

2023 Traffic Signal Grant - TSOG

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1. Provide a plan for improvements

There are currently three major challenges facing the traffic sector in terms of obsolescence of equipment and services used by the industry, namely,

1. The phasing out of the 2G/3G mobile network by 2033, although some service providers will phase out their networks much sooner.
2. The switching off of the PSTN telephone network by 31st December 2025.
3. The phasing out of halogen incandescent (HI) lamps which are still widely used in the traffic industry.

Nottingham City Council (NCC) has already addressed the 2G/3G issue by converting all remaining signals communication equipment that uses the mobile network to 4G. NCC also has the PSTN switch-off well in hand. ALL NCC signals are monitored via IP-based communications using either ADSL/VDSL or 4G comms. NCC have already started to move all PSTN/ADSL comms to SOGEA / SOSADSL, and the intention is that the transfer will be completed by mid-2024, well ahead of the 2025 PSTN switch-off deadline.

The remaining area that NCC needs funding support to address, is the phasing out of incandescent lamps. NCC currently has 52% of signal lamps using LED with the remainder being halogen incandescent. Two years ago, the percentage of LEDs used by NCC was 38%, it can therefore be demonstrated that NCC is moving in the right direction; however, not quickly enough to keep pace with the HI phase out.

If the NCC bid for TSOG funding is successful, it is the intention that we will retro-fit LED lamps to replace the existing HI lamps. Our Asset Management system indicates that we have 130 sites, (60 junctions and 70 crossings) that would benefit from an LED retrofit. With assistance from our Traffic Signal Maintenance (TSM) supplier, we have identified the current cost of converting all of these sites to LED to be in the region of £557K.

The immediate benefits of upgrading to LED are:

1. A reduction in our electricity cost of approximately £118K per annum for the converted assets. Our traffic signal electricity bill across the whole asset is approximately £300K per annum.
2. A carbon reduction of 245 tonnes (CO2), which is a 78% saving against the use of HI lamps.
3. A reduction in the number of faults, and site visits. We average 2300 traffic signal faults per annum, of which approx. 600 are lamp failures – mostly HI lamps. Reducing lamp faults gives both a maintenance cost saving, and a carbon saving through avoidable site visits.

Where funding is available, and it is possible to do so, we will review pedestrian crossing timings and detection to make them more responsive to pedestrians, and also allow more time to cross where it is needed. Thought will be given to converting Pelicans to Puffins where it is possible to do so at the same time as the LED retrofit without major equipment upgrade. Initial indications demonstrate that a pelican can be converted to a puffin for approximately. £3K

Upload relevant document

- [Appendix-1](#)

2. Prioritised upgrade plan

NCC uses the Imtrac Asset Management system to hold all data relating to the age, condition and carbon footprint of all traffic signal assets. Imtrac allows asset life cycle planning enabling reports to be run showing the current age and condition of on-street equipment. At any time, we can identify which sites currently require refurbishment, and which

sites will need refurbishment for each year over the next 15 years, based on projected traffic signal design life of 15 years.

Our current asset average age is 14.9 years, with 19.4% of sites being between 15 & 20 years old, 27.2% of sites between 20 & 25 years old, and 6.8% of sites being over 25 years old. With so many sites being over the projected 15-year design life, this indicates the level of obsolescence that is present in our asset, and thus the need for upgrade works.

Our TSM contractors carries out annual periodic inspections of all traffic signal assets to ensure correct operation, condition of asset and identify any faults present on site. The information obtained from the inspection report will determine if any immediate action is required, i.e. poles / heads to be replaced, safety issues etc. and also helps form the wider asset picture held in Imtrac.

In accordance with our traffic signals maintenance policy and plan, whilst we are easily able to determine which sites are in need of refurbishment and when, the main issue affecting maintenance upgrades is the lack of available funding to be able to carry out the works. As with all local authorities in the current economic climate, maintenance funding has been restricted, and that has meant that only essential works have been carried out - upgrades and refurbishments have not been possible.

In recent years we have looked to external funding, Transforming Cities Fund (TCF), Bus Service Improvement Plan (BSIP) and Active Travel Fund (ATF) to be able to upgrade our assets. Over the three years, we have managed to not only upgrade roughly 10% of our assets through external funding, we have managed to introduce central bus priority and new or improved pedestrian & cycle facilities.

Where we are able to upgrade our assets, we look to install the latest technology for futureproofing, ELV equipment for carbon and energy savings, and to improve the method of signal control, i.e. introduction of SCOOT and/or MOVA to reduce congestion and improve journey times.

In summary, we know our asset, we know what we need to do and when we need to do it, we just need the funding to be able to carry out the policy and plan.

