Transport for London

TONY DICHEV

PROOF OF EVIDENCE

FOR PUBLIC INQUIRY COMMENCING ON

10th OCTOBER 2017

SITE

The scheme is located on the Torrington Place / Tavistock Place corridor, between the junctions with Tottenham Court Road and Judd Street

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SUBJECT OF PUBLIC INQUIRY

The Camden (Torrington Place to Tavistock Place) (Prescribed Routes, Waiting and Loading Restrictions and Loading Places) Traffic Order [2017]

INTRODUCTION

i. My name is Tony Dichev. I am instructed to give evidence on behalf of the Mayor of London (the Mayor). I am a Lead Modelling Specialist in the Operational Modelling and Visualisation Team (OMV) in Outcomes Management within the Road Space Management directorate at Transport for London (TfL). I have over 17 years of post-graduate experience in transport planning, transport strategies and planning, traffic engineering and design. I have specialised in highway supply and demand transport modelling and transport economics and appraisal. In my current role I am responsible for the Scheme Assessment Modelling Team providing traffic assessment support including modelling and analysis to scheme sponsors and senior TfL officials. I provide industry-leading knowledge of various traffic (including pedestrians and cyclists) modelling packages and ensure the development and use of these packages fits with the strategic aims of Mayoral policies. In particular this involves maximising the performance of London's traffic signal control network for TfL and specifically Journey Time Reliability on Mayoral Corridors. The development and implementation of plans and proposals which represent transport priorities across TfL are used to support wider strategies such as the delivery of homes and regeneration. Prior to joining TfL I led the Major Projects Transport Planning Team in the Highways & Transportation division at private consultancy Atkins.

ii. The evidence which I have prepared and provide for the Public Inquiry commencing on 10th Oct 2017 in this Proof of Evidence is true and has been prepared and is given in accordance with the guidance of my professional institution and I confirm that the opinions expressed are my true and professional opinions to the best of my knowledge and belief.

iii. My proof concentrates on the background to the modelling procedures and methodologies in TfL, the rationale for their implementation and the modelling tools used as part of the scheme assessment process.

iv. My evidence will be divided into five sections:

- Section 1 (**Background**) sets out the background to the scheme.
- Section 2 (**Modelling Principles**) sets out the modelling requirements for the scheme assessment process in TfL.
- Section 3 (**Four Stage Modelling**) covers the adopted methodology for any traffic scheme in London under TfL jurisdiction.
- Section 4 (**Modelling Tools**) outlines the Operation Network Evaluation (ONE) model used in the assessment of the scheme.
- Section 5 (**Conclusion**) summarises the statements made in this Proof of Evidence.

v. Please refer to the proof of evidence of Camden and SYSTRA witnesses for the detail of the design, other options considered and assessed and the detailed traffic modelling assessment information of the scheme.

1. BACKGROUND

1.1 SYSTRA were commissioned by the London Borough of Camden (The Council) in April 2016 to provide transport modelling input to investigate improvement options along the Torrington Place / Tavistock Place corridor (The Corridor). With said improvements relating to the Corridor that was implemented in November 2015 designed primarily to improve cyclist provision and safety for all road users (The Trial).

1.2 The traffic modelling exercise assessed the possible impacts on redistribution of motor traffic when the Trial interventions are combined with future committed and planned schemes in the surrounding area along with assessment of alternatives to the current Trial layout.

1.3 TfL have been involved throughout this process, providing advice and guidance on the methodology adopted for the assessment of the scheme.

1.4 The modelling exercise included updating the existing 2012 ONE Model within the study area to reflect the existing highway layout and improve the level of flow calibration (i.e. goodness of fit between observed and modelled traffic flows) to the year 2016. Subsequent to this, a number of options were tested in order to understand the potential impact on the highway network of the Trial and how the Trial would be expected to interact with the wider highway network changes planned to be delivered over the coming years. This work followed the initial TfL assessment in 2015 for Tavistock Place / Torrington Place – Westbound closure between Judd Street and Gower Street as part of the approval process for initiating the Trial.

