



REFERENCE GUIDE

Creating efficient traffic signals

Your guide to improving your
traffic signal network

As you will be aware, the Department for Transport has released the list of awards to local authorities from the £50 million of new money announced in the Plan for Drivers to make traffic signals more efficient.

As part of the plan announced last October, the funding was confirmed by Secretary of State Mark Harper on 17 March, and is to be spent on a range of solutions including upgrading traffic signal systems, replacing unreliable and obsolete equipment to improve reliability, and tuning up signals to better reflect current traffic conditions and get traffic flowing.

While £10 million of the Traffic Signals Obsolescence Grant (TSOG) is being distributed automatically to all eligible English local highway authorities using the Integrated Transport Block allocation grant formula, 67 further grants totalling £40 million are being made to fund projects in 80 local authority areas. Most are for £500,000 but two combined authorities – Greater Manchester and Tees Valley – will receive multi-million payments to cover authorities across their areas.

£30 million is allocated through TSOG, which will fund replacement of unreliable and obsolete equipment in traffic signal systems before spare parts run out, including halogen, communications equipment, and controllers. The remaining £20 million, through the Green Light Fund (GLF) is for tuning up traffic signals to better reflect current traffic conditions. This is the largest single amount of spending in traffic signals in a generation.

118 of the 121 eligible local authority areas in England made an application either directly or via a Combined Authority, meaning more than two-thirds were successful in being awarded funding on top of the automatic allocation.

The Local Council Roads Innovation Group, LCRIG, worked with the Transport Technology Forum to manage the challenge process. Its CEO Paula Clayton-Smith commented: "This historic investment in signals follows grants totalling £15 million paid out to 39 different authorities in 2021 which proved the value in tuning signals to improve efficiency and cut emissions. The authorities worked hard to deliver the evidence the Government needed to support this latest spending, and that team effort has really paid off. We look forward to seeing the benefits of the investment in the weeks and months to come."

Applications for a share of a further £20 million of funding earmarked for the Intelligent Traffic Management Fund (ITMF) will open next month (April). This money, expected to be delivered in packages worth around £2 million each, gives authorities the chance to deploy advanced technology for traffic signals, using emerging technologies to optimise traffic flow and balance traffic across city centres. The application process closes at the end of July 2024 and detailed guidance has been published to help authorities with their bids.

Here are some examples of how other authorities have benefitted from NOW Wireless technology.







Glasgow City Council upgrades to UTMC standards



- **Secure mesh wireless network installed**
- **80% of BT lines removed**
- **900+ traffic light junctions using mesh network**
- **Significant revenue cost savings**

SUMMARY

In 2003 Glasgow City Council's initial requirement was to upgrade its traffic light system to UTMC (Urban Traffic Management and Control) standards. Through their research working with Swarco (Peek at the time), they saw the potential of reducing ongoing revenue costs.

At the time Glasgow City Council had around 800 traffic light junctions, and hence 450 BT lines, costing them in the region of £1 million. The Council was looking to remove a large number of BT lines and implement a secure wireless network that would provide huge ongoing revenue savings for the Council, which could then be used by the Council to improve the highways network in other areas.

THE PROJECT

NOW Wireless proposed the use of a Mesh wireless network to replace 80% of the BT circuits providing the communications to their traffic light controllers and to provide connection from the controllers back to the central management system used to manage the traffic lights across the city.

A trial network along a single street was installed to demonstrate the effectiveness of a mesh network in a city environment. Military-grade wireless technology was implemented at street-level because of the risk



of interference. This robust and highly secure technology was designed for use in the military. This technology makes the network highly robust and resistant to interference and blocking. They are also able to self-heal and self-form which further increases the reliability of the network. Along the street, each traffic light junction had a mesh radio to communicate to junctions close by. Two BT circuits were left in to provide backhaul communications from on-street back to the SCOOT system at the Council building. If one circuit went down, then the data would automatically reroute to the working BT circuit, thus removing any single point of failure.

