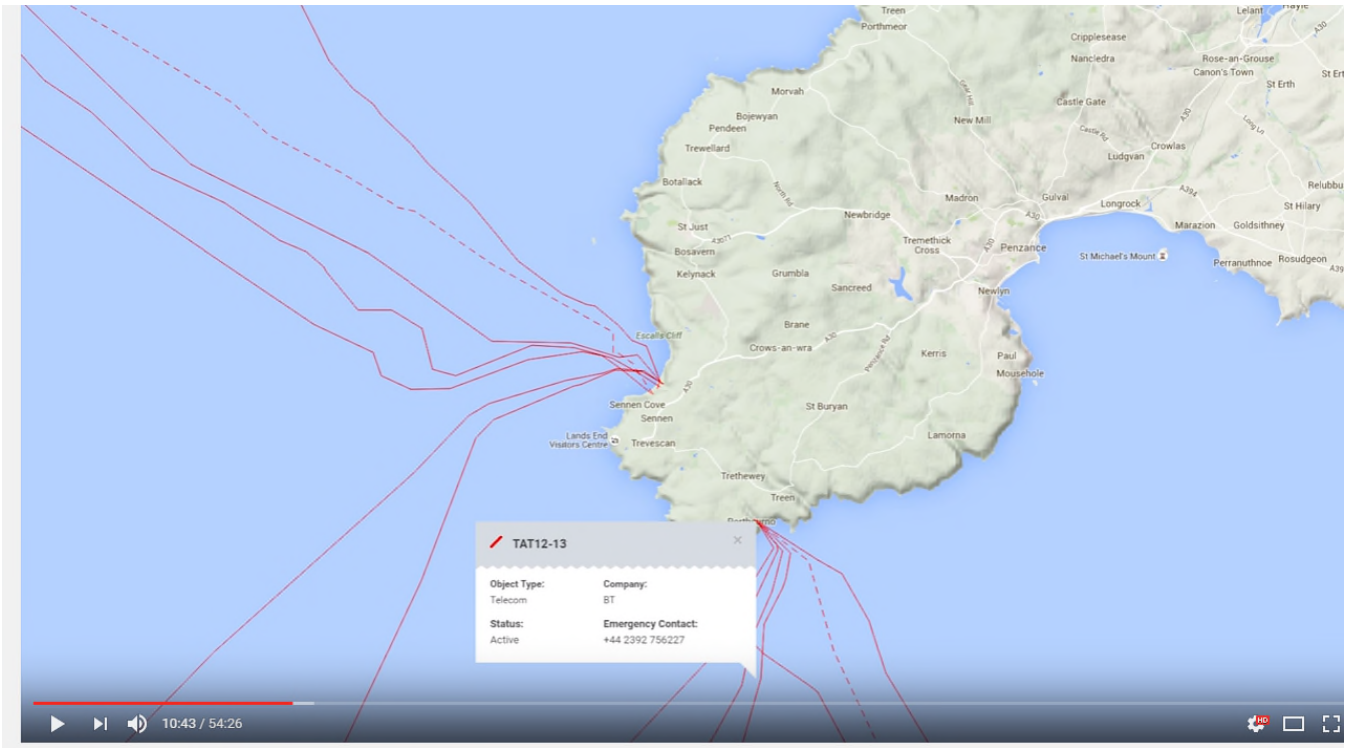
He promised to take the matter up with Highways England and that action would be taken, but could not provide a time scale.

DESIGN

3 Signal design options were created. LinSig was used to give an initial feel for performance. Staggered pedestrian phases were included to allow crossing of the A30 and also assist cyclists. The design sought to maximise the length of all flared lanes within available highway land. The NRSWA searches showed that key Trans-Atlantic communications cables exist in the area so the design also needed to avoid these. Following the LinSig testing the final preferred stage arrangement was;

- main road
- right turn ECO
- side road (peds if needed)
- return to main road
- other side road,
- ped all red (if needed)





The Secrets Of Cornwall - Part 1 - Communications

TEST

MOVA is heavily used in Cornwall due to presence of isolated junctions and very big tourist peaks. Highways England requested MOVA be simulated. In order to test the signal designs we used PTV VISSIM with TRL PC MOVA on WINDOWS 7.

