# NOTE ON PROPOSED TRIAL OF REAL TIME TRAFFIC FLOW AND JOURNEY TIME DATA COLLECTION BASED AROUND THE A6005 AND NOTTINGHAM ENTERPRISE ZONE

## Background

The Head of Transport Strategy requested that the Highway Metrics Team investigate the feasibility of, and applications for, the collection of real time data for the key transport metrics of journey time and traffic flow.

Such data is currently available, but not in real time, from ad hoc manual and automatic traffic surveys, fixed inductive loop sites and TrafficMaster GPS data generated by in-car satellite navigation systems, supplied by the DfT and analysed by NCC. Many other English Cities have now developed a real time capability including Manchester, London, Bristol, Milton Keynes and York. Typically, this capability is aimed at optimising the Urban Traffic Control (UTC) system, providing travel information to the public and for transport planning and appraisal.

Real time data underpins the functioning of a SMART City and enables transport planners to understand how a City's transport system functions and therefore enhances the quality of decisions regarding future strategies.

Introducing real time monitoring of traffic flow and journey times will provide five main benefits:

1. Monitoring and evaluation – Classified traffic flows and accurate average journey time and journey time reliability statistics are essential for the evaluation of transport interventions. DfT funding is almost always conditional on a commitment to provide a post scheme impact evaluation and almost all schemes have objectives relating to traffic flow and average journey times. Any system that delivers this data in real time will enable such evaluations to measure the development of these indicators as a consistent time series up to the point of publication of the evaluation report. This approach avoids the need to specify bespoke suites of one off before and after surveys. Crucially, it also allows for a retrospective assessment of the coverage of the data allowing evaluators to take an investigatory approach, which is often required to capture the full benefits from a scheme. Establishing a reputation for robust, transparent and comprehensive evaluations enhances the City's reputation as a leading City with respect to transport and improves the business case for future funding bids.

2. Informing future transport strategy - A system delivering a consistent network wide data coverage would enable more effective forward planning of a transport strategy. For example, it would allow a more complete understanding of the relationship between journey times, travel demand and network capacity. Currently, traffic flow data in particular lacks detail because coverage of the network using permanent automatic counters is very limited and it is only collected piecemeal as and when required for other purposes, which has led to an ambiguous picture with regards to traffic growth in Nottingham. However, data from the key data source for journey times, the TrafficMaster GPS supplied by the DfT, suggests average journey times are rising steadily. Understanding this relationship is key with respect to setting future policy.

3. Assist in monitoring air quality metrics – comprehensive journey time and traffic flow data can be used to monitor air quality. They contribute to this in two ways. Firstly, they form the base input to The Emissions Factor Toolkit provided by Defra to model pollutants and there is no reason why this could not be applied in real time. Secondly, vehicle registration numbers are recorded as part of the process of calculating journey times, and then these can be matched to DVLA records, which give the emissions for each vehicle thus providing intelligence with regards to the overall fleet.

4. Providing real time travel information to the public - Real time journey time data could be supplied to the public at the workplace, by variable message signs or by apps on mobile devices enabling a more effective use of network capacity and modal choice. This could make a significant contribution to Keep Nottingham Moving. For example, trials in Manchester use these platforms to respond to incidents or worse than normal congestion, to re-direct the public to less congested routes. Providing general travel time information to the public in real time could also highlight the time savings related to public transport or cycle travel thus providing further incentive for beneficial modal switch.

5. Optimise the performance of the Urban Traffic Control System - Academic studies suggest that traditional UTC systems such as SCOOT and MOVA have significant inefficiencies. Part of this is due to a lack of comprehensive real time flow and journey time data across the network as well an inability of traditional detection systems to identify cyclists, pedestrians and trams, or to classify the traffic flow. Clearly tapping in to these potential efficiency savings will have a large benefit to cost ratio and has the potential to make a big contribution to Keep Nottingham Moving.

