Technical Note 8

Project:	**National Highways Spatial Planning Framework**	Job No:	**606059714 – Q14DDX110.012**
Subject:	**Tendering Colchester Borders Garden Community – Review of Modelling**		
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1. Introduction

1.1. Background

1.1.1 The Tendring Colchester Borders Garden Community (TCBGC) is a new Garden Community proposed for land crossing the Tendring and Colchester border located on the eastern edge of Colchester. It has been prepared by Tendring District and Colchester City Councils in partnership with Essex County Council. The proposals comprise delivery of between 7,000 to 9,000 homes as well as employment, schools, health and leisure facilities.

1.1.2 A Regulation 19 consultation on the TCBGC Development Plan Document opened on 15th May 2023 and will close on 25th June 2023.

1.1.3 As a statutory consultee, National Highways (NH) will require an understanding of the impacts of the proposed development on the Strategic Road Network (SRN) in order to prepare its response to the consultation. To assist NH in formulating a response to the Regulation 19 consultation, AECOM has been instructed to assess the suitability of the transport models and any supporting modelling that has been undertaken to assess the impacts of the TCBGC Development Plan.

1.2. Model Documentation

1.2.1 It is understood that an assessment of the TCBGC would be based upon the Colchester Transport Model (CTM). This could be either directly, through the application of the model to test the proposals, or indirectly through the use model outputs to provide the basis for a more detailed modelling involving microsimulation or local junction models.

1.2.2 Documents covering the development of CTM, including the data collection, model development and forecasting, have been made available to AECOM for review. However, it is noted that no detailed forecasts of the TCBGC proposals are available at this stage.

1.2.3 The CTM documents have provided the basis for a high level assessment of the suitability and reliability of the model to assess the TCBGC development, either directly or indirectly in conjunction with microsimulation or junction models.

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1.2.4 It should be noted that there is no information currently available to comment on the detailed impact of the TCBGC development. This would therefore be the subject of a further review once this information becomes available

1.2.5 AECOM's main comments and recommendations are presented in bold and underlined text throughout the note. Recommendations or missing data regarded as potentially critical to the acceptability of the modelling are **highlighted red**. Recommendations and observations that are of concern but are unlikely to be critical to agreement of the modelling are **highlighted in amber**. Observations and clarifications are **highlighted green**.

2. Review of Model Documents

2.1. Scope of Review

2.1.2 The documents available for the review related to the development of the Colchester Transport Model (CTM). These comprised:

- Colchester Transport Model - Data Collection Report (Dated 23rd November 2020)
- Colchester Transport Model - Model Development and Validation Report (Dated 19th August 2021)
- Colchester Transport Model – Reference Case Forecasts, Technical Note (dated 16th August 2021)

2.1.3 As noted in section 1.2 above, these reports have provided the basis for a high level assessment of the suitability and reliability of the model for assessing the TCBGC development. The scope of the review covers the following aspects of the modelling and forecasting:

- Overview of CTM in terms of spatial coverage, modes of travel and time periods
- Adequacy of data underpinning the modelling, including any areas of weakness/concern
- Approach to the development of the base model, in terms of conforming to best practice and Department for Transport (DfT) TAG guidance
- The extent to which the base model meets the DfT TAG criteria for validation including areas where the validation is poor where this may impact on the reliability of the forecasts
- The robustness of the approach to forecasting and extent to which this conforms to DfT best practice.

2.2. Model Overview

2.2.1 The CTM was commissioned by Essex County Council (ECC) in 2019 as a strategic multi modal model for Colchester. Its purpose was to support the development and implementation of transport interventions that underpin the Colchester Transport Strategy and to provide evidence on their impacts.

2.2.2 It was also intended that CTM could be used as a basis for developing sub-models where a more detailed assessment of schemes is required, while retaining consistency with the strategic analysis. For example, this could include microsimulation or junction models to assess the detailed impacts of development and interventions.