A VISSIM model was developed based on empirical vehicle junction counts from 2015 and 2016 covering 11 junctions including junction queue lengths. Pedestrian movements were also counted at Crowlas Crossroads and the existing down-stream pedestrian crossing at this time. 8 Temporary tube sites were installed for 7 weeks and Highways England fixed count sites were used to develop factors to test the summer peak. The large amount of data collection took place because it was intended that the VISSIM model be used to test several schemes in the area.

To accurately test the traffic signal options the model needed to be validated to DfT Standards using Transport analysis guidance (WebTAG), DMRB and TFL 'Traffic Modelling Guidelines'. Amongst other factors this required modelled journey times to compare well with observed journey times.

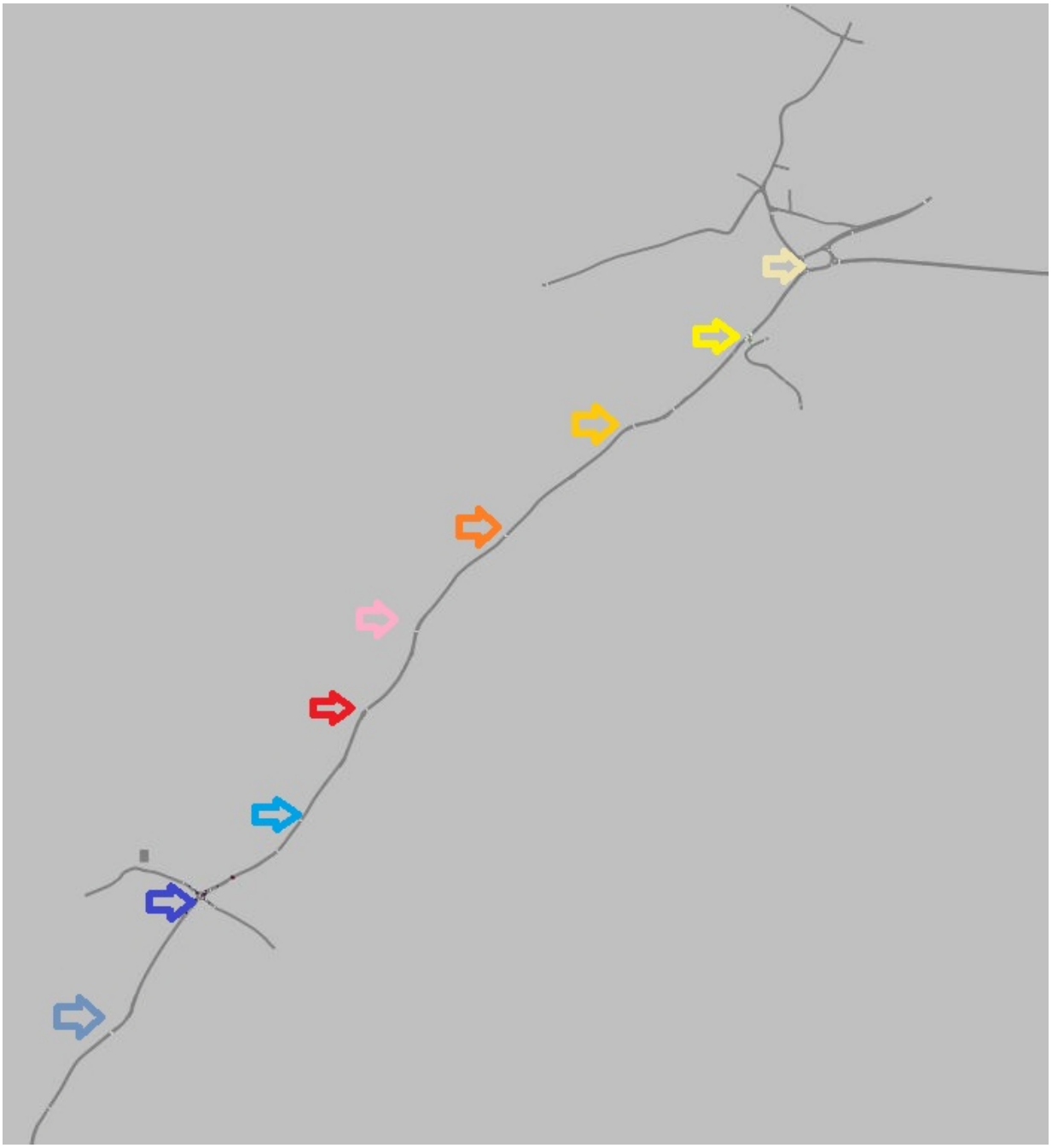
PROBLEM

At this stage of base model development a problem arose where by the model was not replicating observed journey times so would fail due diligence that would not allow us to test signals.