It is therefore recommended that a trial of an appropriate real time monitoring system is conducted to test if the above benefits can be realised within a local context with a view to developing a potential Citywide scheme should the trial prove to be sufficiently beneficial. A successful proof of concept such as this would significantly strengthen any future funding bid and business case for a Citywide scheme. In order to be financially efficient, it also makes sense to conduct a trial that generates data that is needed to facilitate a current evaluation project. Additionally, it is worth noting that both with the trial and any larger scale scheme there would be savings to offset the cost of the scheme. This is difficult to quantify and is likely to be modest, however savings would arise from a reduction in the current monitoring and evaluation programmes, as less bespoke data collection would be required. Additionally the data gathered will have commercial value, to developers for example, and can thus be sold on which should generate some additional revenue.

**What is proposed?**

A test bed area has been identified based around the Boots Enterprise Zone and the A6005 Corridor from Chilwell to the City Centre. This will enable the data collected by the trial to also be used in the evaluation of the Nottingham Enterprise Zone: Boots Campus Sustainable Transport Package, effectively killing two birds with one stone. A requirement to carry out an impact evaluation is contained within the business case and therefore NCC is required to report on the scheme's impact on travel patterns. The trial would thus be conducted in two phases, before and after the scheme is opened. The initial phase would concentrate on collecting essential before data while the second phase will last longer and be the main part of the trial.

The trial will compose the following elements

1. A network of fixed cameras capable of counting and classifying traffic, including cyclists and pedestrians, and providing the data in 'real time'
2. A network of Automatic Number Plate Recognition (ANPR) cameras capable of recoding journey times between key locations on the test network.
3. Provision of 'floating' journey time data in real time. 'Floating' data refers to data sets crowd sourced from multiple data sources gathered from devices providing signals such as, mobile phones, tablets, satellite navigation systems, smart watches etc. and then combined using proprietary algorithms to produce an overall measure of point-to-point journey times and traffic speed.

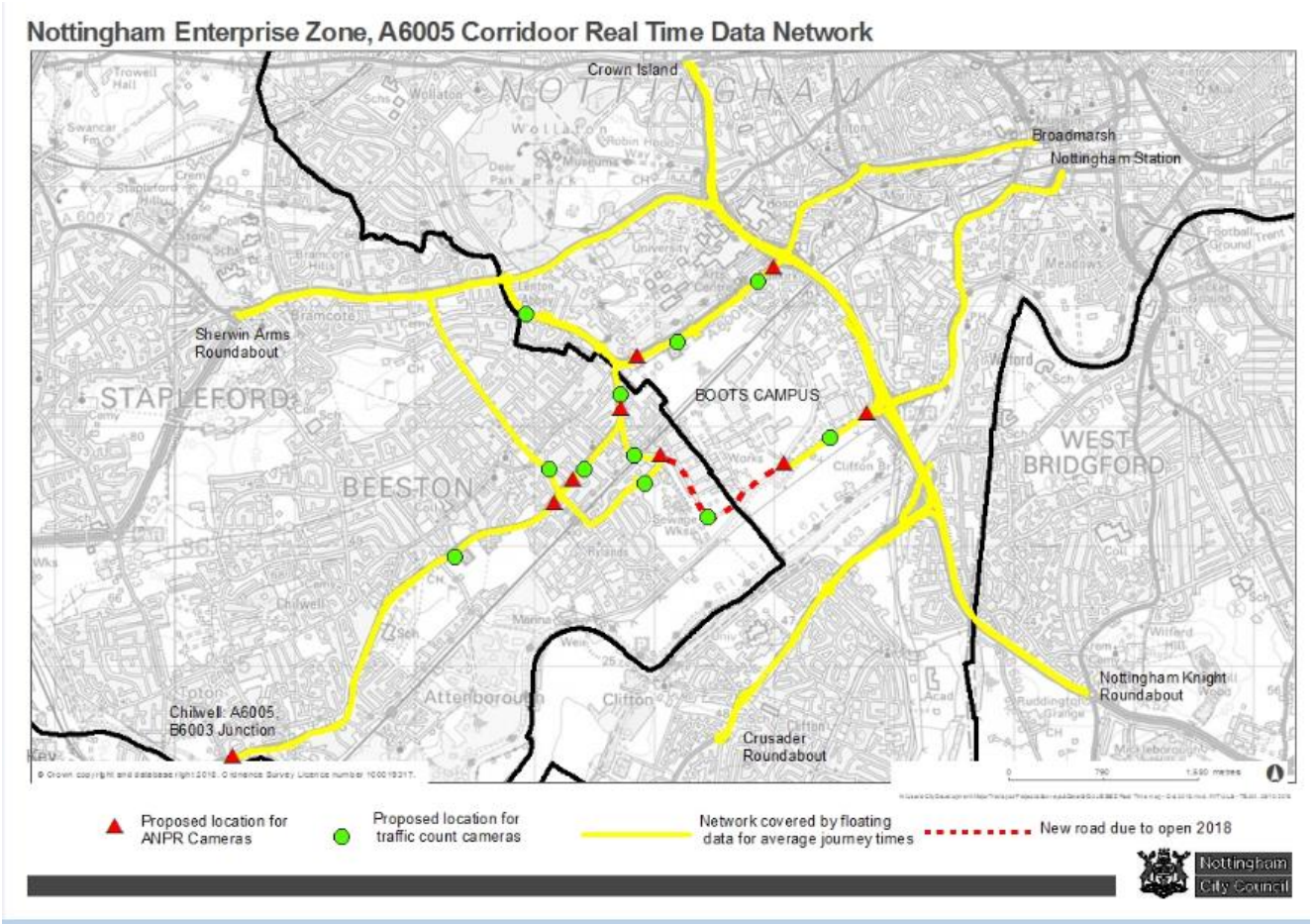
The principle is that the floating data and ANPR cross validate each other. ANPR does also offer significant additional 'intelligence' over and above the floating data, but is more expensive to collect. ANPR generated journey times offer the following advantages:

