Technical note

Project:	South Oxfordshire District Evaluation of Transport Impact	**To:**	James Gagg
Subject:	Stage 1: Network and Model Performance Review	**From:**	Steven Ward
Date:	7 October 2016	**cc:**	Graham Bown, Nick Bailey

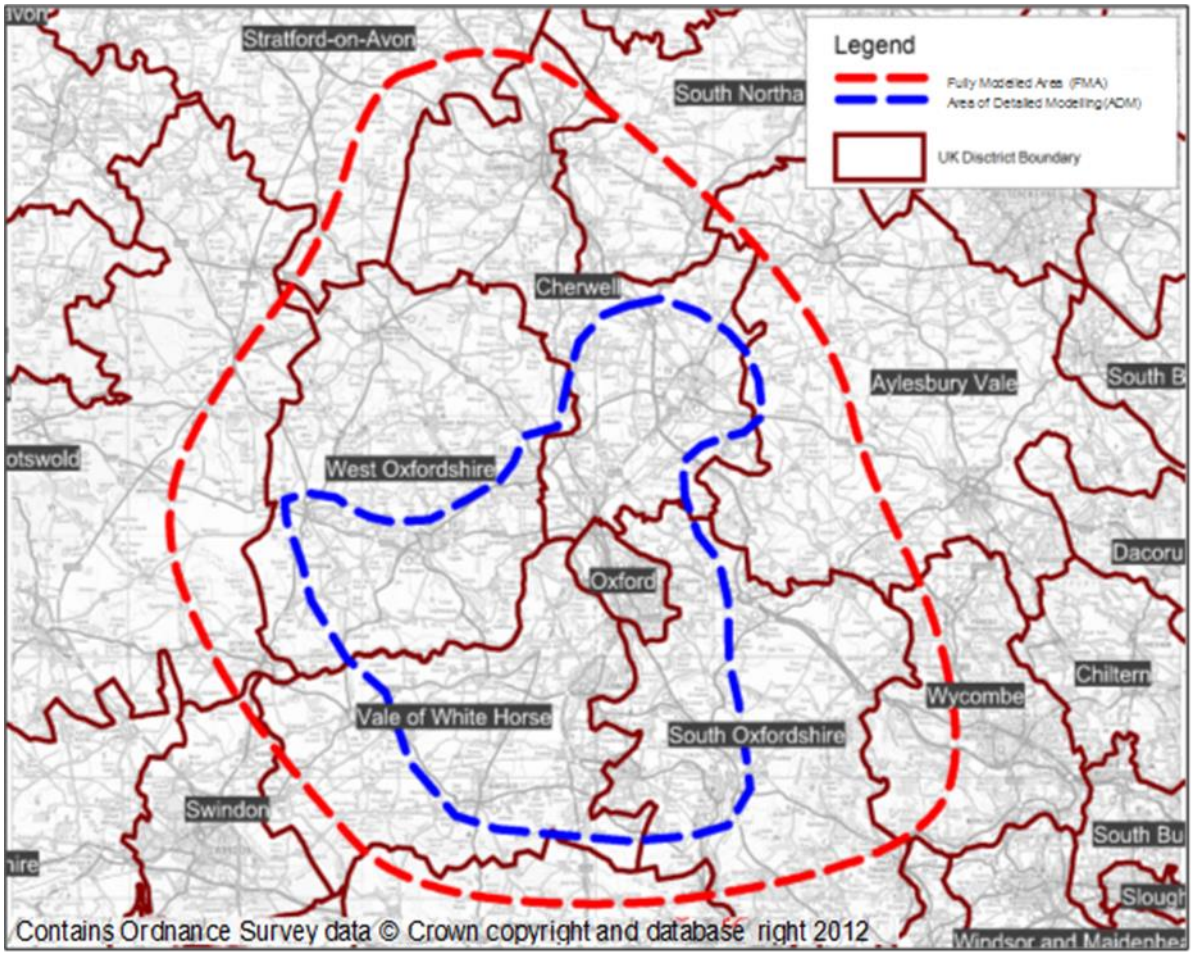
1. Introduction

1.1. Background to modelling

In 2015 Atkins developed a SATURN highway assignment model for Oxfordshire County Council. The highway model was developed as a part of a suite of multi modal strategic models to provide an evidence base for planning and development mitigation, at a strategic level and for the appraisal of major transport schemes.

Figure 1 below shows the areas of detailed modelling and fully modelled area of the Oxfordshire Strategic Model (OSM) network. South Oxfordshire is partly covered by the area of detailed modelling, with the remaining area largely covered by the fully modelled area, however, the southern part of the district is outside the fully modelled area but key links are included in the model.