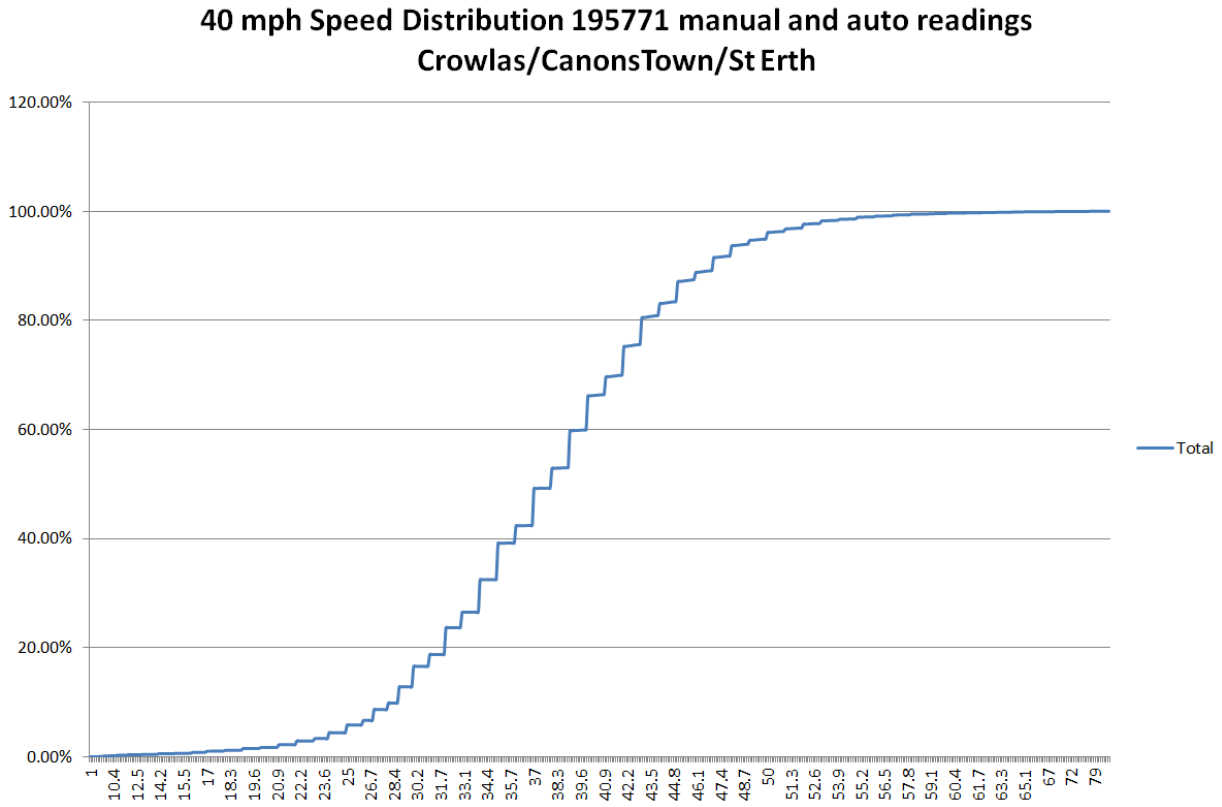
The main A30 link was split down in to 8 journey time segments shown by the coloured arrows in the map below. Journey times were examined over these 8 segments for AM and PM peak, Westbound and Eastbound giving 32 journey times. With only 4 coming in as within the 15% difference limit between modelled and observed. It was vital to meet due diligence because the client wanted to check the effect of platooning and driver behaviour in relation to proposed traffic signals throughout the 6km stretch of the single carriageway A30.

The observed journey times were retrieved from floating vehicle data (including Trafficmaster readings) and in general journey times in the model were lower than observed; implying vehicles were travelling too quickly. During project discussions the client informed us that a large amount of speed readings had been taken at locations throughout the corridor for previous work examining safety issues.

