Appendix A - Traffic Modelling Proof of Evidence - Chris MacDonald

SUPPORTING EVIDENCE

SUPPORTING EVIDENCE PROVIDED BY
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PUBLIC INQUIRIES INTO:

THE ESSEX COUNTY COUNCIL (GILDEN WAY/SHEERING ROAD (B183) IMPROVEMENT/WIDENING/REALIGNMENT, A1025 NEW LINK ROAD FROM B183 TO M11 AND GRADE SEPARATED JUNCTION/ROUNDABOUTS AT M11 JUNCTION 7A SCHEME) (PHASE 1) COMPULSORY PURCHASE ORDER ("CPO")

and

THE ESSEX COUNTY COUNCIL (GILDEN WAY/SHEERING ROAD (B183) IMPROVEMENT/WIDENING/REALIGNMENT, A1025 NEW LINK ROAD FROM B183 TO M11) SCHEME) (CLASSIFIED ROAD) (SIDE ROADS) ORDER ("SRO")

and

THE HIGHWAYS ENGLAND COMPANY LIMITED (M11 HARLOW NORTH JUNCTION (7A) (SLIP ROADS, SPECIAL ROADS) SCHEME 2018 ("SPECIAL ROADS SCHEME")

National Transport Casework Team reference: NATTRAN/E/LAO

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1. Introduction

1.1. My name is Chris Macdonald and I am an Associate Transport Consultant at Jacobs. I am a Chartered Member of the Institute of Logistics and Transport (CMILT) and I am currently preparing my submission for the Transport Planning Professional Qualification (TPPQ) through the Transport Planning Society (TPS).

1.2. I have worked for Jacobs since October 2016, joining as a Principal Consultant. I have recently been promoted to Associate Transport Consultant. Prior to Jacobs I joined Halcrow as a graduate in 2008 and progressed through to Senior Transport Consultant before joining Jacobs. I have worked on a wide range of projects in this time both in the UK and internationally. Between 2008 and 2016 Halcrow became CH2M and during this period in 2013 I also completed a part time MSc in Transport Engineering and Planning at the University of Salford.

1.3. I have been Traffic and Economics discipline lead on the Harlow M11 J7a scheme since August 2017. I have overseen the development of the traffic forecasting, modelling and economics of the scheme through the PCF Stage 4 gateway. I am responsible for both resource management, technical guidance, task coordination and quality assurance within this discipline.

2. Scope of Evidence

2.1. In my evidence I will:

- Provide background as to the development of the 2014 base VISUM traffic model and how this model is considered an appropriate tool to assess this scheme.
- Provide a narrative as to the scheme option appraisal process which identified the M11 J7a scheme as the preferred option.

2.2. In doing so I will draw upon the evidence of the other experts as required who are presenting evidence to the inquiry.

3. Harlow Stansted-Gateway Traffic Model Audit

3.1. TAG outlines the level of modelling and appraisal required at various stages of a scheme's development. For the M11 J7a scheme, it was identified in early 2014 that a review of the existing traffic model (Harlow Stansted Gateway Traffic Model – HSGTM) covering the M11 J7a study area should be undertaken. This review would seek to establish the suitability of the HSGTM in its existing form and identify what work (if any) would be required to ensure the model is suitable for this stage of assessment.

RAG Analysis for use for M11 J7a (18 March 2014)

3.2. The purpose of this note was to provide a full Red/Amber/Green (RAG) review of the Harlow Stansted Gateway Traffic Model (HSGTM) Local Model Validation Report (LMVR) Rev 5 from January 2013. This assessment sought to provide an understanding as to the fitness for purpose of the HSGTM model for use in supporting Essex County Council's Business Case for the M11 Junction 7a.

3.3. This review was completed with reference to the LMVR document. The HSGTM was a SATURN model and was developed and managed by AECOM.

3.4. Based on the RAG analysis, it was recommended that investment in an update of the HSGTM was undertaken to assess the M11 Junction 7a scheme in order to incorporate new traffic data and economic parameters as well as evolving industry forecasting methodologies.