2.2.3 The model builds on the data and the components of the Phase 2 Essex Countywide Transport Model (Essex CW) and the North Essex Rapid Transit (NERT) model. It also provides a better representation and enhanced validation of the local network.

2.2.4 The main features of the model are described in Chapters 2 and 4 of the Model Development and Validation Report. The model provides multi-modal functionality and comprises a highway assignment model, public transport model (covering bus and rail), and a variable demand model. There are separate models for the AM, Inter-peak and PM peak periods. The model base year is for a neutral month in 2019.

2.2.5 The CTM highway assignment model is focussed on Colchester (the Area of Detailed Modelling). The immediate surrounding area comprising the Rest of the Fully Modelled Area (the remainder of Colchester District, eastern and southern parts of Braintree District, Tendring District, is modelled to a reduced level of detail but including capacity restraint. The remainder of mainland Great Britain forms the External Area, based on a skeleton network of key roads without capacity restraint.

2.2.6 The zoning system in CTM was developed from the Essex Countywide Model zoning system, which was based on Lower Super Output Areas (LSOAs) in urban areas, Middle Super Output Areas (MSOAs) and Local Authorities (LAs) & Regions in the external areas.

2.2.7 Further disaggregation of the original Essex CW model zones was carried out within the Detailed model Area. The zones expected to accommodate the future Tendring-Colchester Borders Garden Community were also disaggregated to facilitate the modelling of this development.

2.2.8 From a consideration of the information presented in Chapters 2 and 4 of the Model Development and Validation Report, AECOM considers that the resolution of the network and model zoning structure is sufficient to support an assessment of the impacts of the TCBGC proposals on the surrounding highways network. It could also be used to assess the impact of public transport proposals associated with the development, through application of the public transport and variable demand procedures within the model.

2.2.9 **Should a more detailed assessment of the impacts on the local network including junctions be required, it is recommended that a local microsimulation model or separate junctions models should be developed using outputs from CTM**.

2.3. Model Data

2.3.1 The CTM highways model was developed from the Essex CW model. The Essex CW model was developed from a range of data sources, primarily Mobile Network Data (MND) and has a base year of 2017. The highways model was updated to a 2019 base year using a combination of existing data provided by Essex County Council, WebTRIS and the Department for Transport supplemented by a programme of data collection (ATC's and MCTC's) collected in October 2019.

2.3.2 The bus demand matrices were also initially based upon the Essex CW model. This was subsequently re-developed within the Colchester area using new survey data also collected in October 2019.

2.3.3. Two sources of rail data were available for the model. This comprised Office of the Rail Regulator Station usage data based upon LENNON ticket sales, and MOIRA station to station flow data, also based upon LENNON.

2.3.4. **It is considered that the combination of existing data sources and additional survey data provides a sound basis for the development of the 2019 base year models.**

2.4. Development of Base Year Models

2.4.1 The development of the CTM base year highways, rail and bus trip matrices is described in detail in Chapters 8 and 9 of the Model Development and Validation Report.

2.4.2 The starting point for the highways trip matrices was the Essex CW model, which had been developed from Mobile Network Data (MND). These matrices were disaggregated to the CTM zoning system and refined using existing and new survey data and uplifted to a 2019 base year to form the prior matrices.

2.4.3 The prior matrices were assigned to the highways network and following initial adjustments to the prior matrices, a "matrix estimation" ("ME") process was used, utilising the 2019 survey data, to produce the final highways matrices. These were assigned to the network for validation of the base year model.

2.4.4. The rail matrices, similar to the highways demand matrices, were also sourced from Essex CW. These were further refined and adjusted in CTM to match station usage totals using the new data sources.

2.4.5 The bus matrices for CTM were not sourced from the Essex CW model and were developed using the bus survey data collected in 2019. These were refined using a bus demand gravity model. The gravity model was used to obtain a trip matrix in the CTM zone system consistent with NTEM trip ends and the expanded observed on-board bus passenger survey data.