The VISSIM microsimulation software as a platform is very open to customisation so as an experiment we decided, for the first time to try and incorporate this raw data in to the VISSIM model. This would mean replacing the existing speed flow relationships in the model which are based on 'Free flow vehicle speeds in Great Bitain:2015' *DfT National Statistics* (cover sheet of 2016 publication shown below).



In terms of the speed readings these had been taken using a radar gun and L200 survey machine along the main A30 link. Readings had been taken both Westbound and Eastbound in both 40 mph and 60 mph sections at a variety of free flowing locations. The majority of the readings (195,771) applied to the 40 mph sections. A pivot table in EXCEL was used to create the speed flow curves and these were transferred as raw inputs in to VISSIM.



Statistical Release 30 June 2016

Department for Transport

Free Flow Vehicle Speed Statistics: Great Britain 2015

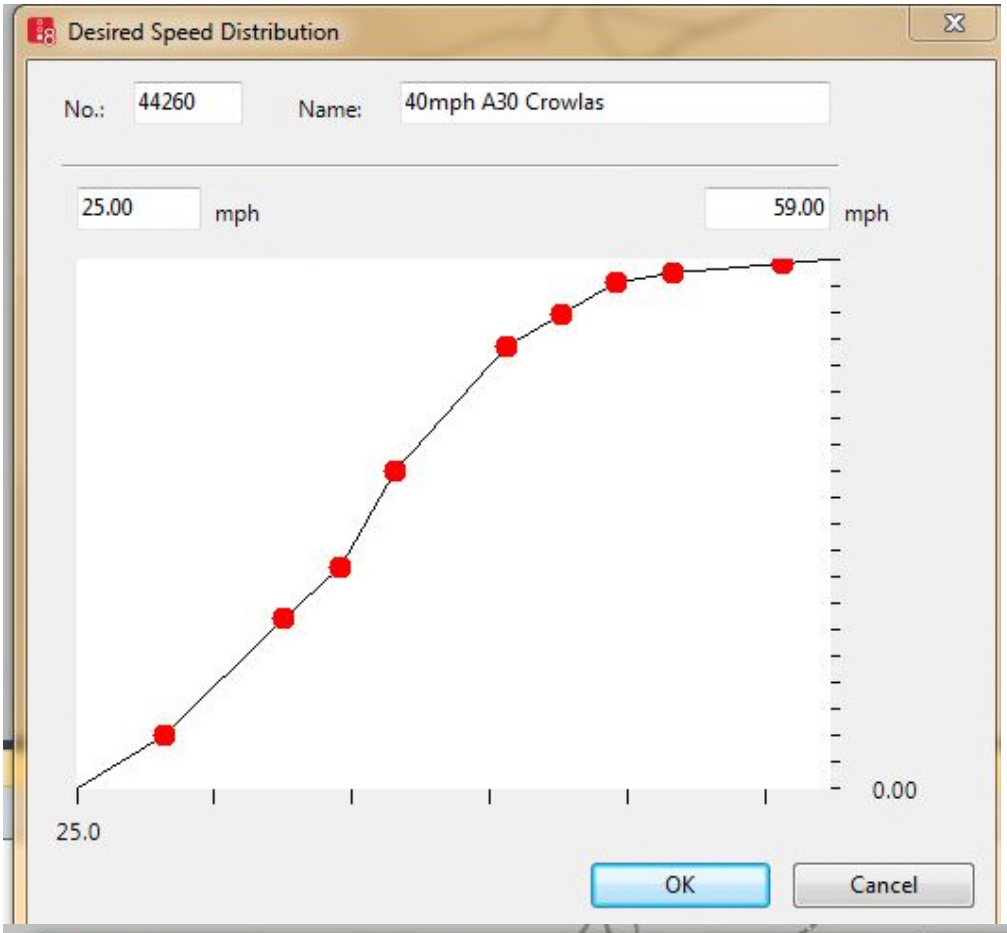