3.5. Based on this recommendation, a further proposals paper was developed which highlighted the options to bring the planed Stage 2 and 3 modelling

in line with TAG to support the M11 Junction 7a Outline and Final Business Cases.

Recommendations Report (24 March 2014)

3.6. Building on the RAG analysis review, the purpose of this note was to provide recommendations for the update of the transport modelling that was deemed necessary to support Essex County Council's (ECC) Business Case for the M11 Junction 7a scheme. This note fully established the requirement for a robust analysis and appraisal method, with reference to TAG guidance.

3.7. It was acknowledged that, the existing HSGTM would be suitable for use at the SOBC stage of assessment, including selection of the preferred route. However, the use of this model at this stage would still present risks as the findings and conclusions drawn from the existing model may not be suitable to inform all of the required elements of the public consultation. Further, the HSGTM would not be able to provide suitably robust outputs to support the planning application.

3.8. Taking the above into account, to develop a robust assessment process in-line with current guidance, it was therefore recommended that a new demand model and new base matrices should be developed in line with current guidance (at the time of writing), and that this new model should include the capability for full variable demand modelling (VDM) so to sufficiently account for potential modal shift generated by the scheme.

Software Review

3.9. Building on the HSGTM audit review and recommendations report, this technical note presented a review of potential software options in terms of their strengths and weaknesses in the evaluation of the M11 Junction 7a scheme. The review drew on Jacobs' use and application of a number of

different software types and, in some cases, supplemented with information provided by other users and software suppliers. The note formed the basis for discussions to be held with key stakeholders with regard to developing the Appraisal Specification Report for the M11 J7a scheme. This took place as in the form of a Transport Modelling Working Group. The review was intended to minimise the risks in terms of delivery and acceptability of model outputs for use to support the Planning Application of a Major Scheme Business Case (MSBC), such was the stage of the M11 J7a scheme development at the time of writing.

3.10. Three industry dominant software options were considered:

- SATURN
- CUBE (Voyager)
- VISUM

3.11. The review of model software options scored against a series of criteria and sub-criterion covering the areas of Technical Capabilities, Model Usability & Audit and Software Support & Local Requirements. An initial scored assessment was undertaken by experienced Jacobs staff who were highly proficient in the use of these three software options and were aware of the M11 J7a scheme. This scored assessment was subsequently completed independently by a separate set of experts with no local knowledge of the client or M11 J7a scheme.

3.12. At the time of this review, the HSGTM covering Harlow and the proposed area for the M11 J7a scheme was a SATURN model. However, Jacobs' client, Essex County Council, did not have direct access to this model (owned and managed by AECOM) or access to the data used to develop it. While the potential to build on this model was considered, this option was discounted due to:

- The risk of not receiving the HSGTM model from AECOM, which would result in a default position of requiring a new model to be developed.

- Full due diligence would need to be undertaken on this model, which would add cost and time to the model development.

3.13. A summary of the advantages and disadvantages of each model, with reference to M11 J7a and the requirements of Essex County Council are provided below (technical references are correct as of March 2014).

SATURN	VISUM	CUBE (Voyager)
• Same software as the existing HSGTM and the standard software for highway MSBC applications • SATURN is the only software to offer both blocking back and flow metering functionality. • Cumbersome software interface and lengthy model development times means that other software choices can offer better value for money, especially when starting from scratch	• VISUM recently introduced blocking back and flow metering functionality. • At the time of the review, VISUM was better at integrating with GIS and 'talking' to VISSIM which would likely be needed at a later stage of scheme development. • At the time of writing, it has not yet been confirmed that VISUM would be accepted as a fully compliant WebTAG highway assignment model package, although the software provider states that it is compliant.	• Widely used in the UK in support of public transport schemes and can be used for non-MSBC highway modelling, although there are no plans to make the highway component fully WebTAG compatible. • Strong GIS and scenario management capabilities. • Limited network detail and no offer of blocking back and flow metering functionality which will affect the accuracy of the traffic modelling • Used more commonly overseas and on grid-based networks. • Most likely used as a GIS add-on to a SATURN network.