2.4.6 **AECOM considers that the Colchester Transport Model is informed by reliable data sources and that the model has been developed in line with current best practice and in line with the principles set out in TAG.**

2.4.7 AECOM notes however that, since CTM is based upon a 2019 Base Year, it will reflect the pattern of trip making and travel behaviour that existed prior to the Covid-19 pandemic. It is acknowledged that the pandemic has had a significant impact on travel behaviour. TAG Unit M4 forecasting and uncertainty, released in May 2023 provides advice on proportionate accounting for Covid-19 in prior calibrated models.

2.4.8 **AECOM recommends that consideration should be given to the various options for adjustments to the model to take account of the impact of Covid-19, as set out in Appendix B of TAG M4. The merits of these options should be assessed in order to provide a practical and proportionate method to factor the growth applied to the 2019 CTM matrices during forecasting**.

2.5. Calibration and Validation of Base Models

2.5.1 Details of the calibration and validation of CTM highways model are set out in Chapter 9 of the Model Development and Validation Report, while details of the calibration of the public transport model are set out in Chapter 10.

2.5.2 The results of the calibration of the highways model demonstrated that the matrix estimation process was effective in adjusting the demand matrices to observed counts, without overly modifying the trip end totals (derived from NTEM) or trip length distributions (from the mobile phone network data and NTS). This was evidenced by the comparisons of prior and final matrix totals and performance statistics carried out in accordance with TAG Unit M3 as presented in section 9.3.

2.5.3 The results presented in section 9.4 demonstrated that the base model has achieved a very good level of convergence. More than 98% of links have cost and flow changes of less than 1% for all modelled time periods. This provides confidence that the model is stable.

2.5.4 The highway calibration and validation standards were assessed in terms of compliance to TAG guidance. The results of the calibration of screenlines demonstrated a good match between modelled and observed totals

2.5.5 The calibration screenline results demonstrates a good comparison with the modelled traffic flows in and out of Colchester providing a good match with observed data. The 85% TAG criterion for calibration counts is exceeded for all vehicle classes across all time periods demonstrating that the modelled flows provide a good representation of observed conditions.

2.5.6 The performance of the validation screenlines is reasonable. In the AM peak, 9 of the 12 screenlines pass the TAG criteria, reducing to 8 in the Inter Peak and 7 in the PM peak. The validation counts for the PM Peak for cars and total vehicles are slightly below the required 85%. This is considered a satisfactory result since the data used for validation is independent of the model calibration process and therefore represents a more stringent test of model performance.

2.5.7 In terms of the validation achieved for individual links, the percentage of links meeting the TAG criteria was high (generally 95% and above) for the 206 sites used in the model calibration. The pass rate for the 88 validation sites ranged between 81% for PM peak, 89% for AM peak and 91% for inter-peak. Based upon these results, AECOM considers this performance to be very good.

2.5.8 AECOM also carried out a more detailed review of the results of the observed and modelled flows on the individual links within the network that are presented in Appendix K of the Report. This compared observed and modelled flows for each of the 206 links used for the model calibration and the 88 links used for the validation. This was undertaken to identify the location of links that had failed to achieve the TAG validation criteria, in order to identify any failures in the area of the network that likely to be influenced by the TCBGC proposals.

2.5.9 The examination of individual links showed that for the calibration there were no links within the vicinity of the proposed TCBGC that failed to achieve the TAG validation criteria. With respect to the validation sites, there are 2 sites close to the TCBGC site that fail the TAG criteria. However they only fail in one time period, with a GEH just over 5, which is just outside the TAG criteria.

2.5.10 The results of the journey time validation showed that out of the 20 routes, 3 routes in the AM and two routes in the PM failed to meet the criteria whilst all routes in the IP met the TAG criteria for journey time validation using Teletrac observed data. A comparison of modelled with observed Tom Tom data for the same routes showed that all routes in all time periods met the TAG criteria.