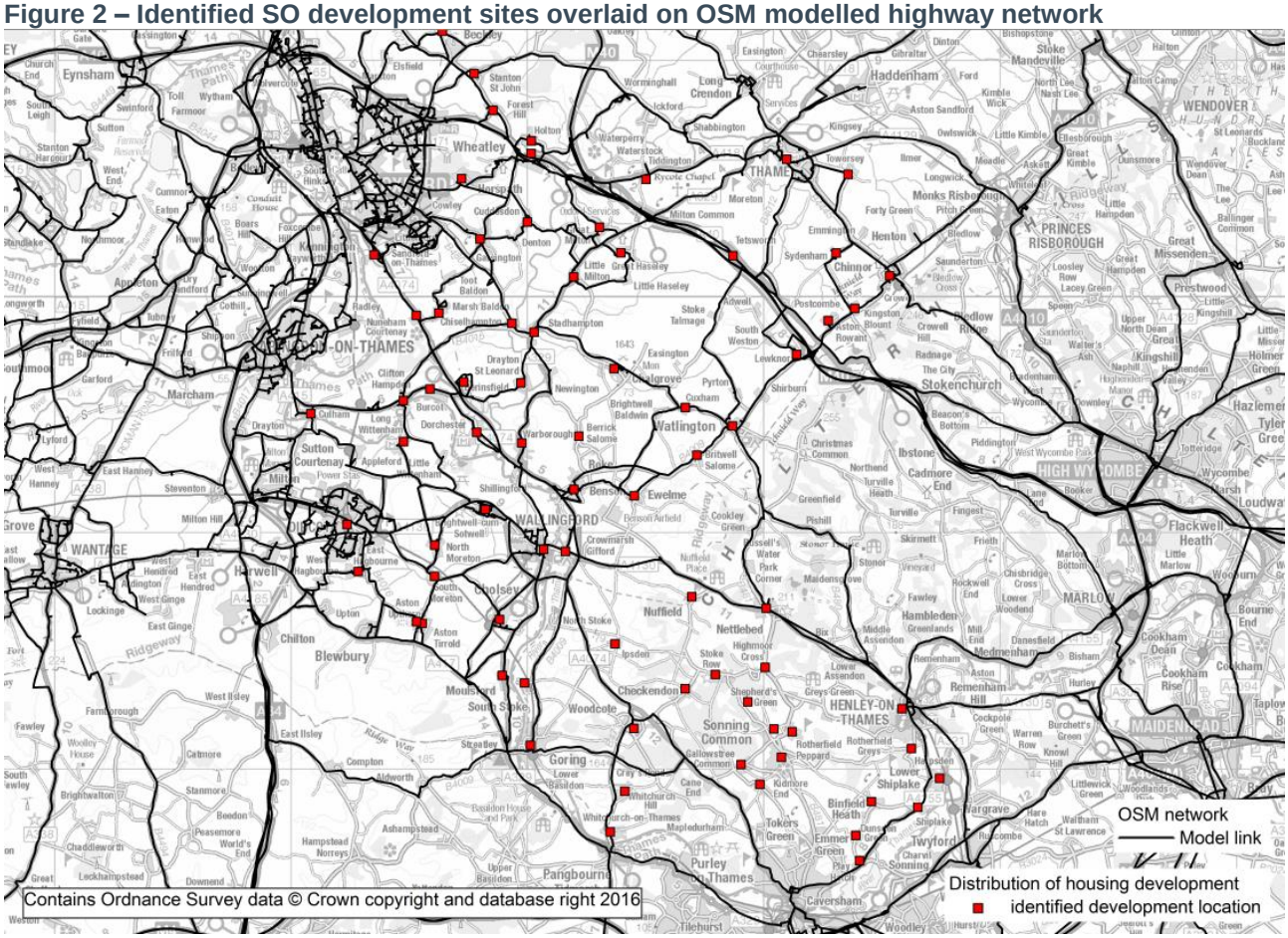
Figure 1 - OSM extent of area of detailed modelling and fully modelled area.



1.2. Assessment of planned growth locations

South Oxfordshire District Council (SODC) has commissioned Atkins to undertake an assessment of planned growth locations and recently observed traffic surveys against 2013 base year modelled flows to determine the suitability of using the OSM highway assignment model to assess the potential impacts of identified developments in the forthcoming South Oxfordshire Local Plan. The locations of the development sites identified within the District alongside the modelled highway network are shown on Figure 2.

Figure 2 – Identified SO development sites overlaid on OSM modelled highway network



Growth in Districts adjacent to Oxfordshire has been included in forecast versions of OSM using aggregate demand forecasts for entire Districts from TEMPRO. Individual development proposals, such as Haddenham, Aylesbury Vale and Princess Risborough, Wycombe, are not represented explicitly in forecast models. Should the OSM be used to assess the impact of cumulative Local Plan proposals within the District, it may be appropriate to review the demand associated with significant developments in adjacent Districts and specifically where trips are loaded to the network.

2. Assessment of Model Flows - Data and analysis

2.1. Traffic count observations

Traffic count data was supplied by SODC in two discrete sets of traffic count observations.