4. Appraisal Specification Report (October 2014)

4.1. The Appraisal Specification Report (ASR) set out the methodology to appraise the M11 Junction 7a (and potentially alternative) schemes through to, initially, a preferred route announcement. At this point, the contents of the ASR would be reviewed in order to capture any modifications required, based on scheme adjustments or changes in guidance at that time.

4.2. This ASR detailed how the traffic model would be used to provide relevant information for the Public Consultation for the scheme. The traffic model and ASR would be subsequently updated for use as part of the scheme Planning Application at later stage.

4.3. At the time of writing, the ASR detailed the development of the VISUM Harlow Transport Model, which would later be detailed within the Local Model Validation Report.

4.4. The ASR set out the method of defining an appropriate Core scenario:

- Assemble demographic, economic and other data for the study, drawing on the TEMPRO database and RTF13 (RTF14 if available) for LGV and HGV forecast growth trends;
- Consider the sources of uncertainty and qualitatively assess their likelihood, using an uncertainty log, developed in conjunction with ECC and local planners; and
- Establish a core scenario, based on local data, constrained to NTEM v6.2 for compliant use in the preferred route announcement and a transport business case.

4.5. For reasons detailed further below, the exact Core scenario undertaken within later assessments is detailed within the corresponding assessment report.

5. Traffic Data Collection Report (12 July 2016)

5.1. The Traffic Data Collection Report was an industry standard document detailing the data used to support the development of a highway traffic model of the Harlow area to assess a potential new junction on the M11. These data sources would later provide the necessary information for the model building process and for the calibration and validation of the Harlow Transport Model. This was later reported within the Local Model Validation Report.

6. Local Model Validation Report (06 May 2016)

6.1. The LMVR was an industry standard document detailing the model construction, validation and calibration for the new Harlow Traffic Model based on traffic data collected in 2014, hence defining the model base year.

6.2. The model was constructed in VISUM following the latest DfT Highway Assignment Modelling Guidance. The demand data used in the model was a mixture of observed and synthetic data. Observed mobile phone data was collected in an area stretching from Epping in the south to Bishop's Stortford and Stansted Airport in the north. Synthetic demand was generated from established sources including National Trip End Model, Census, National Travel Survey, and Bluesheep employment survey data. The network was created from the ITN network, a reliable data source provided by Ordnance Survey. The network was coded with reference to online aerial photography and specific data provided by Essex County Council and Hertfordshire County Council.

6.3. Overall, the LMVR demonstrates that the model performs well against the modelling assessment criteria thus providing reassurance that the model is representative of conditions in the 2014 base year. It was recognised that the link flow and screenline validation fell slightly below WebTAG

guideline threshold criteria, however for journey time validation the criteria was exceeded.

6.4. With specific reference to the area surrounding the proposed M11 J7a junction, the model replicated well the observed levels of link flow and routing. This representation of traffic conditions gave confidence for an accurate transfer of trips to any such modelled scheme in forecast models. In addition to the area around the scheme, the model met link flow calibration at other key junctions on the M11.

6.5. In addition, the model met link flow calibration at J7 and attention was made to ensure that the main A414 – M11 north –south movement was accurately represented. The flow of trips east and west across Harlow validated to criteria giving further confidence in assessing any network changes in the Harlow area. Routing through the model was also considered to be accurate and checks were carried out to check that delay was at the correct junctions in the model, particularly in peak periods.

6.6. Considering the above, the model was considered fit for purpose for the assessment of a new junction on the M11 as well as for the assessment of alternative schemes in the Harlow, M11 and A414 area.

7. Model Forecasting Report (12 April 2016)

7.1. The 2016 Model Forecasting Report (MFR) detailed the development of forecast models for use in assessing the proposed M11 J7a scheme. This report formed part of the Stage 2 PCF Gateway.

7.2. The forecast models were developed for two future years: 2021 which at the time of writing, was the anticipated opening year of the scheme, and a forecast year 2036.

7.3. The 2016 MFR was developed in line with TAG guidance published in November 2014.

7.4. Three growth scenarios were developed for these assessment years, covering an NTEM Growth Scenario, a Medium Growth Scenario and a High Growth Scenario.