- Enhanced understanding of travel behaviour enabling targeted interventions such as communications campaigns to facilitate behavioural change. For example, Transport for Greater Manchester (TfGM) used ANPR to assess the percentage of daily repeat journeys on a route. They found that in some locations where they had assumed that congestion was caused by commuters, this was in fact due to business travel.
- ANPR is also potentially more accurate as it does provide a random sample close to around two thirds of all vehicles that pass the camera site, whereas floating data is not random as it comes from vehicles that have satnav systems or Bluetooth for example.
- ANPR is less opaque – floating data providers use proprietary algorithms that make assumptions on vehicle behaviour in order to combine data sources and fill in gaps where data sparsity is an issue. These algorithms are kept confidential by the data supplier so there is no way to assess their validity other than testing the journey times they produce against other methods of measurement.
- ANPR is also more effective than floating data on more lightly trafficked roads where data sparsity can be an issue for floating data sources. While this is perhaps less relevant for the key radial and orbital routes, it is pertinent for the Boots evaluation for which some distributor roads, Thane Road for example, require monitoring.
- ANPR can provide intelligence about the make-up of the vehicle fleet by matching with DVLA records showing vehicle class, emissions etc.

The key disadvantage of ANPR is cost. To comprehensively cover a City the size of Nottingham using the Greater Nottingham Congestion Monitoring Network against which the LTP congestion indicator is reported, would be prohibitively expensive both in terms of capital costs and maintenance.

It is therefore recommended that a hybrid solution is trialled with regard to journey time monitoring, with ANPR deployed at key points and then infilled with floating data.

The attached plan shows the study area and key components of the trial.




The majority of the camera locations are on County roads. Nottinghamshire County Council are aware of the proposals and no additional difficulties are foreseen with regards to this.

**Recommended suppliers**

In the UK market Google are the preeminent supplier of floating data through their Strategic Partner, Ancoris, with over 73% (Including their subsidiary Waze) of the market share, while Vivacity Labs Ltd have developed unique camera technology suitable for the above aims. Both suppliers have been used by other major Local Authorities for various combinations for similar purposes so there is a good expectation that the product will be fit for purpose. It is therefore recommended that dispensation from the normal procurement pathway is granted as the two organisations are, to all intents and purpose, sole suppliers. Justification for this is provided below:

Vivacity Labs Ltd are the preferred provider for the fixed cameras as they are the only supplier that offer cameras capable of counting and classifying not just vehicles but also vulnerable road users, clearly a capability to count cyclists and pedestrians is essential given the priorities for NCC whose policy is to encourage mode switch to active modes. This capability also has implications for fine-tuning of the UTC system as signal timings are influenced by flows of cyclists and pedestrians as well as motorised traffic.