CONCLUSION

The trial ran successfully for a year and a half which resulted in Glasgow City Council requesting the installation of a full live system. Twenty years later they now have more than 900 traffic light junctions running over our mesh network, saving significant amounts per year of on-going revenue costs.

Over the last seven years, Glasgow City Council has started to include the sensors Now Wireless also provide to give them a better understanding of how the traffic in the city is running. From bluetooth detectors for journey time, air quality devices for detecting pollution, and AI technology linked to their new and existing CCTV cameras to look at vehicle count, classification, predictive AQ, route analysis and many other applications. This data is analysed and displayed on the NOW Wireless data analytic software platform, SenseView.





Wolverhampton NO₂ traffic pollution hot spot monitoring



- **30,000 data points collected per day**
- **Analysing NO₂ and journey times**
- **Data review in real time**
- **Provides complete overview of NO₂ pollution within city of Wolverhampton**

SUMMARY

Wolverhampton had air quality issues related to NO₂ emissions from road traffic and there were a number of hot spot areas where the annual mean air quality objective for NO₂ was being exceeded.

The council wanted to get a clear picture of pollution levels in real time, in these hot spot areas, without having to spend tens of thousands of pounds on chemiluminescent sensors.

Wolverhampton has over 400 mesh nodes, providing secure wireless communications to its on-street applications, such as traffic light controllers.

THE PROJECT

Using its mesh network, the council was able to connect our pollution monitors and bluetooth detectors directly into their Mesh network, thus removing the costs of communications, and power installations to these sensors.

They then wanted to be able to view the results in real-time, which they were able to do using our own Senseview software platform, and to then import the data into Swarco's MyCity to be able to then look at how best to use this data.

The components that Wolverhampton used in the project are the Intelligent Antenna and Mesh node which provided the power, and the communications to the sensors, bluetooth and NO₂.

The NO₂ detector takes readings from the gas sensors and then records the data to a database. If it detects a peak above a pre-set value, then it can send an alert via email, or text, and can write to a URL with a data update and can also be sent directly from the NO₂ detector to the in-station or OTU via a simple web page.

The bluetooth detector can be used to track traffic as it passes through the city. We could then see how pollution levels are affected as journey time increases or decreases.

CCTV and video data can be used to classify vehicles. Heavy-duty vehicles can produce twice as much NO₂ as cars, and idling engines also cause spikes of NO₂, all of which can be spotted using our AI.

Senseview, our in-house GUI, shows the levels of NO₂ at specific sites



CASE STUDY



where the NO₂ detector is installed, and journey times for set routes, in real time, giving a clear picture of what is happening on street. As the data is recorded, we can also look at historic journey times and pollution levels, and track improvements (or not) as we implement plans which we hope will reduce NO₂ and improve air quality.

The data gives an overview of pollution as a whole over Wolverhampton, along with a more detailed look at both pollution and journey times around a specific site.

During the first phase of integration the detection devices were integrated into MyCity, this included: five pollution sensors, 72 bluetooth journey time sensors and 28 vehicle counters.

The feed data was sampled every five minutes which resulted in roughly 30,000 data points collected each day. The second phase of integration will bring in the rest giving a total 200 detection devices resulting in 60,000 data points per day and an overall 22 million data points per year.

CONCLUSION

The initial actions would be to change traffic plans (timings, etc) and look at gating traffic outside the areas of concern, the hot spots. Now we can try and change driver behaviour and mindset, by informing drivers of the quickest routes available, or by informing drivers of pollution levels in certain areas, specifically around school environments, and drop off points near schools.

We would also look to inform drivers of the best time to travel by informing drivers of the lowest journey times in the day, so that if people can wait and be productive at home, then the journey later would be quicker, and therefore the lost time travelling will be reduced.