- NTEM Growth – Estimation of the level of future housing and employment based upon official NTEM projections. This scenario was constrained to NTEM levels of projected growth.
- Medium Growth – This includes all developments defined as ‘near certain’ or ‘more than likely’ and was considered a more optimistic prediction of growth. This scenario was not constrained to NTEM.
- High Growth – This scenario is an optimistic forecast of growth and was considered to represent levels closest to the relevant local plan predictions. This scenario was not constrained to NTEM.

7.5. TAG guidance states that the Core Scenario should be the growth scenario, which represents the least level of uncertainty. TAG states that this is usually defined as a scenario which:

- Includes NTEM growth in demand;
- Includes sources of local uncertainty that are ‘near certain’ or ‘more than likely to occur’; and
- Uses appropriate general modelling assumptions.

7.6. For the 2016 MFR assessments therefore, the NTEM scenario is deemed to be the Core scenario.

7.7. At the time of writing it was understood that the NTEM models were being updated and that they did not include the latest levels of forecast growth that were being driven by the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG). Accordingly, it is being assumed that the core scenario represents a low growth situation.

7.8. In line with TAG guidance, an Uncertainty Log was developed which contained the latest land use and infrastructure development assumptions which would affect future travel demand and supply. To help identify

appropriate development to be included in the three alternative forecast models, a list of prospective developments was provided by ECC and the districts within the study area. This Uncertainty Log was developed in collaboration with the four key districts (Harlow, East Herts, Uttlesford and Epping Forest).

7.9. The Uncertainty Log contained:

- Locations and magnitude of future development sites, obtained from the various districts and key documents;
- future year transport schemes collated from discussions with local authorities in collaboration with Planning Officers and co-ordination with Highways staff; and
- classification of the likelihood of development and transport schemes coming forward based on table A2 of TAG unit M4.

7.10. The core scenario (NTEM Growth) includes all “near certain” and “more than likely” but no “reasonably foreseeable” or “hypothetical” schemes.

7.11. The tables below show the total number of dwellings and jobs added for each modelled year and for each growth scenario.

Forecast Dwellings	2014-2021			2014-2036		
District	**NTEM**	**Medium**	**High**	**NTEM**	**Medium**	**High**
Harlow	2,613	2,613	3,168	3,643	4,643	7,479
East Herts	3,789	6,311	7,018	5,232	12,246	16,039
Epping Forest	3,561	4,121	4,399	4,472	7,767	8,987
Uttlesford	4,427	4,456	4,456	6,692	9,792	12,792
TOTAL	**14,390**	**17,501**	**19,040**	**20,039**	**34,448**	**45,297**

Forecast Jobs	2014-2021			2014-2036		
District	**NTEM**	**Medium**	**High**	**NTEM**	**Medium**	**High**
Harlow	3,514	3,514	3,514	8,531	8,531	8,531

Forecast Jobs	2014-2021			2014-2036		
District	**NTEM**	**Medium**	**High**	**NTEM**	**Medium**	**High**
East Herts	158	599	599	400	2,000	2,397
Epping Forest	503	1,035	1,385	2,463	7,634	10,646
Uttlesford	325	553	553	1,627	2,767	2,767
TOTAL	**4,500**	**5,701**	**6,051**	**13,020**	**20,932**	**24,341**

7.12. For areas outside of the four districts presented in the table above, TEMPro growth forecasts were used. These TEMPro growth factors were consistent between the three scenarios.

7.13. The growth factors used for Good Vehicles are presented within the table below.

Year	Growth Factor	
	LGVs	HGVs
2021	1.1893	1.0684
2036	1.6000	1.2557

7.14. For the key growth generator of Stansted, airport zone growth factors were calculated separately and applied to the zones that cover Stansted Airport in the model. Traffic growth factors provided by MAG were applied to be representative of airport growth up to 35mppa by 2030. This level of growth was capped at this point as this is the level of passengers by Stansted's planning application at the time of writing. The growth factors applied to the Stansted model zones are presented within the table below.

Year	Forecast Growth Scenario		
	NTEM	Medium	High
2021	1.44	1.44	1.44
2036	1.93	1.93	1.93

7.15. Primary and secondary school growth was derived from advice provided by Essex County Council and information obtained from draft Local Plans and development masterplans.