2.1.1. Oxfordshire automatic traffic count data

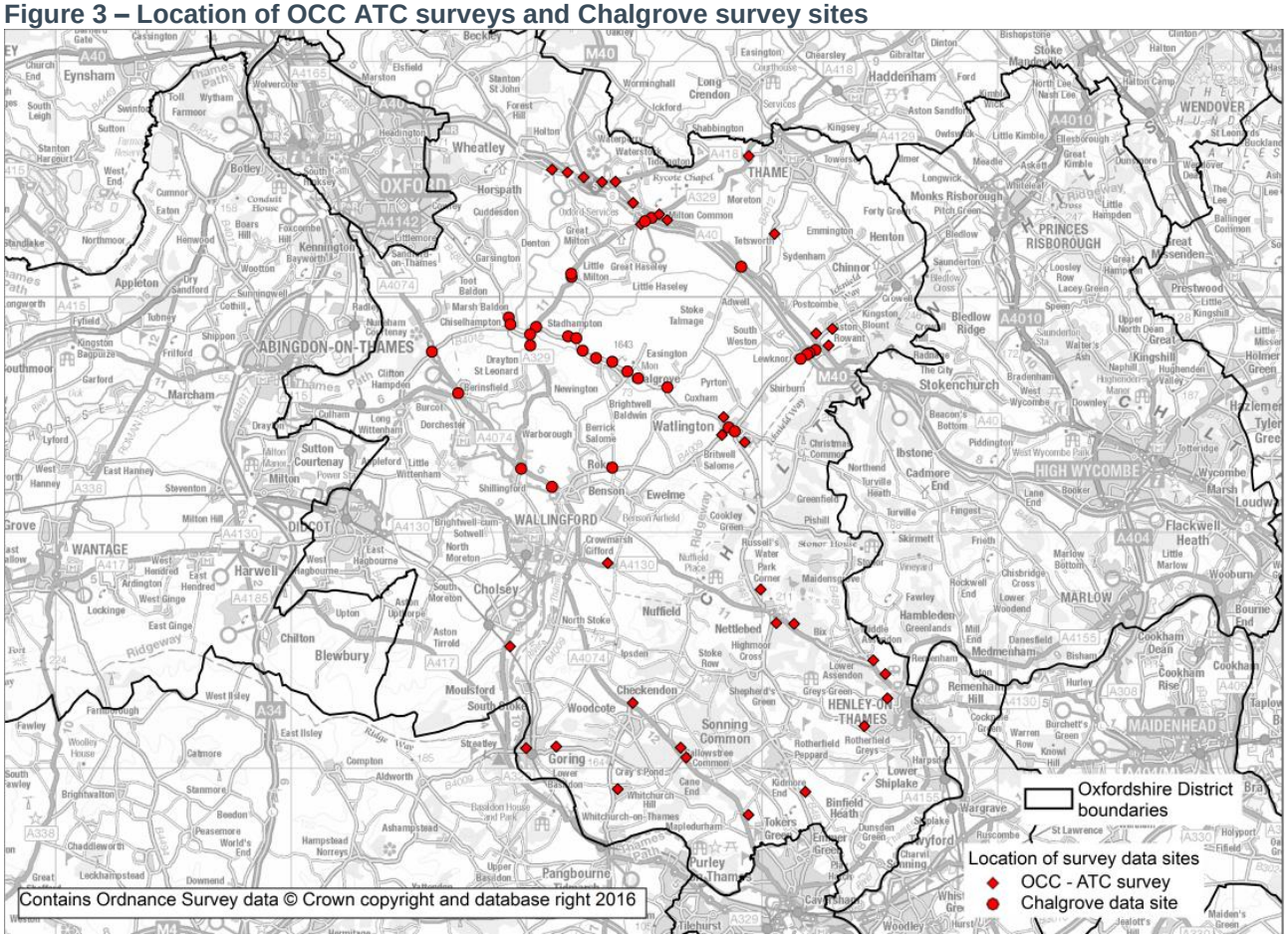
The first of these data sets is Automatic Traffic Counter (ATC) data from Oxfordshire's established annual counter monitoring programme and includes data from 35 sites within the District.

Data was provided for three time periods:

- Morning peak (08:00 – 09:00) Tuesday to Thursday average;
- Inter peak (10:00 – 16:00) Tuesday to Thursday average and
- Evening peak (17:00 to 18:00) Tuesday to Thursday average

For all 35 sites data represents total vehicle flows, by time period, in 2015 and the location of these count sites is shown in Figure 3.

Figure 3 – Location of OCC ATC surveys and Chalgrove survey sites



2.1.2. Chalgrove Airfield survey data

Further data was provided from a series of traffic counts undertaken in 2016 on the local road network adjacent to Chalgrove airfield. The data was collected as part of the assessment for the proposed redevelopment of Chalgrove airfield. This data takes the form of ATC data for seven sites and manual classified counts (MCC) at 21 junctions (5 roundabouts and 16 priority junctions). This data was supplied for the following time periods:

- Morning peak (08:00 to 09:00)
- Evening peak (17:00 to 18:00)

ATC data was provided as directional total vehicle link flow, the MCC flows are given as total vehicles for individual turning movements at the surveyed locations. The location of these count sites is shown on **Figure 3 – Location of OCC ATC surveys and Chalgrove survey sites**

2.2. Preliminary data analysis

The original data provided by SODC was in the form of a spreadsheet. This spreadsheet was used as the starting point for the analysis undertaken and reported here.

Data from the Chalgrove data set was appended to the analysis spreadsheet.

The location of each of the observed link flows was identified on the OSM network and the a-node / b-node for the modelled links on which the observations were located was appended to the analysis spreadsheet

The traffic data observations were undertaken in 2015 and 2016, to allow comparison to 2013 modelled flows a factor was prepared to convert observations to 2013.