About this release

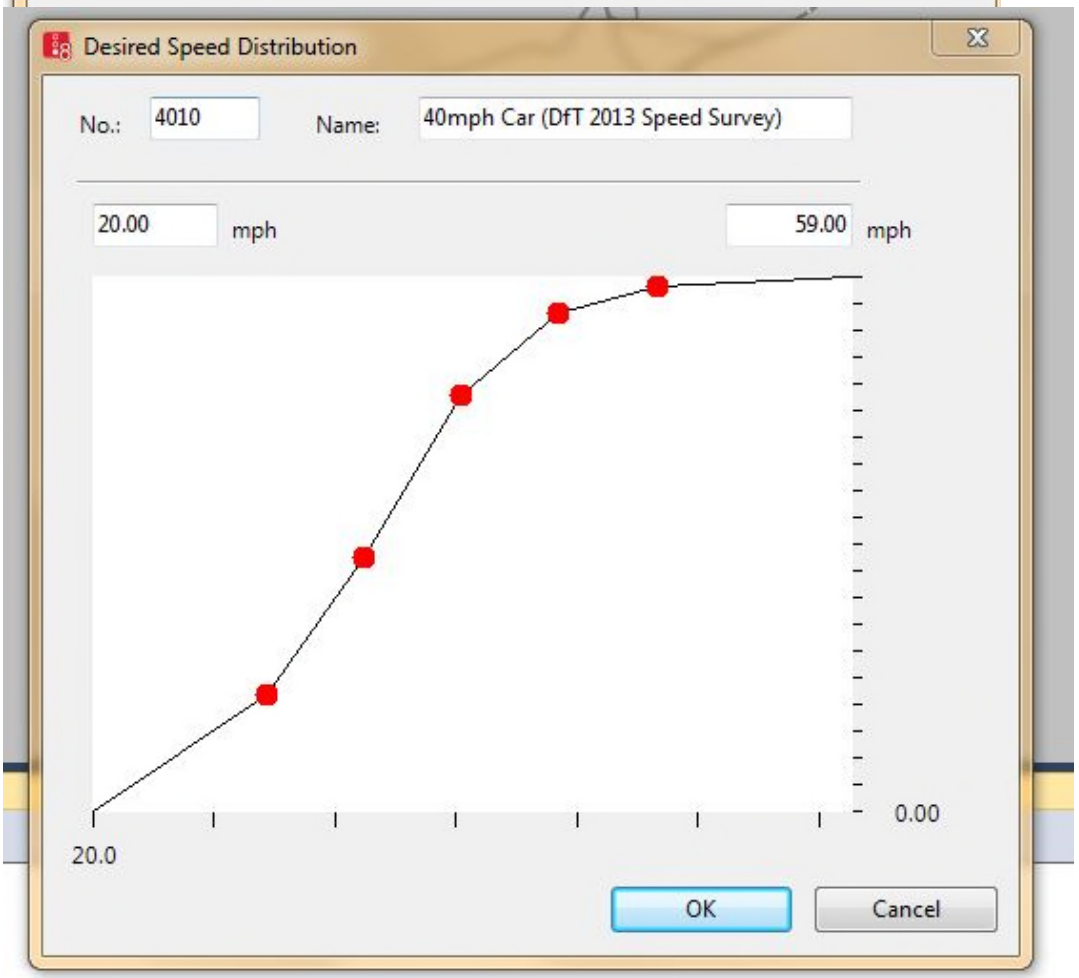
This Statistical Release presents estimates of traffic speeds in free flowing conditions on roads in Great Britain, updated for 2015.

These statistics provide insight into the speeds at which drivers choose to travel and their compliance with speed limits, but should not be taken as estimates of actual average speed across the road network, which are available separately (see Background Information on p15).

Since 2011, average free flow speeds for all vehicle types across each road type monitored have remained broadly stable. The percentage of vehicles exceeding the speed limit for each type of vehicle has generally declined for nearly all vehicle types and road types.

- On motorways, 46% of both cars and light commercial vehicles (LCVs) exceeded the speed limit (70 mph) in 2015. Since 2011, there has been a small, steady, decrease from 49% for both vehicle types. 11% of cars and 12% of LCVs exceeded the speed limit by 10 mph or more.