7.16. Also incorporated into the Uncertainty Log was a list of highway schemes and their levels of uncertainty. Those with 'Near Certain' or 'More than Likely' levels of certainty were coded into the core scenario models. An opening year was provided for each scheme and this determined which future year models each highway scheme was included in.

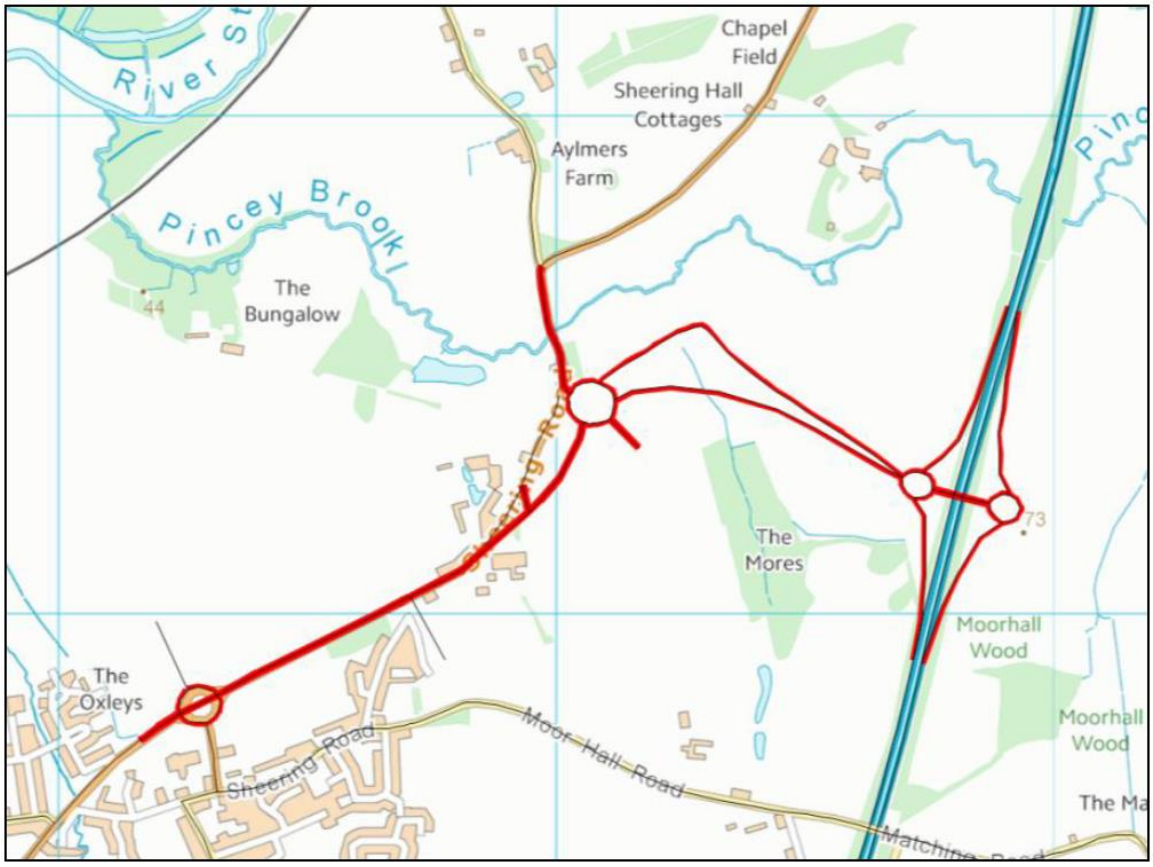
7.17. The generalised cost parameters were updated in the forecast models to reflect the changes in value of time and vehicle operating costs anticipated for 2021 and 2036. These projections were taken from the November 2014 version of the WebTAG databook, as referred to in TAG Unit M4.

7.18. The do-something network was created through the additional coding of the highway scheme elements presented within the table below. These scheme elements applied to both the 2021, 2036 and 2041 assessment year do-something models.