3. Links to carbon reduction and Air Quality (AQ) targets

The proposed upgrading of existing halogen incandescent lamps to LED will, as previously indicated, produce a 78% reduction in CO₂. The switch to LED lamps will also mean less lamp faults, which in turn will result in less site visits by engineers, which again will produce a reduction in carbon emissions.

NCC is aiming to become the first Carbon Neutral City in England by 2028; therefore, any carbon savings made on traffic signals and journey reductions feed into the corporate action plan to achieve this.

Although not strictly maintenance, over the last few years, NCC has moved away from traffic signals using fixed-time control to more adaptive methods of signal control like SCOOT and MOVA. Moving to SCOOT/MOVA improves the efficiency of traffic signals meaning less wasted green time and less standing traffic, all of which not only improves journey time it also helps to improve air quality by reducing carbon emissions.

Where traffic signals are upgraded with the latest controller technology, they have the ability to have air pollution monitors installed, which in turn can be linked to our Traffic Control Centre instation systems. Our Stratos system has the capability to receive real-time pollution sensor data, which in turn through our Strategy Manager can be used to dynamically adjust traffic signal timings to reduce the air pollution caused by standing or stop/start traffic.

Our Asset Management System, Imtrac, calculates and display the carbon footprint of each and every set of traffic signals, thus allowing us to consider upgrading equipment at the most polluting sites. If we are successful in our funding bid, but not able to upgrade all assets identified as requiring LED retrofit, this data will be used to prioritise the sites that will be upgraded.

4. Monitoring plan, including indicator selection and targets

A switch from incandescent lamps as proposed, will provide a financial saving of around £118K per annum based on projected figures from our traffic signals supplier. This is obviously easily monitored through our financial system to verify the levels of saving made by retrofitting LED lamps.

Where we have upgraded sites to ELV / LED we have observed a significant drop in the number of lamp faults that traffic engineers have to attend. With currently on average 600 lamp faults a year requiring attendance, predominantly from HI lamps, retrofitting to LED will vastly reduce that number of faults. The fault rates are easily verifiable through our InView Fault Management System, and the data forms part of the monthly review of KPIs with our TSM supplier. We have data available for each of the last five years that allow us to monitor the trend in our fault rates, we would therefore easily be able to demonstrate before and after figures if the proposal goes ahead.

The fault rate, and the age and type of assets, are always taken into consideration by potential bidders when our traffic signals maintenance contract is put out to tender. We are currently in a collaboration with two other local authorities for signal maintenance, and when the last contract was tendered the others received a better per unit rate for maintenance than ourselves due to having more modern equipment and lower fault rates. If our asset is improved as proposed, and with a resultant drop in the fault rate, we would anticipate a more competitive price next time our TSM contract is tendered.

As with all local authorities, a core value of NCC is to seek Best Value from all contracts; and to achieve savings where possible. Our proposal to upgrade HI lamps will meet the corporate core objective of saving money. We would hope that a contribution from the electricity savings may be put towards signal maintenance in future years.

NCC believe that the robust methodology already used and being proposed for prioritisation of traffic signal upgrades will ensure that reductions in carbon emissions and congestion will be clearly evidenced following any upgrades. The modernisation of existing Pedestrian crossings and conversion upgrades will also help to support the ambitions of NCC in encouraging all forms of active travel.

5. Technology vision

NCC's technology vision is to be at the forefront of traffic signals technology, utilising the latest hardware and software to meet NCC's corporate goal of 'Keep Nottingham Moving'.

NCC was one of the first Traffic Control Centres to:

- Display (VMS) live parking space availability at all major city centre car parks
- Provide the public with online traffic camera images (currently 300+ cameras)
- Move ALL traffic signal communications away from analogue to digital IP-based communications
- Move all traffic signal control and monitoring systems to a cloud-based solution

NCC has been working with VivaCity and Yunex Traffic to ensure that we have the latest technology installed both at our instation and out on street. VivaCity have installed over 200 sensors on the road network around Nottingham City allowing us to collect a variety of data, for example we collect journey time information between sensors, count data and classification of traffic on the network, including pedestrians. Yunex Traffic are integrating the VivaCity data into our Stratos instation system to allow the data to be used in our Strategy Manager for adjusting signals timings etc.

We are also working with VivaCity, as a trial, to convert an existing junction running MOVA to a 'SMART' junction that will run an AI cloud-based solution improving the efficiency of the junction using the data provided by VivaCity sensors. If this trial is successful, it may be rolled out to other junctions on the network.