2. MODELLING PRINCIPLES

2.1 The capacity of London's traffic network (both road and footway) is coming under increasing pressure and maintaining the smooth operation of this network is a challenging task.

2.2 TfL's primary goal is to deliver journey time reliability and it is essential that traffic schemes are developed to a high quality and their impacts on the network are well understood and mitigated to maintain journey time reliability objectives. Traffic modelling plays an increasingly vital role in this objective.

2.3 It is TfL's remit to ensure that the effects of all planned interventions on the road network are thoroughly understood before they are implemented. TfL traffic modelling procedures and methodologies are fundamental in achieving this requirement.

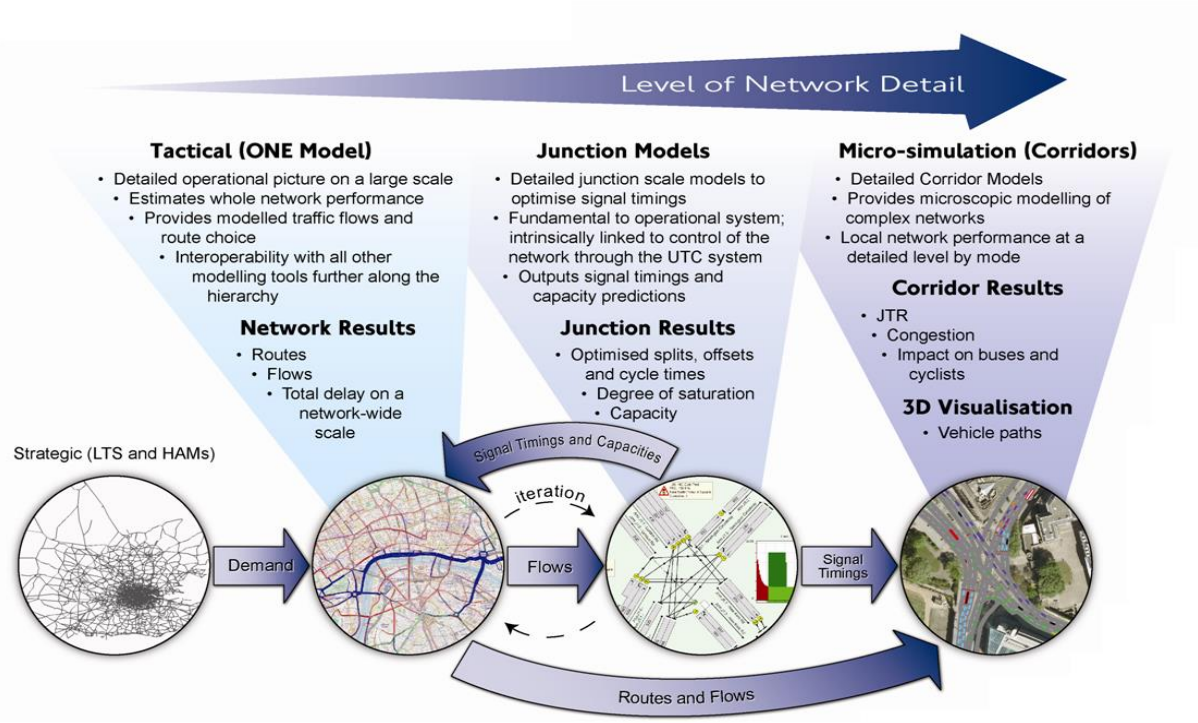
2.4 TfL Modelling guidelines draw upon expertise from across the industry and form a comprehensive source of best practice.

2.5 The OMV team act as a Centre of Excellence for traffic modelling within Transport for London Surface Transport Directorate. OMV's operational modelling focuses on the real-time traffic environment providing essential offline tools that Corridor and Area Managers, scheme sponsors, Boroughs and private developers use to manage and optimise the road network.

2.6 OMV has established a 3 tier operational modelling approach, summarised in Figure 1. It indicates the main types of traffic modelling and shows how they link together. The 3 tier approach encompasses:

- Tactical;
- 3D Micro-simulation; and
- Junction optimisation models.