The Department for Transport (DfT) traffic counts website was interrogated and five permanent count sites local to the District were identified. Summary data for 2013, 2014 and 2015 was extracted for those 5 sites and used to derive a factor to convert 2015 data to 2013, therefore enabling a comparison with modelled flows. Average growth between 2013 and 2015 for the five sites is calculated to be 4.11%. To convert 2015 to 2013 flows were factored by 0.961. In the absence of long term DfT data for 2016, this factor has also been applied to the 2016 Chalgrove data.

2.3. OSM flow output and conversion to vehicles

Base year 2013 modelled actual flows were extracted for the morning peak, inter peak and evening peak. The flows output by the model are given as passenger car units (PCUs), to enable direct comparison with the observed traffic data the model, output flows were converted from PCUs to vehicles, Table 1 below shows the factors used to produce vehicle flows.

Table 1 - PCU values for OSM assignment user classes

Saturn assignment user class	Vehicle class	PCU value
User Class 1	Cars	1.0
User Class 2	Cars	1.0
User Class 3	Light goods vehicles	1.0
User Class 4	Heavy goods vehicles	2.3
Buses	Scheduled buses	3.0
PassQ flows *	Aggregate flows residual traffic from previous time period.	Aggregate, assumed as vehicle flows.

**'PassQ' flows. PassQ flows although aggregate vehicle flows were not disaggregated and factored for expediency. The flow totals for PassQ are low and if disaggregated and factored are unlikely to affect the conclusion of this analysis.*

2.4. Data quality

As explained, the observed data to be used in this analysis originates from two sources and as such is likely to exhibit different characteristics. Data collected on different days and in different years will, by its very nature, exhibit inconsistencies. Data collected over a series of subsequent days, such as ATC data, may be more reliable than single day observations as inconsistencies can be identified and removed.

Data from a series of local observations made as part of the assessment for a proposed redevelopment of Chalgrove airfield has been analysed here. The data collected for this purpose for the main was collected on a single day, this data therefore represents a discrete point of data. The model represents average weekday situation, it is therefore perhaps not unexpected that the average flows from the County's monitoring programme would validate better than the 'single point in time' data from the Chalgrove counts.

2.5. Comparison of modelled to observed flow criteria

The OSM base model output was interrogated read actual vehicle flows for each of the modelled links for which observed data was available. The modelled flows were compared to the observed flow data. WebTAG 3.1 guidance for assignment model link flow validation, has been used to assess model performance in South Oxfordshire. Acceptability guidelines as presented in Table 2 of WebTAG 3.1 are shown in Table 2 below.

Table 2 - Link flow validation criteria and acceptability guidelines

Criteria and measures	Acceptability guidelines
Individual flows within 100 vehicle per hour for links with flow less than 700	>85% of cases
Individual flows within 15% for links with flow from 700 to 2,700 vehicles per hour	>85% of cases
Individual flows within 400 vehicles per hour for links with flow more than 2,700 vehicles per hour	>85% of cases
GEH statistic less than 5	>85% of cases

3. Assessment of Model Flows - Results and discussion

When assessing the results of this analysis the original purpose of the OSM highway assignment model should be understood. The model is strategic in nature and primarily intended to provide an evidence base for planning and development mitigation as well as the appraisal of major transport schemes. Figure 1 above shows the extent of the area of detailed modelling (ADM) and fully modelled area (FMA), and how those areas relate to South Oxfordshire District. Outside the FMA, the extent of model validation decreases. The analysis undertaken here sits mainly within the FMA. Model definition outside the FMA is such that junctions are not modelled explicitly

3.1. Flow validation

Table 3 below shows a summary of observed versus modelled flow to assess model link flow validation against guidance. To supplement the flow validation, guidance recommends considering percentage differences between modelled flows and counts on screenlines. The available observed data does not lend itself to the formation of screenlines and hence screenlines have not been considered.

Table 3 - Analysis results versus WebTAG criteria

Peak period	Total counts	WebTAG criteria and measures		
		Link Flow <700vph	**Link flow from 700 to 2,700vph**	**GEH <5 %age**
Morning peak	162	88 / 133 (66%)	13 / 29 (45%)	57%
Inter peak	60	33 / 56 (59%)	1 / 4 (25%)	35%
Evening peak	162	66 / 126 (52%)	9 / 36 (25%)	45%

N.B. No link flows greater than 2,700vph within the observed data

The analysis presented in Table 3 above shows that during the morning peak 61% (101 / 162) of links meet the WebTAG link flow criteria and during the evening peak this is 46% (75 / 162).of links.

3.2. GEH analysis for individual count locations

Figure 4 and Figure 5 present the individual count site locations spatially and indicate if the value of GEH is within the WebTAG acceptability criteria. The count site symbols are coloured green where the GEH is <5, (within the criteria) and red if >5 (outside the criteria).