Table 3.6 : List of Highway Schemes for 2021 and 2036 Do-Something Models

Scheme Description	Scheme Probability	Opening Year	Dependant upon	2021 & 2036		
				NTEM DS	Medium DS	High DS
J7a Scheme		2021		Y	Y	Y
Lower Sheering Rd, local access only	More than likely	2021	J7a	Y	Y	Y
Reduced speed limit on Gilden Way	More than likely	2021	J7a	Y	Y	Y
HGV ban through Old Harlow and Churchgate St	More than likely	2021	J7a	Y	Y	Y

7.19. The M11 scheme link coding is presented within the figure below. The additional arm to the south east of the new roundabout of Sheering Road represents the primary access to the Harlow East housing development.



7.20. The results of the fixed demand assignments (non-variable demand modelling), were considered consistent with the scale of growth generated by the forecasting methodology and its assumptions.

7.21. Given the value and strategic importance of the M11 J7a scheme for road traffic in Essex, Hertfordshire and the wider region it was decided that a Variable Demand Model (VDM) was necessary to accurately simulate future traffic conditions.

7.22. All forecast models achieved convergence within the parameters set. The models reached a suitable level of stability and proximity, and consequently the forecast models can be seen as fit for purpose for appraising the proposed scheme. It should be noted that the models did not reach the same levels of convergence as the base year models.

8. Option Assessment Report (May 2016)

8.1. The Option Assessment Report (OAR) documented the Stage 1 scheme appraisal process of identifying the need for intervention and the process of option development and selection.

8.2. Stage 2 involved the further appraisal of a small number of better performing options in order to enable decision-makers to make rational and auditable decisions about whether or not to proceed with the intervention.

8.3. TAG states that forecasts of population, households and employment should be based on the TEMPRO database. While this provides a useful reference case with which to compare model outputs (and provides consistency of approach with other scheme appraisals), for the M11 J7a OAR it was considered pertinent to base the evaluation on the best available planning data at the time of assessment, rather than TEMPro forecasts. This was due to TEMPRO forecasts at that time, not including the latest Local Plan information and therefore were very much lower than the emerging Local Plan growth predictions. This aspect is detailed further within the Model Forecasting Report summary above. Outside of the core four districts, TEMPRO background growth factors were applied.

Table 4.2 Inputs to 2036 Highway Modelling Matrix Building (Medium Growth)

District	Estimated Housing	Estimated Jobs
Harlow	4,850[#]	6,000
Epping Forest	6,575	9,725
East Herts	15,550	2,400
Uttlesford	10,455	7,750
Other Districts	18,775	9,800

[#] It should be noted that the level of development in the immediate vicinity of Harlow will include sites that are located within East Herts and Epping Forest. These would comprise around 8,000 homes that would also be likely to impact on the immediate area of Harlow.

8.4. The modelling undertaken for the purposes of the OAR, included an evaluation of the 'without intervention' scenario, referred to as the 'Do Minimum model'.

8.5. The future year matrices were developed using an Uncertainty Log, which contains the best available planning information obtained from the various districts at the time of assessment (as detailed above).

8.6. Following WebTAG guidance, a Constrained version of this model was also run, in which the growth was constrained to TEMPRO. As per guidance, the Constrained models included those sites and schemes which were considered near certain (NC) or more than likely (MtL), and with overall district and model area growth constrained to TEMPRO.

8.7. A summary of these scenarios is provided in the table below.

Table 4.4 Transport Intervention Determination Modelling Scenarios

Scenario	Network	Matrix
2014 Base	Existing network	2014 matrix
2021 Do Minimum	Includes schemes in Table 4.3	Base plus committed development plus TEMPRO background growth
2036 Do Minimum - Constrained	Includes schemes in Table 4.3	Base plus Local Plan NC & MtL sites, constrained to TEMPRO
2036 Do Minimum - Unconstrained	Includes schemes in Table 4.3	Base plus Local Plan sites; TEMPRO growth applied to non-study area trips

8.8. As the Unconstrained modelling shows the greatest impact on the network due to the level of growth included, all outputs reported in the OAR were based upon the outputs from the Unconstrained scenario.