Figure 1: Operational Modelling Hierarchy



2.7 In terms of the Trial ONE Model and LinSig junction models have been utilised to provide understanding of the impacts of the options in line with TfL procedures and methodology as set in the figure above.

2.8 Before building a traffic model it is appropriate to define what is meant by the term 'model' in its most general form:

"A model can be defined as a simplified representation of a part of the real world ... which concentrates on certain elements considered important for its analysis from a particular point of view." [1]

[1] Ortúzar J de D & Willumsen L G, *Modelling Transport*, 3rd Ed., Ch1, Wiley, London, 2001, p2.

2.9 It is important to be aware of the simplifications that are made in creating a model and to understand whether they have any significance for the intended analysis. Simplifications can be made by the modeller, either deliberately or inadvertently, during model development or calibration, or can be inherent to the particular choice of modelling software used for a project.

2.10 The development of a clear brief can prevent ambiguity and increase the likelihood of producing fit for purpose traffic models. It is important to define the intended purpose and therefore scope for which the traffic model is to be developed. The model developer should be made fully aware of this purpose in order to ensure that the final modelling meets the required criteria.

2.11 A base model is a model that has been demonstrated to sufficiently recreate traffic conditions as observed and measured on-street. It should be suitable for use in analysing current network performance and as a benchmark against which other modelling scenarios can be tested.

2.12 For the Trial the Base Model is the 2016 network as existing with the Tavistock Place / Torrington Place – Westbound Closure (one way) between Judd Street and Gower Street in place.

2.13 A proposed model is a validated base model that has been modified to take account of proposed network changes. These changes can include physical layout, signal timings or predicted developments in traffic demand. By comparing proposed modelling to the original validated base model, the impact of the proposed changes can be gauged, allowing informed decisions to be taken based on those impacts.

2.14 The Proposed Model for the Trial considers also includes all committed schemes in its vicinity such as West End Project.

2.15 Traffic model development is a complex task that can be completed in a variety of ways, and the process of auditing a model can also therefore be challenging. The Model Auditing Process (MAP) has been created by the Road Space

Management directorate (RSM) to simplify this process by providing a structured framework which leads all interested parties through model development, submission and auditing.

2.16 MAP applies in all circumstances where TfL requires traffic modelling to assess impacts on the Transport for London Road Network (TLRN) or the Strategic Road Network (SRN). However, where a Borough is the promoter of a scheme that does not impact on the TLRN or the SRN the use of MAP is only advisory. All traffic models commissioned by TfL and submitted to RSM are audited in accordance with MAP.

2.17 The Corridor crosses the SRN hence the local junction modelling complies with the MAP procedures. Currently Base LinSig models have been approved and Proposed LinSig models are in the audit process.

2.18 Successful traffic modelling can better inform decision making and aid the development of optimal solutions.

2.19 The modelling assessment for optioneering and feasibility studies, utilising the tactical level of modelling, is considered as best practise in TfL. The Trial is using the ONE Model as the main analytical tool.

3. FOUR STAGE MODELLING

Overview

3.1 Traffic models are predictive tools employed by TfL to better help plan, design and operate the transport networks they manage. Models are designed as simplifications of the real world and are used to evaluate the impacts, both negative and positive, of future network interventions. It would be impractical and costly to undertake scheme selection and evaluation in real world environments, so traffic models present an offline environment in which numerous design solutions can be tested and appraised with the aim of achieving the optimum balance of benefits and value for money.

3.2 The OMV team in Surface Transport utilise a hierarchy of traffic models that has been established over a number of years on key projects like Congestion Charging Western Extension Zone (2007) and subsequent removal (2010) and the London Olympic and Paralympic Games (2012).

3.3 The level of investment in new infrastructure on London's roads is massive, and includes large scale schemes that redistribute the road space across modes. In order to assess the impact of a scheme on the surrounding area and create a business case it is crucial that we build models that show the impact of the scheme in isolation. However, with the number of schemes planned for introduction it would be irresponsible to ignore the interactions between neighbouring schemes. This was the motivation behind the development of the Four Stage modelling methodology; Base, Future Base, Do Something and Sensitivity.