Figure 4 - Morning peak - Modelled vs Observed flow (GEH)

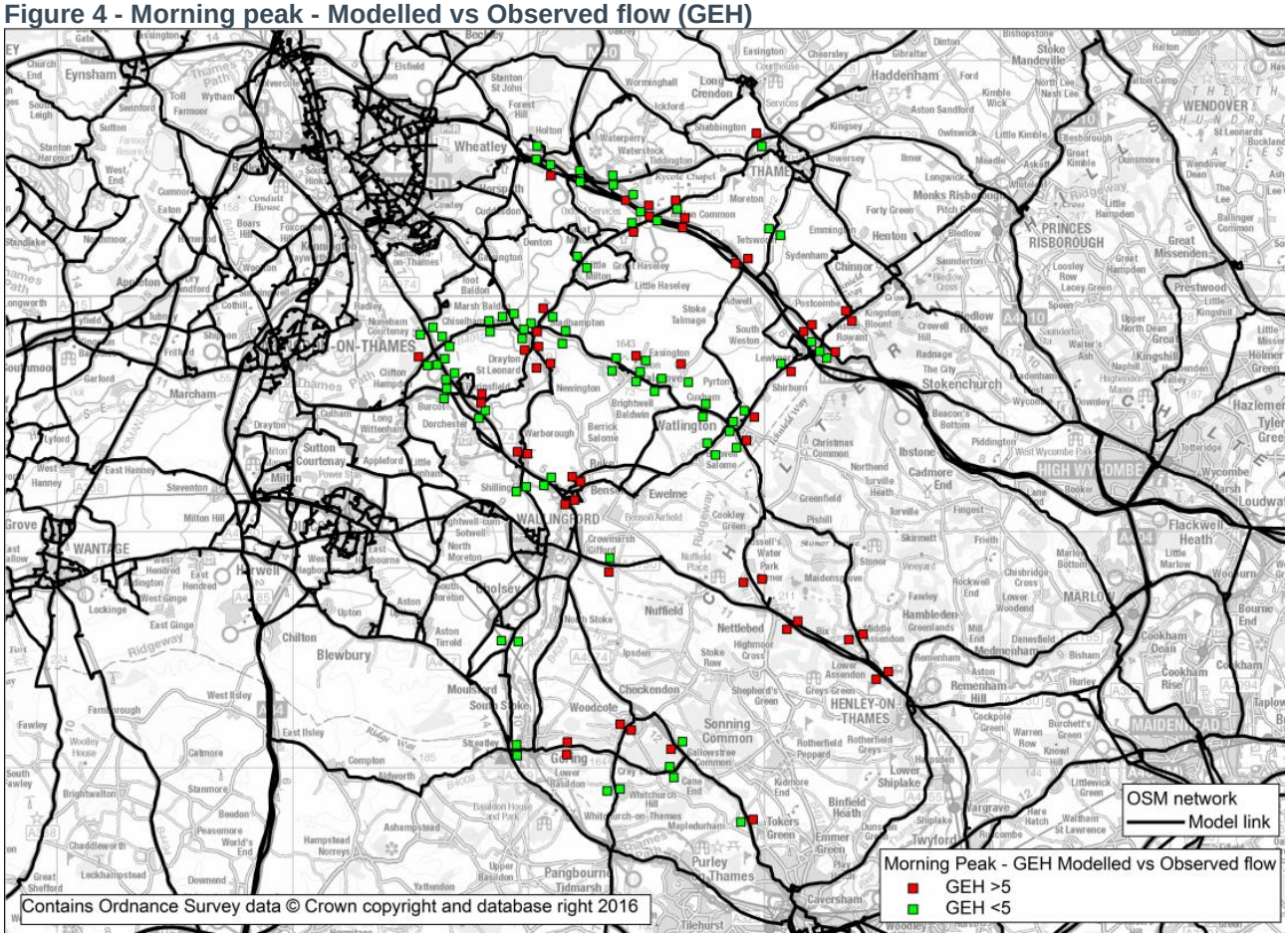
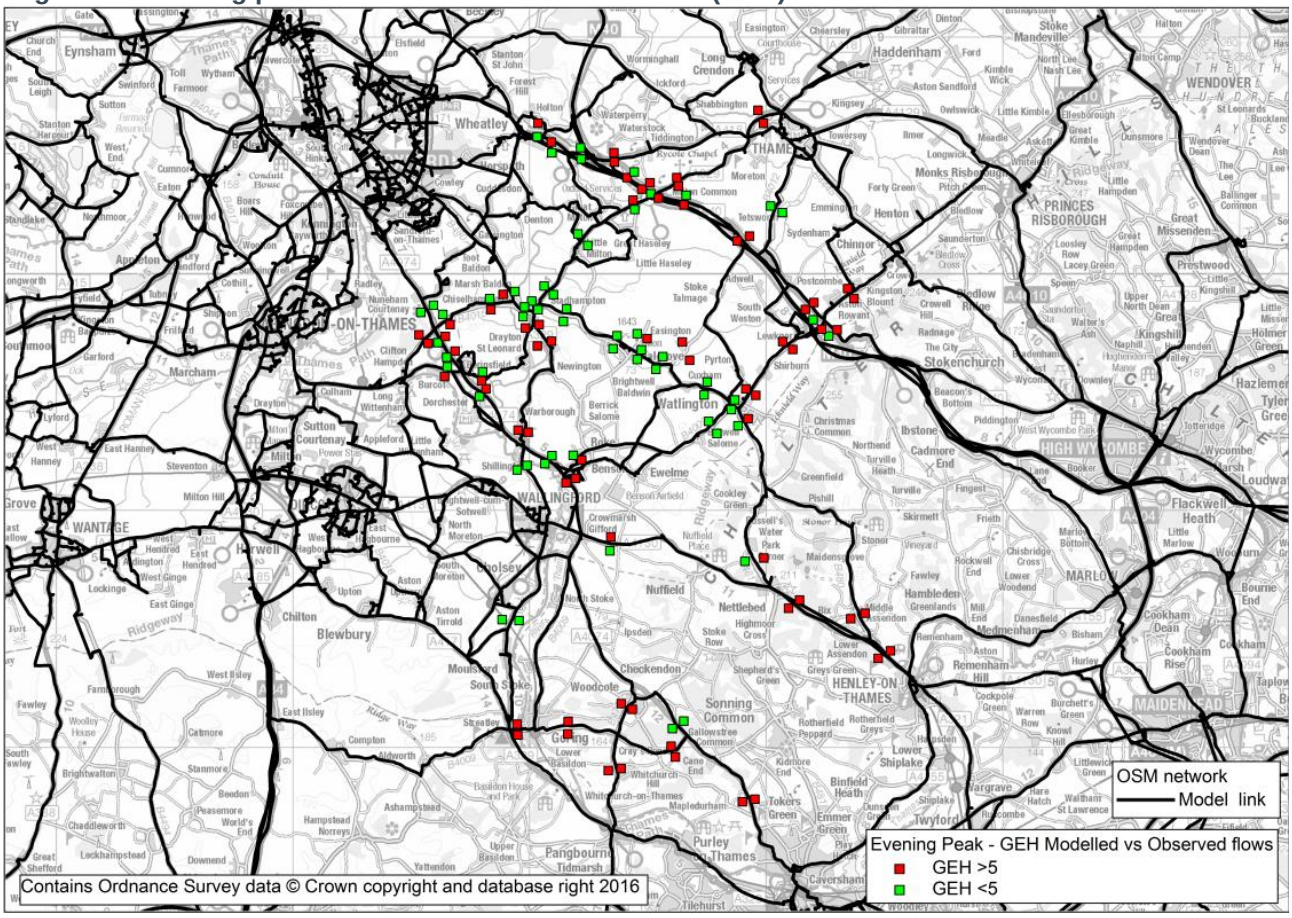