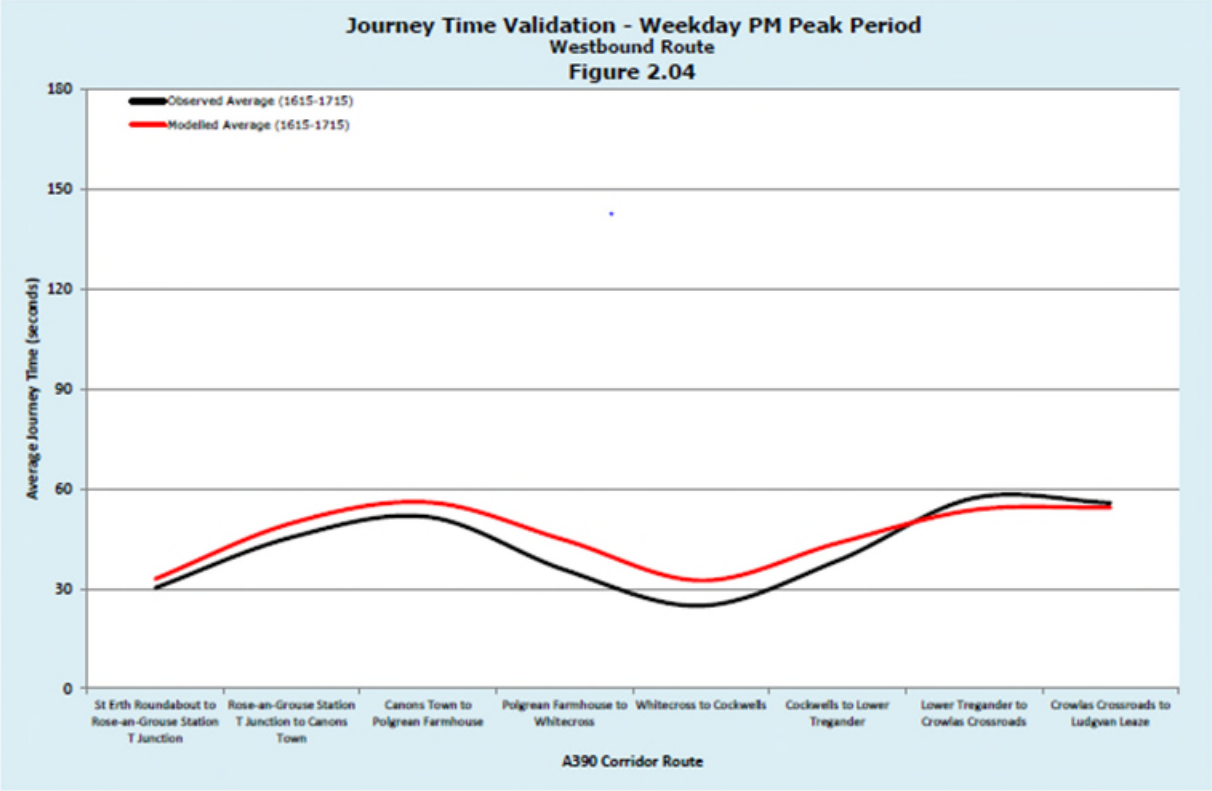

Desired Speed Distribution
No.:
44260
Name:
40mph A30 Crowlas
25.00
mph
59.00
mph
0.00
25.0
OK
Cancel


Desired Speed Distribution
No.:
4010
Name:
40mph Car (DfT 2013 Speed Survey)
20.00
mph
59.00
mph
0.00
20.0
OK
Cancel

RESULT

The result was a dramatic improvement in the accuracy of the modelled journey times with all of the 32 modelled journey time figures coming in as at least 85% accurate when compared to recorded.

The graph below demonstrates the accuracy of the resulting modelled and observed journey times.



BUILDING THE PC MOVA MODEL

The next stage was to build the PC MOVA model. The datasets were worked up with the help of JSTSM who visited site and created datasets for final use on street. A problem occurred; platooning was now accurate and driver behaviour was being modelled properly, however, in MOVA 'OPT BDR' was not showing in messages and the signals were holding green for a little longer in the model than what might be expected on street.

JSTSM recommended several changes to datasets. Our initial thought was that these seemed to be counter-intuitive and a discussion followed. When changed the parameters seemed to have a large influence on the modelling environment in the MOVA datasets.

For info the following key **Lane Data** parameters were changed:-

LANE DATA saturation flow = 1200 p.c.u

SATGAP = 2.2
CRITGAP = 4.7

This improved the VISSIM PC MOVA model immediately. It must be noted we would not use these values on street however in the modelling environment these values visually make sense. A benefit of the Microsimulation is the visual representation which was important when fine tuning MOVA operation. Thanks to JSTSM for providing this information.

OUTCOME

A robust model was developed which reflected the likely impact of the signals on the A30 corridor. We were able to provide detailed information regarding the queueing on each approach throughout the assessment time periods across all of the scenarios. Highways England are currently considering the content of the report.