Staffordshire CC - Air quality monitoring and reduction near care home



- **Provided accurate and cost effective solution to monitor air quality levels**
- **Quality data-developed plan of action to reduce poor air quality**
- **Air quality detectors and digital signature detectors installed**
- **Achieved improvement in air quality and system rolled out in two other towns**

SUMMARY

Staffordshire County Council (SCC) won funding to take part in the live labs project. Over 130 SME's submitted applications to address mobility and air quality challenges. Ten projects were selected as winners, one of which was managed by NOW Wireless.

THE PROJECT

The project involved helping the improvement of air quality outside a care home on the inner ring road of Newcastle-Under-Lyme. NOW Wireless used artificial intelligence to predict pollution an hour ahead of time. The results implemented special plans into SCC's TMS system. The plans enabled traffic to be gated outside the town centre, to reduce pollution in the town centre.

Strategic places around the county were targeted, looking at areas where improving air quality would have the biggest impact on the local residents and passers-by. These included schools and care homes.

Unfortunately, the traditional chemiluminescent sensors can cost tens of thousands of pounds and a more cost-effective solution was needed to measure air quality. This solution needed to be accurate, and still provide



data in real time (as opposed to diffusion tubes). Using this information, a plan of action was required to see how air quality could be improved, while at the same time not unduly affect the journey of a vehicle, as any extensive delays would cause problems further down the line for the council.

NOW Wireless, working with Staffordshire County Council, already had a solution for measuring air quality in real time, as well as sensors for calculating journey time, and software, including an AI, to run diagnostics on route analysis, and NO₂ spike forecasting.

Using this data, the plan was to forecast when high levels, or spikes, in NO₂ were going to occur at the strategic locations around the town of Newcastle-Under-Lyme. Schools and care homes were targeted as areas of interest.

Once we had this information, we would look to hold back, or gate, traffic for a short time at a place outside of the town, where dispersal of NO₂ was easier, and with less risk to the public. We would link into the existing TMS system ran by Staffordshire County Council and connect directly into traffic light controllers on street. This would enable us to move traffic more quickly past the strategic areas of concern, and improve the local air quality.

NOW Wireless installed air quality detectors, and Digital Signature Detectors at significant points around Newcastle-Under-Lyme. Its AI software then analysed the data from the Digital Signature devices.

Using route analysis, we could see which routes were the busiest, and so where best to implement any strategies for improving air quality.

The AQ strategy implemented was to look at holding back the traffic outside the town, somewhere where if NO₂ levels did increase, would not be as big a problem as outside the care home. The busiest route had been chosen between Talke Road / Bradwell Lane and the care home at Lower Street / Church Street. However the site chosen to gate the traffic was one junction down, at Liverpool Road / London Road. This site is more open, with a higher dispersal rate of the NO₂. The traffic would be held for 10-20 seconds longer than usual at this site, and then 10-20 seconds less at the care home site. Using our Journey Time sensors, we would check to make sure the overall journey time was not increasing significantly for the driver.

We would trigger this 'gate' using spikes in NO₂. We would then use our AI software to forecast spikes in NO₂ one hour ahead, and use that data to gate the traffic, whilst making new forecasts every five minutes, incorporating weather data and other sensor data. This proactive gating should prevent spikes from occurring in the first place, as opposed to reactive gating after the event has happened.

Senseview2, our in-house software, analyses the raw data, and produces graphs in real time to show air quality and journey time. Viewing this data, we can see that the journey time between the gated site, and the care home is not increasing, and that though we are currently not reducing NO₂ overall, we are flattening out the spikes of NO₂, which is in part due to forecasting poor air quality.

CONCLUSION

Overall, Staffordshire County Council found working with NOW Wireless, effortless, timely and productive. The challenges were really with creating plans within SWARCO TMS, due to inexperience at Staffordshire County Council. Now those issues have been addressed, the next steps become that much easier.