Figure 5 – Evening peak – Modelled vs Observed flows (GEH)



A broad overview of the analysis presented in Figure 4 and Figure 5 indicates that some areas of the model are more representative of observed flows than others. This would, at first glance, indicate that based on the analysis undertaken here the existing OSM highway assignment model is better suited to the assessment of development for some local areas than others (Table 4). Arterial routes towards Oxford including the A40, B480 and A4074 are reasonably well represented by the model, particularly in the morning peak. The southern extent of the District is less well represented in the model, this area is outside the area of detailed validation and modelled flows are not expected to and do not compare well to recent observations.

To better determine the value of the analysis presented here, it would be constructive to quantify the magnitude of residential developments proposed at individual locations. This would enable the matching of areas of model performance against areas of proposed development concentration*. For example if there were two discrete areas of significant development but the model is only seen to perform well in one of those areas then only one of those areas could be meaningfully assessed, with the current OSM highway assignment model.*

The overview of the results of the analysis reported here would seem to show that the model performs more favourably against observations on the south west / north east route corridors across the model, in particular the A4074; B480 & M40/A40. The analysis shows the model performing less well on more local links on the network. This conclusion would fit with the strategic nature of the model.

Table 4 - Assessment of model suitability by development cluster

Local Plan development cluster	Analysed data coverage Red – Poor Amber – Reasonable Green – Good	Red (Model not suitable for development assessment in current form) Amber (Model may be suitable, with some amendments) Green (Model is suitable)
Around Wheatley		OSM is suitable
Around Thame		OSM may be suitable with network enhancements to be considered in the subsequent stage
Around Chinnor		OSM may be suitable with network enhancements to be considered in the subsequent stage
Around Chalgrove		OSM is suitable with network enhancement on local roads to be considered in the subsequent stage
Around Watlington		OSM is suitable
Around Stadhampton		OSM may be suitable with some enhancement of model performance in evening peak to be considered in the subsequent stage
Around Didcot		OSM is suitable based on previous validation
Around Walingford		OSM may be suitable with network enhancements to be considered in the subsequent stage
Southern South Oxfordshire		Model may not be suitable
Haddenham, Aylesbury Vale		OSM may be suitable with network enhancements to be considered in the subsequent stage
Princess Risborough, Wycombe		OSM may be suitable with network enhancements to be considered in the subsequent stage

The Haddenham site in Aylesbury Vale and the Princess Risborough site in Wycombe, are not represented explicitly in forecast models and the model may require enhancement if these development sites are to be assessed explicitly. We plan to discuss with neighbouring districts and their consultants to understand and monitor cross border interactions.

A proposal within the SODC preferred option for a proposed sustainable settlement of some 3,500 dwellings is on the site of the former airfield at Chalgrove. The Chalgrove site is adjacent to and accessed from the SE/NW running B480. The analysis undertaken here shows the model to perform well against observations along the B480 adjacent to the site and to the north toward the A329 and south toward the B4009. However the model performs less well on the M40/A40 corridor to the east and A4074 corridor to the west of Chalgrove. Figure 6 and Figure 7 below show detail of the link flow comparison (GEH) for the area surrounding Chalgrove for the morning and evening peak respectively.