Another unique technology offered by Vivacity Labs is the integration of machine learning capabilities within their camera systems. This aids more accurate vehicle classification than with conventional systems, as well as ultimately having the potential to provide a more proactive approach to optimising a UTC system. Vivacity in partnership with Innovate UK

and TfGM are trialling a smart junctions project in Manchester which aims to use this technology to fine tune traffic signal timings at key junctions. Vivacity have offered to enter into 'partnership' with NCC to integrate further tests within the trial proposed in Nottingham. While it is not clear what if any additional cost would fall on NCC over and above that detailed in this note, it would be a useful addition as the A6005 corridor is one of the most problematic in Nottingham with respect to peak period congestion.

Google supply floating data based on their Google Maps application. Google is uniquely placed to benefit from mobile and tablet sources through its traffic and journey-planning Apps that are widely used on all Android devices. Google has built up a history over the last few years of what traffic flow and congestion is usually like on specific roads at specific times. This means it can be combined with real-time data and historic data to help predict forthcoming traffic conditions.

Together with their minor subsidiary, Waze, they have a 73% share of the journey planning apps market. The data they provide has been validated by TfGM against other data sources. No other supplier of floating data has been identified that can rival the amount and reliability of Google data, given its market share and validation exercises performed by other users. TfGM, for example, is using Google data as an alternative to Bluetooth data as it found that the number of Bluetooth users is declining. TomTom provides traffic data from its satellite navigation systems (and informs Apple Maps), but it acknowledges that the sat nav market is in decline and is looking at revamping its map service to try to rival Google. The primacy of Google data for these purposes is illustrated by the decision taken in Amsterdam, to adopt Google data in place of TomTom.

**Potential for partnership working.**

**Vivacity** – As a relatively new company they are seeking to establish a market in the transport sector. Working with Highway Authorities in major Cities thus helps them commercially and it is hoped that a partnership approach to this project will deliver significant added value for NCC. The most promising area to explore is to provide further test sites for their smart junctions approach, although it's not clear how this will play out and exactly what is on offer.

**Academia** – It is hoped to find an academic partner in order to evaluate the trial and it is hoped that such a partner would be able to provide some limited additional funding to offset the costs detailed below.

**Boots** – As a major employer the provision of real time travel times on the road network, alongside public transport information, will clearly be potentially helpful to both Boots and the City Council's wider transport policies, if this can elicit further mode switch away from the car. Thus an important element of this proposal is to work with Boots to provide this.

The above options will be further explored once the DDM has been approved.

**Costs**

The costs outlined below are an estimate based on quotes from Anhoris, Google's strategic partner in the UK, and Vivacity Labs Ltd. At present, the exact detail of the final distribution of the Vivacity cameras is to be determined, as detailed site assessments are required. The associated IT costs are also somewhat of an unknown as detailed discussions between partners are required to assess this, thus a 10% contingency has been built into the estimated costs presented below.

The costs quoted here for Traffic Count and ANPR Cameras are for hiring them from Vivacity rather than purchasing them outright. This approach minimises the cost and risks of the trial. Clearly, any future large-scale scheme would require these to be purchased out right.

**Phase 1 (3 months):**

| **Item** | **Total cost (£)** |
|---|---|
| Ancoris (Google data) | £6000 |
| Vivacity Traffic Count | £13,000 |
| **TOTAL COST** | **£19,000** |

**Phase 2 (6 months):**

| **Item** | **Total cost (£)** |
|---|---|
| Ancoris (Google data) | £12,000 |
| Vivacity Traffic Count & ANPR cameras | £38,000 |
| IT Costs | £10,000 |
| Installation of Real Time Journey Time Display in Boots | £8000 |
| **TOTAL COST** | **£68,000** |

**OVERALL COST:**

**Ancoris (Google) - £18,000**

**Vivacity - £51,000**

**Real time display for Boots- £8,000 (supplier to be decided by normal procurement procedure)**

**IT Costs - £10,000**

**10% Contingency - £9,000**

**Combined Total - £96,000**