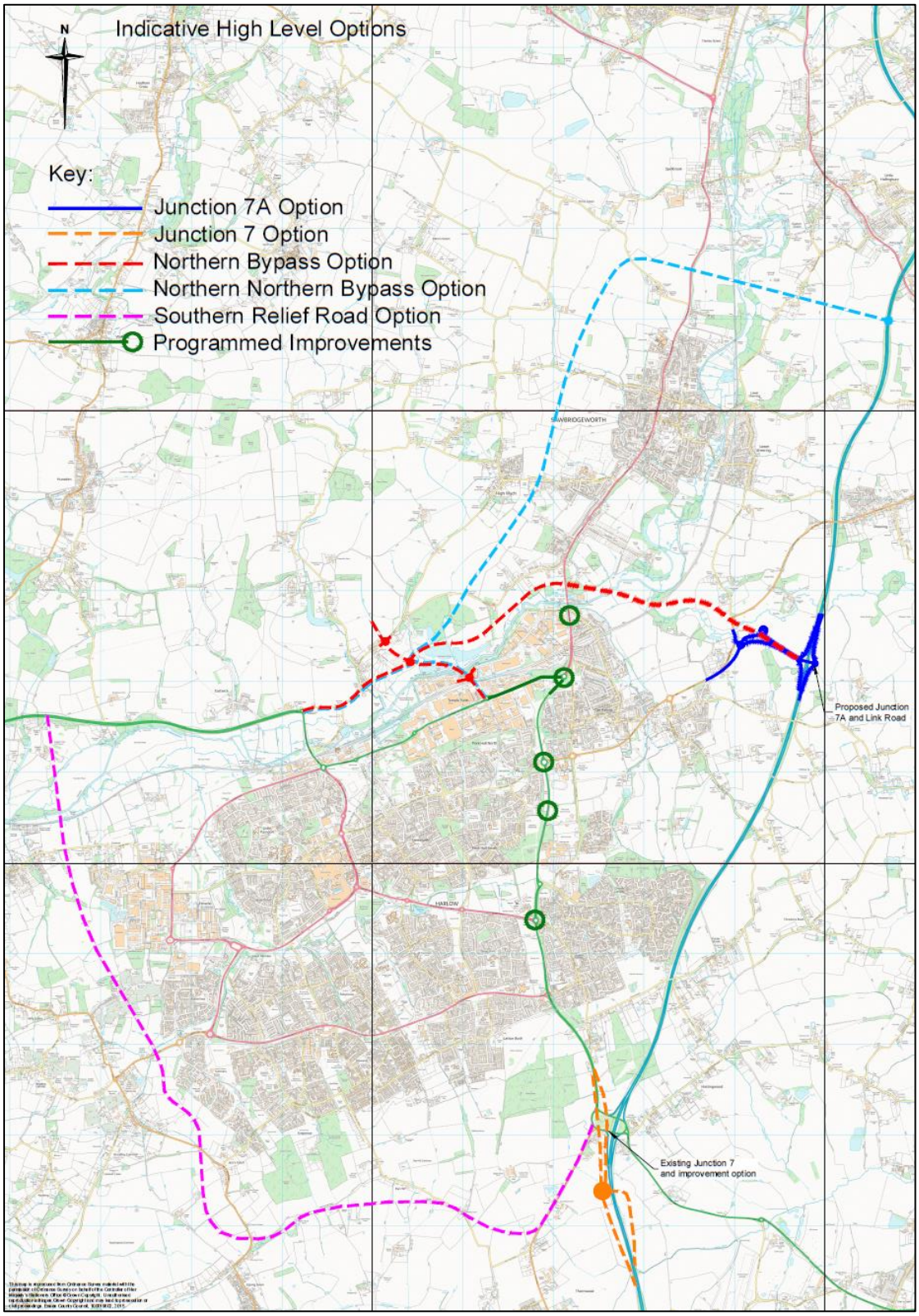
8.9. The OAR contained a review of numerous feasibility studies undertaken in and around Harlow through the 1990s and 2000s. These historical studies included:

- Evaluation of Alternative A1184-M11 Connections (1994)