Figure 6 – Morning peak – Modelled vs Observed flows (GEH) for area around Chalgrove

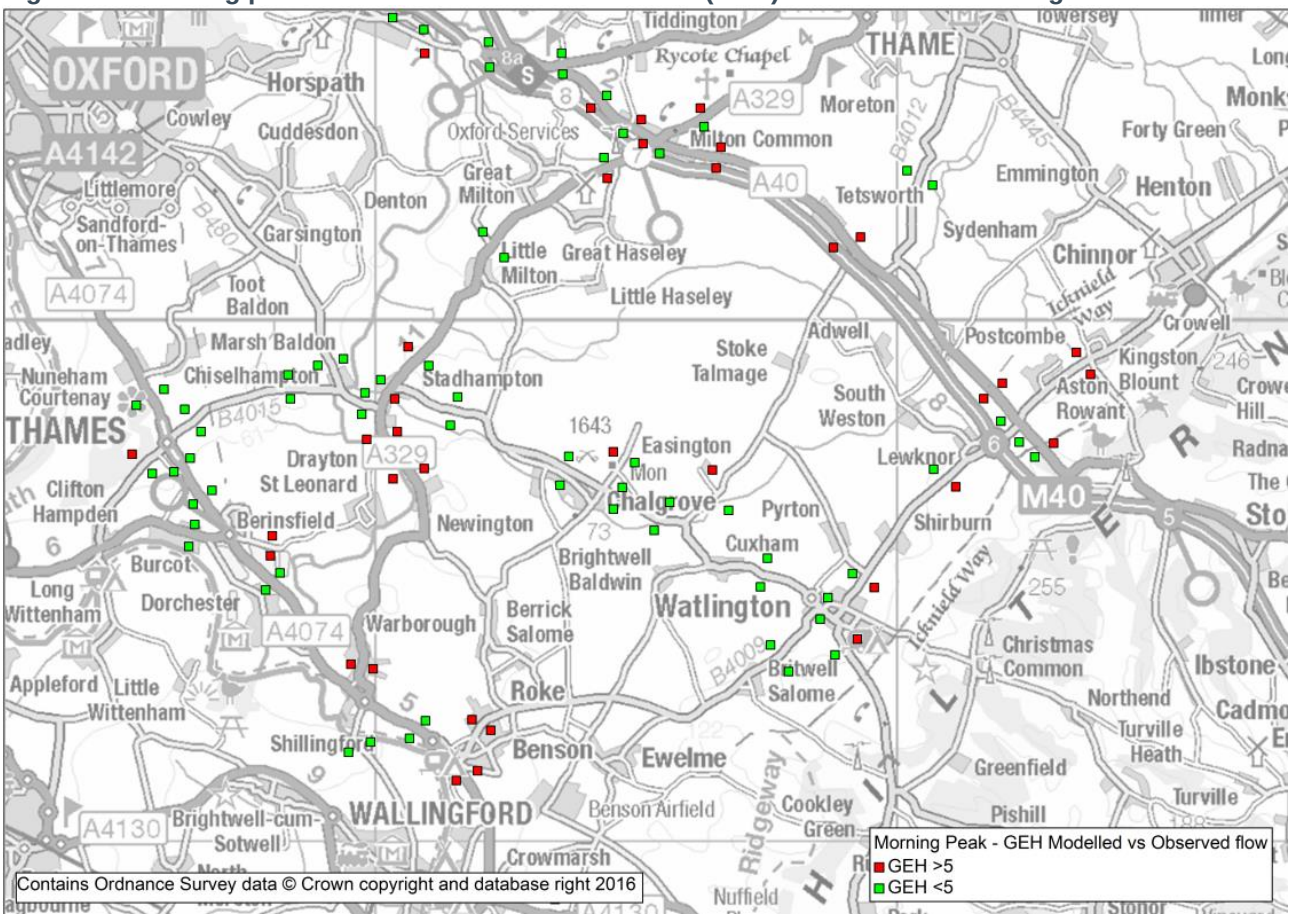
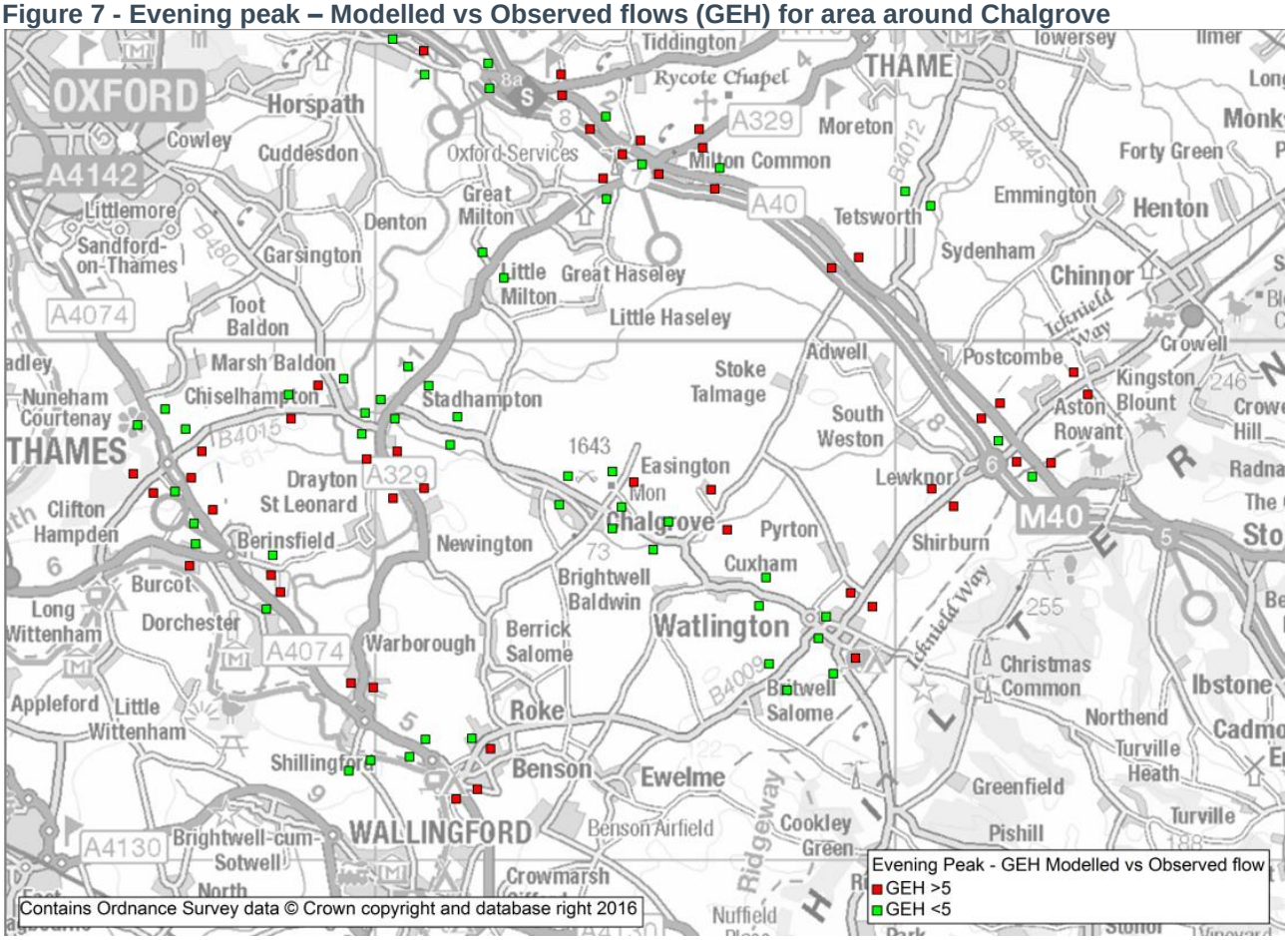