3.4 The Four Stage methodology was developed to model major road schemes in central London which are closely linked to other road schemes meaning interactions between schemes are likely. For schemes that are either:

- Sufficiently far away from other large scale road investment projects, such that they are unlikely to have an impact upon each other; or

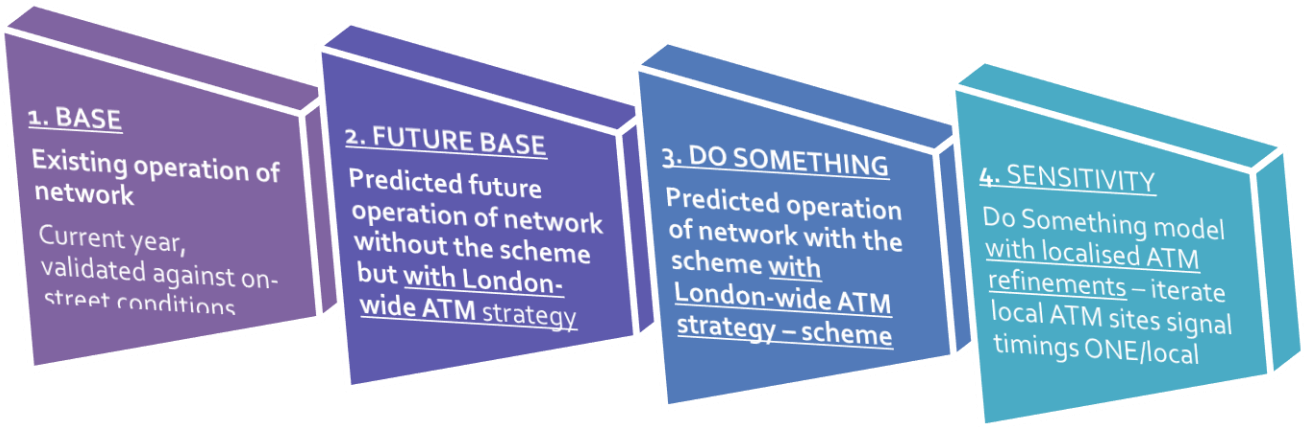
- Minor enough that traffic reassignment impact is localised and impact upon other road investment projects is unlikely;

3.5 In these cases the Four Stage modelling process would be considered too time intensive and instead a traditional Base versus Proposed modelling framework could be used.

3.6 There are further considerations to be made regarding tactical modelling. If the scheme is located in Central or Inner London, it is likely that the ONE Model would be used. Currently the base year for this model is 2012. This model contains up-to-date signal timings and road characteristics and is used for the near future planning horizon.

3.7 The Four Stage modelling methodology is shown in Figure 2. The approach adopted aligns TfL's appraisal process with that of the Department for Transport's Transport Analysis Guidance (WebTAG).

Figure 2: Four Stage modelling methodology



3.8 The way the Four Stage methodology is used will vary across schemes. Timescales for each step depend on the size and nature of each specific scheme.

3.9 The Base Model represents the current situation of the network, before any significant works are carried out. The goodness of fit of this model ensures subsequent models will correctly represent the impacts of network changes.

3.10 For the Trial assessment, the Base Model was developed for 2016 to include the Tavistock Place / Torrington Place – one way eastbound between Judd Street and Gower Street as present at the time.

3.11 The Future Base Model represents the future year in which the intervention under consideration is planned to be implemented, but assumes the options under assessment are not implemented.

3.12 The current Future Base model of the Trial includes all strategically significant schemes planned for implementation up to that point. The proposals under review are excluded. The Future Base also includes a London-wide Active Traffic Management (ATM) mitigation strategy.

3.13 The Do Something model represents the future year in which the options under consideration are planned to be implemented, including them as well. The considered options are to be coded into the Future Base Model to create the Do Something Models.

3.14 At Sensitivity stage the ATM strategy across London is reviewed and if necessary, a localised strategy is developed to obtain the most efficient network operation for the proposed design layouts.