Over the last three years, NCC has moved a further 20% of our junctions onto SCOOT or MOVA control to improve the efficiency of the network. It is our intention that whenever junctions are refurbished, they are upgraded to an adaptive form of signal control rather than left to run fixed-time UTC or local. Also, every time a junction is refurbished, a traffic camera is installed at that junction to allow the Traffic Control Centre to monitor incidents and congestion enabling additional operator intervention where required.

Nottingham has centralised bus priority on 5 major arterial routes into the City. Our instation is connected to the local bus companies' management systems to allow late running buses to be given traffic light priority. Also, trams are given traffic light priority over their three routes. It is our intention to continue to prioritise public transport where possible.

Nottingham, along with our partners in Nottinghamshire, have been looking at FUSION by Yunex Traffic, FUSION is the next step in adaptive control that will ultimately provide the basis for connected vehicles. In recent history, NCC was involved in a European funded trial, "Project Modum", with Nottingham Trent University, for connected vehicle technology. NCC continues to work closely with universities on various transport projects.

With regards to maintenance, it is our aim to continue upgrading on-street equipment where possible to reduce energy costs, reduce the number of faults which in turn will reduce ongoing maintenance costs. All systems currently have remote access allowing operators to interrogate controllers and clear faults where possible to avoid unnecessary

6. Support to public transport, vulnerable road users and active travel

NCC already provides centralised bus priority and tram priority to support public transport throughout Nottingham. We are also looking to add bus priority to additional junctions over the next 12 to 18 months.

Several cycle lanes have been added to various routes throughout the City as part of the Active Travel Fund, and we continue to add in new routes as funding allows.

As part of the Covid19 emergency response, a review was undertaken of all pedestrian crossing timings to reduce the waiting time at crossings. Pedestrian crossings that were being held-off under UTC control were taken off UTC control and allowed to run local, thus improving the response time. Although Covid19 restrictions are no longer in place, we received such positive feedback from the public to the changes, that we have retained the majority of changes made to make journeys easier for pedestrians.

Where signals are refurbished, we aim to add in additional pedestrian facilities at junctions and have done so at several junctions that have been refurbished over the last 3 years. Additional signalised pedestrian crossings have been added to the network as part of road safety schemes. Nottingham City has just been successful in receiving additional external road safety funding that is to be used to add further crossings, add additional pedestrian facilities at junctions where none exist, and also improve existing pedestrian crossings.

If our TSOG funding is successful, whilst visiting sites to retrofit LED lamps, consideration will be given to adding in tactile rotating cones, where none exist, and also review local crossing timings to ensure that all are compliant with the latest guidelines in allowing vulnerable users additional time to cross.

7. Future proofing

The instation equipment that our Traffic Control Centre has is the latest available technology. We have a Yunex UTC-UX traffic control system which is supported by a Stratos instation system. Stratos is modular allowing the latest technology to be added as and when it becomes available. We currently use Stratos to communicate with all traffic signal outstations, communicate with various city centre car parks and with a network of variable message signs. We also use Stratos Strategy Manager which allows strategies to be written to act upon a variety of triggers from a variety of sensors, i.e. traffic flows from UTC counts sites, VivaCity sensors, ANPR data, air pollution sensors and car park discharge rates. Actions can be taken from signal / plan changes to displaying messages on VMS. Our Stratos instation can collect data from a variety of sources for both current use and potential development.

We are currently looking to replace both our existing free text VMS and our parking sign VMS, with a replacement model that allows the two functions to be combined in one sign. This will be useful for displaying parking spaces information under normal conditions, and then being able to display incident information when required by the Traffic Control Centre. Signs can be controlled manually by an operator or automatically through a Stratos strategy. We are also looking to expand the current network of signs to place more on the perimeter of the city for incident control.

On-street, all of our signals are connected via an ADSL connection, which not only allows the Traffic Control Centre to control the signals and receive faults data, at several sites we also connect one or more CCTV cameras sharing the same router / connection to reduce costs. With the existing ADSL connection in place, we can also add other additional sensors / equipment as and when required or available to maximise the use of communications.

Where signals are upgraded, the controller of choice is the Siemens (Yunex) ST950ELV which is the latest specification controller of which we have over 120 ST950 controllers on-street. The ST950 will allow all current, and potentially developing technologies to be connected to the Traffic Control Centre through the Stratos interface. For example, the SMART' junction that we are trialling AI control with VivaCity connects to the ST950 controller.

In summary, our instation infrastructure is current, flexible and ready for any innovations. Our on-street equipment is gradually being updated with new controllers, overhead detection instead of loops, such as multi-lane radar detection and the latest version of MOVA. NCC are interested in implementing FUSION which would offer increased adaptability compared to SCOOT and increased flexibility through multimodal prioritisation and optimisation.

Consent

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