2.5.11 The synthetic bus trip matrices were assessed against the available bus data obtained from Essex County Council, and this demonstrated a good performance between the observed data and the modelled boardings in Colchester Town Centre. Rail demand showed a satisfactory performance when compared against observed daily station entries and exits.

2.5.12 The validation of the public transport model showed that modelled bus journey reproduced observed journey times across all time periods. The validation of rail journey times showed that modelled journey times for both mainline and local services demonstrated a good correspondence between observed and modelled journey times.

2.5.13 **In summary, AECOM considers that the results of the highways model screenline and journey time validation presented in Chapters 9 of the Model Development and Validation Report, shows that the model generally performs well against the observed data in terms of meeting TAG criteria. Furthermore, a more detailed examination of the validation of the individual links within the vicinity of TCBGC demonstrates close match between modelled and observed link flows.**

2.5.14 **AECOM considers that the base model presents a reliable base for the development of forecasts to assess the TCBGC proposals.**

2.6 Approach to Forecasts

2.6.1 The Colchester Transport Model is designed to take account of future strategic and local growth in population and employment and to be capable of predicting mode choice and trip distribution for trips with one or both trip-ends within Colchester.

2.6.2 Under the public transport choice model there is also an additional sub-mode choice between rail and bus modes, where the model considers the attractiveness between travelling by bus only or via rail (and bus).

2.6.3 The demand model is consistent with the development assumptions set out in the Local Plans for Colchester, Tendring and Braintree and NTEM growth. For the Tendring Colchester Borders Garden Community 4,800 dwellings are assumed by 2041. Trips rates derived from TRICS have been used to calculate trip ends for the housing and employment developments. The number of TCBGC car and public transport trips were adjusted in line with the mode share targets for the North Essex Garden Communities.

2.6.4 **It is noted that the model split targets have not yet been agreed and are the subject of a Technical Note (TN07) dated 14th June 2023, prepared by AECOM on behalf of National Highways raising a number of queries about the targets adopted.**

2.6.5 There are two scenarios, Core and High. The Core scenario includes development proposals where the likelihood of these going ahead is near certain or more than likely. The High scenario includes the developments from the Core scenario and also developments where the likelihood of these going ahead is reasonably foreseeable.

2.6.6 The total trip ends of the Core scenario have been controlled to NTEM growth between the base year (2019) and each forecast year, while the growth of the High scenario is higher than NTEM and includes the trip ends related to the additional developments included in the high scenario.

2.6.7 Application of the variable demand model resulted in a modest mode shift from rail to car. This was explained through a reduction in car cost over time due to fuel efficiency improvements and a relative increase in the cost of rail travel.

2.6.8 The highways assignment results within the model simulation area that includes Colchester and the immediate vicinity of the A12, are presented in Chapter 5.2 of the report. This provides a comparison of 2041 post and pre variable demand flows and the post variable demand 2041 flows with 2019 base year flows.

2.6.9 There is no separate assessment of the traffic generated by the TCBGC proposals and the impact on the highways network.

2.6.10 **Based upon the review of the information contained within the forecasting Technical Note, Aecom is satisfied that the variable demand modelling was carried out in accordance with the guidance set out in TAG Unit M2.1 (Variable Demand Modelling).**

2.6.11 **Aecom is also satisfied that the forecasting of trips ends, was also carried out in accordance with TAG Unit M4, (Forecasting and Uncertainty) combining local plan assumptions and data and NTEM growth projections.**

2.6.12 As noted in paragraphs 2.4.7. and 2.4.8 above, the impact of the Covid-19 has a significant impact on travel behaviour and on demand and consideration should therefore be given to the various options for adjustments to the base year matrices that are identified in Appendix B of TAG M4. In addition, Aecom would also highlight the uncertainty with respect to the long term impacts of Covid that will lead to increased uncertainty in forecasts of future traffic growth.