Base Review

3.15 A Base Review is to be undertaken on the Base model for the required peak periods and is required to make updates and improve the accuracy of future forecasts. This is focused on the scheme study area as well as a cursory check of the network in the immediate vicinity of this study area.

3.16 The Base refinements are to be added to the Future Base and Do Something models so that the refinements made in the Base are transferred to the future year scenarios.

3.17 The Base Review process requires an evaluation of the existing network coding, signal timings, junction capacities and turning count validation within the study area to create a scheme specific base model. This model should be calibrated against turning counts to the following criteria:

- 85% of turn counts within the key area have a GEH lower than 5;
- Screenline counts within the wider model area should also be monitored for significant changes;
- Matrix estimation and trip length distribution should be monitored;
- A review of wider area journey time statistics to ensure that the Base Model journey time validation is maintained; and
- A log of all changes and refinements to the Base Model.

Future Base

3.18 The Future Base modelling is developed incorporating other committed schemes due to be implemented on street by the agreed future year of the permanent scheme, with the exception of the specific options under assessment.

Do Something

3.19 The Do Something models will incorporate the specific options being appraised into the Future Base modelling.

Sensitivity

3.20 At this stage if the scheme is seen to cause significant congestion problems the ATM strategy will be reviewed and any local mitigation considered and added

to the models to ensure efficient operation of the highway network. The need for this stage depends on the wider impact of the scheme.

4. MODELLING TOOLS

Overview

4.1 The TfL ONE Model is a tactical highway assignment model built in the VISUM software environment. The model is built as a simplified representation of the real world at a particular moment in time. The model has been built and calibrated to average November 2012 traffic count and journey time data. The scope and scale of the model is in line with WebTAG guidance, which states:

"Within the Area of Detailed Modelling, a relatively high level of detail will generally be appropriate. Guidelines for Developing Urban Transport Strategies (Institution of Highways and Transportation 1996) suggests that "all roads that carry significant volumes of traffic" should be included and more generally that networks "should be of sufficient extent to include all realistic choices of route available to drivers"."

4.2 Due to the nature of assignment modelling and the assumption that users of the network have perfect information when deciding on a route, the inclusion of too many smaller roads will most likely result in an unrealistic amount of rat-running. For these reasons only key strategic roads and through routes are included in a strategic model, as outlined in WebTAG.

4.3 For the purposes of the Trial and the further options under consideration, tactical modelling using the ONE Model has been undertaken.

Model Purpose

4.4 The ONE Model is considered best practice for optioneering and feasibility phases of the assessment of proposed schemes and as such, it was used for the analysis of the Trial project.

4.5 The ONE Model has been developed with the PTV transport modelling software package VISUM. It is a Highway Traffic Assignment model and incorporates Car, LGV, HGV and Taxi user classes as well as modelling buses as fixed line

routes pre-loaded onto the network and differentiates between Congestion Charge payers and non-payer.

4.6 The model consists of three peak hour models addressing morning, lunchtime, and evening peak travel patterns:

- AM Peak 08:00 to 09:00;
- Inter-Peak 12:00 to 13:00; and
- PM Peak 17:00 to 18:00.

4.7 For the Trial AM and PM modelling has been undertaken, which is common practice when the major impacts of the scheme are during the peak hours.

4.8 The ONE Model can inform micro-simulation and network optimisation models of route choice changes when new highway infrastructure is introduced or existing signal timings are reviewed.