Figure 7 - Evening peak – Modelled vs Observed flows (GEH) for area around Chalgrove



From the analysis undertaken and the summary provided in Table 4, two main outcomes can be drawn:

- OCC provided sufficient data and the model performance can be considered to be good, reasonable or poor
- Where insufficient new data was provided we have judged model performance on whether the model is within the FMA (model likely to be suitable) or outside the FMA (model likely to require enhancement or be unsuitable)

4. Conclusions and Recommendations

4.1. Guidance on scoping of the ETI

The OSM was developed as a strategic model to provide an evidence base for planning and development mitigation as well as the appraisal of major transport schemes. If the model is to be used for assessment of SODC local plan proposals, the analysis presented here suggests that it may require some refinements to be undertaken to ensure that the model more closely reflects recent observations.

In order to define any requirement for refinements a greater understanding of specific local plan scenarios to be tested is required to determine how suitable the model is in its current form.

Broadly speaking, model network coverage relates well to the development locations within the Local Plan. If the developments to the west of Henley-on-Thames and around Sonning Common are likely to generate large numbers of trips, SODC may wish to consider extending the model network and upgrading buffer coding to include the southern part of the district in the Fully Modelled Area (FMA). The District may also wish to consider enhancing network coverage of local roads around Chalgrove.

Further data collection may be required to verify present year model performance around Didcot and Thame, particularly if significant developments are proposed and there is the likelihood of the model being used to support a major scheme business case.

Assessments undertaken here focuses solely on comparison of traffic flow levels between modelled and observed. To give a better understanding of model performance it may be worthwhile to compare modelled and observed journey times, for vehicles through routes across the network, this would allow a better understanding of how delays are modelled.

The analysis undertaken has used a series of ad-hoc counts to determine the ability of the model to reflect recently observed data. This has not been undertaken in a WebTAG recognised way, which advocates grouping counts into screenlines and has not compared modelled and observed journey times.

We do not think that the model, without improvement, is presently suitable for testing developments in the southern part of the District outside the fully modelled area. We also recommend discussions with neighbouring authorities to determine potential impacts of growth outside of the District and how these are represented in forecasts.

We conclude that the model is generally suitable for testing strategic transport impacts around Chalgrove, Wheatley, Watlington and Stadhampton, alongside performance within the fully modelled area in existing settlements including Didcot.