2.6.13 **Aecom recommends that In line with the advice set out in paragraph B.2.3 of TAG M4 issued in May 2023, sensitivity tests should be applied to any forecasts prepared using the CTM to assess the further potential for change with respect to the long term impacts of Covid-19. This sensitivity testing should be carried out in line with the DfT's Uncertainty Toolkit.**

3. Summary of Findings and Recommendations

3.1. Scope and Limitations

3.1.1 This note has set out the main findings of a review of the suitability and reliability of the CTM to provide outputs that for assessing the TCBGC development. This would be either through the direct application of the model to test the proposals, or indirectly through the use model outputs to provide the basis for a more detailed modelling involving microsimulation or local junction models. The review is intended to assist NH in formulating a response to the Regulation 19 consultation on the TCBGC proposals.

3.1.2 The review was based upon 3 reports prepared by Jacobs on behalf of Essex County Council. These cover the data collection, the development of the base year models and the reference case forecasts.

3.1.3 The reports provided the basis for a high level review and assessment of the development of the base year model and the procedure adopted and assumptions underpinning the forecasts. This enables an assessment to be made with respect to the suitability and reliability of the CTM to provide model outputs that could be used to assess the TCBGC development, either through the direct application of the model or indirectly in combination with local junction models.

3.1.4 **While the Reference Case Forecasts Technical Note report provides comparisons of core scenario forecasts (2041) with base year (2019) flows, in the absence of forecasts that are specific to the TCBGC development, there is no information to assess the detailed impacts of the TCBGC proposals. These forecasts would need to be reviewed once these have been prepared.**

3.2. Key Findings and Recommendations

3.2.1 Based upon the review of the Data Collection Report, Model Development and Validation Report Reference Case Forecast Technical Note, AECOM considers that the Colchester Transport Model is informed by reliable data sources and has been developed in line with current best practice and in line with the principles set out in TAG.

3.2.2 The results of the highways model validation demonstrated that the model generally performs well against the observed data in terms of meeting TAG criteria for the screenlines and journey time comparisons. Furthermore, a more detailed examination of the validation of links within the vicinity of TCBGC demonstrates a close match between modelled and observed link flows.

3.2.3 While AECOM considers that in general, the base year CTM presents a reliable base for the development of forecasts to assess the TCBGC proposals, it notes that CTM represents a 2019 Base Year and will reflect the pattern of trip making and travel behaviour that existed prior to the Covid-19 pandemic.

3.2.4 **AECOM recommends that the advice on proportionate accounting for Covid-19 in prior calibrated models as set out in Appendix B of TAG M4 (Forecasting and Uncertainty) issued in May 2023, should be taken into account to adjust the 2019 CTM matrices.**

3.2.6 Based upon the review of the information contained within the Reference Case Forecasts Technical Note, AECOM is satisfied that the variable demand modelling was carried out in accordance with the guidance set out in TAG Unit M2.1 (Variable Demand Modelling). It is also satisfied that that the forecasting of trips ends, a combination of local plan assumptions and data and NTEM growth projections, was carried out in accordance with TAG Unit M4.

3.2.7 **AECOM notes there are no detailed forecasts available to review and there has been no separate assessment of the traffic generated by the TCBGC proposals. Therefore, there is currently no information available in order to assess the impact of TCBGC on the highways network.**

3.2.8 AECOM considers that the CTM future model would provide a sound basis for the development of forecasts to assess the impact of the TCBGC on the SRN. This would be either through the direct application of CTM model to test the proposals, or to provide outputs to support the development of detailed modelling involving microsimulation or local junction models.

3.2.9 However, forecasts prepared using CTM would require sensitivity testing to take account of the greater uncertainty arising from Covid-19.

3.2.9 **Aecom recommends that when preparing forecasts from assessing TCBGC, to comply with advice set out in paragraph B.2.3 of TAG M4 issued in May 2023, sensitivity testing should be carried out to assess the further potential for change with respect to the long term impacts of Covid-19. This sensitivity testing should be carried out in line with advice and best practice set out within the DfT's Uncertainty Toolkit.**