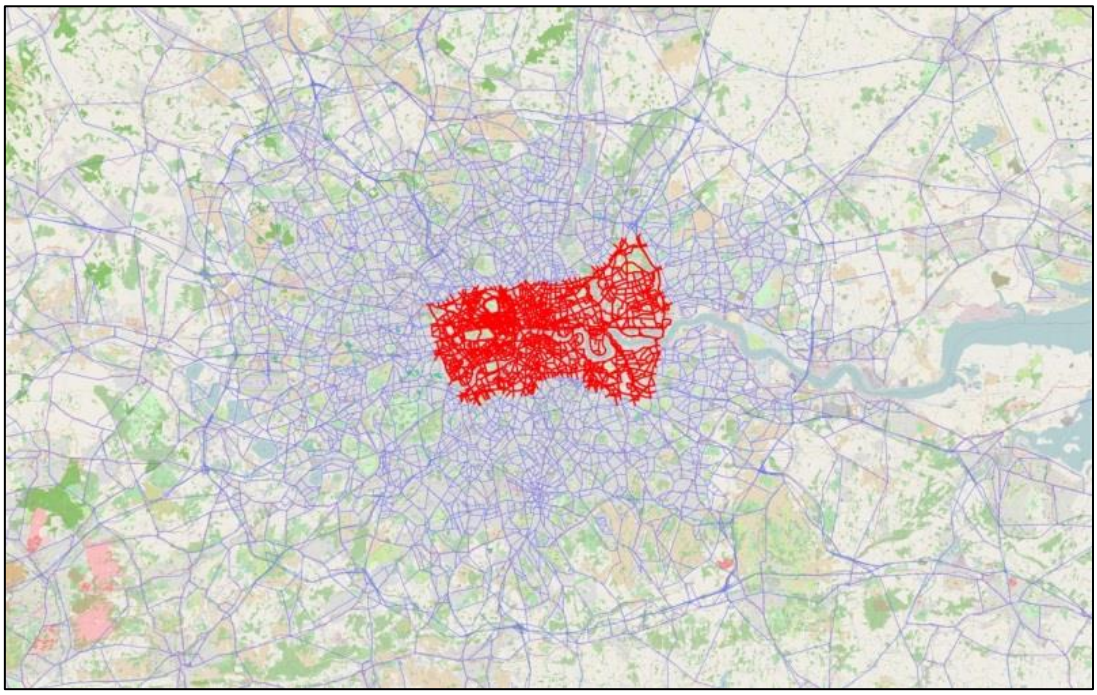
4.9 The model can be used to assess the impact of proposed signal schemes prior to implementation. This provides an indication of likely localised and wider congestion impacts on the highway network so that appropriate mitigation action is planned. The Trail modelling has been designed to assess for that.

4.10 The ONE Model can be used to make operational decisions as a response to planned events on the network such as long-term road works and road closures.

Model Area

4.11 The 2012 ONE Model covers an extensive area. It contains a 225km^2 detailed simulation network where node impedances are calculated using Intersection Capacity Analysis (ICA) and links and turns are modelled with volume-delay functions (VDFs) that are fairly linear up to the capacity for links and exponential for turns. Figure 3 shows the model detail in the area within the North / South Circular Road (shown in red).