Those next steps include longer gating times. Moving from holding traffic back for 30 secs – 1 min. The addition of CCTV and the NOW Wireless AI unit running queue detection would send out an alert if queues build up. This means looking at holding traffic back for longer, whilst making sure that queues don't build up by monitoring the junction over CCTV, and then allowing more traffic to flow past the care home site. Continuous measurement of air quality and journey time would show us how long we could hold traffic back for before queues build up, and what affect we were having on air quality at that site.

Due to the success of the project, other towns in Staffordshire are now being targeted to implement this solution, including Burton and Stafford.



Portsmouth CC - Traffic monitoring cameras



- **Provided plan to improve communications links between traffic monitoring cameras**
- **Installed and implemented NOW Wireless Senseview system**
- **Provided reliable camera coverage**
- **Reduced cost of communications**

SUMMARY

Portsmouth City Council have explored the use of traffic monitoring cameras in various guises over the last five years, but none provided them with the quality of service and reliability that they required. The communications links from on-street cameras to the cloud always seemed to be a particular weak point in the city.

Using the NOW Wireless mesh network has meant that they can connect multiple cameras over a wide geographical area, back to node points that have fixed line connections to the cloud. This has meant that they can have reliable camera coverage over a substantial number of junctions in the city, whilst minimising the number of fixed line connections and thus keeping their ongoing costs low.

The fact that the NOW Wireless Senseview system is browser-based and cloud hosted means that they can view the cameras from anywhere at any time, which is great for flexible working and incident management. They are no longer tied to being physically located in our Transport Management Centre to get “eyes on” the network. It also means that they have been able to easily roll out viewing access to their highways maintenance contractor to be able to make better decisions when responding to incidents.

Here are the public sector bodies and other clients that currently use our technology to help improve their on-street connectivity, improve air quality and shorten journey time for their constituents:

Bristol CC	Lincolnshire	Swansea
Cardiff CC	NE Lincolnshire	West Midlands (incl Coventry, Dudley, Sandwell, Solihull, Walsall and Wolverhampton)
Cheshire West and Chester	Middlesbrough	Wakefield
Dumfries and Galloway	Milton Keynes	Warwickshire
Dublin CC	Newport	Worcester
East Ayrshire	Portsmouth	
Edinburgh	Shropshire	
Glasgow	Southampton	
Inverness	St Helens	Hong Kong
Kirklees	Staffordshire	NHS
Leeds	Surrey	Transport for London (TfL)
		Transport for Greater Manchester (TfGM)

How NOW Wireless technology can help you

We have always believed the efficiency of traffic signals is a key part of effective and efficient cities and towns. We have spent more than a decade researching this and coming up with solutions to help.

Using traffic lights, CCTV sites and 5G systems, for example, allows rapid clusters of vital information to enable you to manage traffic flow and other challenges more effectively.

- Our Mesh 5G provides high bandwidth communications to on-street devices using the 5Ghz spectrum with advanced TDMA protocols. This technology can cover all the needs of a smart city in a building block approach where every component fits together and works with a unified cloud. This system was developed in 2003 and has since been deployed in over 42 towns and cities across the United Kingdom.
- Traffic light extensions provide reduced communications costs and a location with communications and power to provide CCTV, air quality sensors, AI, bluetooth and CAV.
- Wireless saves 95% of communication costs.
- Typically, 20 traffic lights can be added to one backhaul. Even one wireless link can cut costs by 50%.
- Mesh 5G is already installed on over 10,000 traffic lights throughout the UK.
- Traffic lights form the foundation for smart technology in cities, towns and rural areas, with each junction capable of installing sensors, AI and CCTV in less than 20 minutes. Our system fully manages and interfaces into UTC and UTMC supported by Swarco, Yunex, Telnet and most other city management suppliers.
- Mesh 5G is fully UTMC compliant allowing for connections to existing management infrastructure as well as all devices that subscribe to the UTMC standard.

You can find our more here:

<https://www.nowwireless.com/traffic-lights>

<https://www.nowwireless.com/mesh-4g>

Or contact us at: paul@nowwireless.com to find out how we can help you with your traffic signal funding bid.





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