Figure 3: 2012 ONE Model Detailed Network Area



Fixed Demand and Zoning

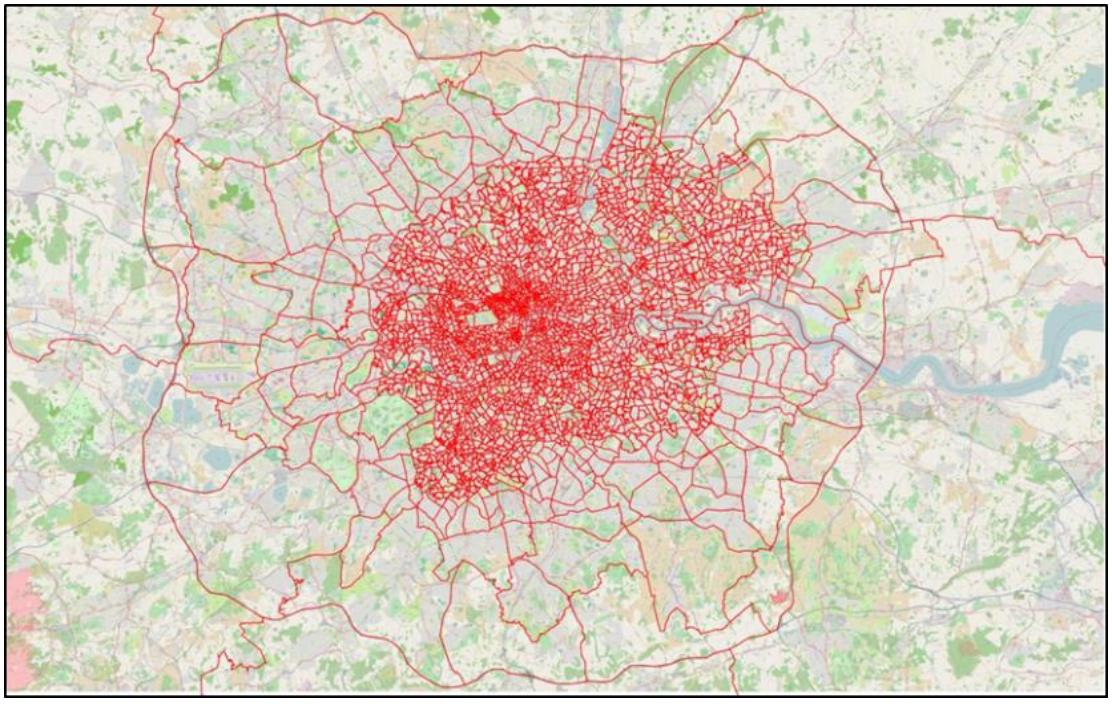
4.12 The demand contained in the ONE Model is fixed, with the same number of trips assigned to the network in the Base, Future Base, Do Something and Sensitivity models (if required). Over time, individuals may decide to reduce their mobility or use alternative modes – effects which are not represented in the ONE Model.

4.13 The demand in the ONE Model is based on estimates provided by TfL Group Planning and the London Transport Study (LTS) model. Whilst in reality demand origins and destinations can be anywhere on the highway network, this behaviour is too complex to represent in a tactical model. Consequently trips are grouped into zones and load onto or exit from the network at designated locations. The point at which trips are loaded onto the network influences the routes vehicles take through the network and every effort is made to locate these points in logical locations. However it is possible that when changes are made to the network, some unrealistic local trips might be observed.

4.14 The zone granularity is small within the detailed network area. This level of detail is also maintained in the buffer network within the North and South Circular so that the zoning system is compatible with the next planned phase of expansion to the model's detailed network area.

4.15 A decreasing level of zonal detail is used between the North and South Circular and the M25. Figure 4 shows the zone detail within the M25.

Figure 4: Zone System within M25



4.16 The remainder of the UK outside of the M25 is represented by 7 zones.

Equilibrium Assignment

4.17 The ONE Model utilises an equilibrium assignment methodology wherein it assigns trips between all origins and destinations to their least cost path and assumes that drivers have perfect network knowledge when selecting routes.

4.18 At the outset the traffic model algorithm assesses, for each origin trip, all the possible route permutations to every destination, it then selects the lowest cost route and assigns trips through the network. This infers that the trip has perfect

knowledge of the delays and congestion along each and every route and therein makes decisions about the lowest cost route before departing. Routing decisions will differ between the Base and Proposed scenarios as a result of the changes made and the point at which a new route is chosen can be some distance from the changes themselves. Consequently the impacts of reassignment can be dispersed over a large area, and evidence of 'model noise' might be observed.

4.19 The results presented are therefore more representative of network conditions sometime after the changes have been implemented, when individuals have learned of alternative routes and chosen the one best suited to them, rather than the local (and potentially greater) effects that may occur on the first day after the changes are implemented.

Calibration and Validation

4.20 The calibration and validation data used within the ONE Model came from various sources. These were:

- Screenline and Cordon Counts derived from TfL Screenline and Cordon Surveys.
- C2 Automatic Traffic Count (ATC) database;
- Turning Counts - Adhoc Turning Count database;
- Bluetooth ATCs – Inner Ring Road Bluetooth Surveys; and
- Journey Time Data – London Congestion Analysis Project (LCAP).

5. CONCLUSION

5.1 TfL's modelling methodology as explained in this Proof of Evidence in my view meets professional and industry standards.

5.2 TfL Modelling procedures draw upon expertise from across the industry and comprehensive sources of best practice.