- The Harlow Transportation Study (2005)
- J7 Harlow: Direct access with A414 (2005/6)
- A414-M11 Link Road Feasibility Report (2007)
- Harlow Eastern Access Study (2011)
- Harlow Junction 7a Feasibility Study (2011)

8.10. Through these studies, the OAR established that a number of options identified fulfil either all or most of the scheme objectives. For the purposes of the OAR, the options were refined to the following:

- **Option 1:** New M11 junction to east of Harlow, J7a, with local link to B183 Gilden Way;
- **Option 2:** Improved M11 J7;
- **Option 3:** Both Option 1 and Option 2;
- **Option 4:** **‘**Northern Bypass’, which includes a dual carriageway link from J7a through to A414 at Eastwick, and an additional single carriageway access into Harlow via River Way;
- **Option 5:** ‘Northern Northern Bypass’, which comprises a dual carriageway link from A414 at Eastwick, aligned to the south of Gilston, and then to the west of Sawbridgeworth, connecting with the M11 via a new junction south of Little Hallingbury;
- **Option 6:** ‘Southern Relief Road’, which comprises a dual carriageway link from the A414 east of Roydon, skirting the western and southern edges of Harlow, and connecting with J7 via the B1393. The image below presents these option concepts.


N
Indicative High Level Options
Key:
Junction 7A Option
Junction 7 Option
Northern Bypass Option
Northern Northern Bypass Option
Southern Relief Road Option
Programmed Improvements
BISHOP'S STORTFORD
HARLOW
Proposed Junction 7A and Link Road
Existing Junction 7 and improvement option

8.11. Each of the scheme options where evaluated via three methods:

- Highway assignment modelling of options – assessed using the VISUM forecast models set out within the Traffic Forecasting Report and as per the Appraisal Specification Report.
- Economic appraisal to estimate BCR and VfM – high level option costs for each option were offset against the benefits generated by the time saving benefits of the scheme using standard TAG values of time.
- EAST high level evaluation – each option was assessed using the DfT's Early Assessment and Sifting Tool (EAST) guidance.

Highway Assessment

8.12. With regards to the highway assignment model assessments, the bullet points below are the extracted conclusions from the OAR for each option.

- Option 1: Junction 7a – this option would improve access to Harlow without attracting additional through-traffic.
- Option 2: Junction 7 – while this scheme provides some additional capacity at J7, it has little impact on Harlow itself, and does not provide any relief to the pattern of trips within the town.
- Option 3: Junction 7 and Junction 7a – given that the J7 scheme modelled is unlikely to be implemented in the layout modelled, the VISUM model outputs have provided a broad indication of the combined effects of having both schemes in place, and it is considered that these are generally consistent with or better than the impacts of the individual schemes.
- Option 4: Northern Bypass (& J7a) – this option would have little overall effect on the level of traffic within Harlow itself, but would facilitate more strategic movements around the town. It would not improve the accessibility of Harlow for the majority of trips on the local network, which either have origins or destinations within the town

- Option 5: Northern Northern Bypass – this option would have a lower overall effect on the level of traffic within Harlow than the Northern Bypass, and would be likely to attract more strategic movements around the town. It would not, therefore, improve the accessibility of Harlow for the majority of trips on the local network, which either have origins or destinations within the town,
- Option 6: Southern Relief Road – would have the least overall effect on the level of traffic within Harlow than all of the options being assessed, and would also attract fewer strategic movements around the town. It would not, therefore, improve the accessibility of Harlow for the majority of trips on the local network, which either have origins or destinations within the town

8.13. Full details, including geographical outputs are available within section 7 of the OAR.

Economic Assessment

8.14. The economic appraisal assessment included within the OAR considered the estimated scheme option costs against the economic benefits generated by each option.

8.15. A set of preliminary scheme costs were developed for each of the intervention options. These were based on high level concept drawings, from which capital and maintenance costs were also estimated and assumptions made about the overall scheme budget. The build up of these option costs was detailed within the ‘Order of Magnitude Estimate’ report (28 May 2015).

8.16. The summarised high-level cost estimates for each option are presented in the table below. These figures contain 44% Optimism Bias in line with TAG guidance for this stage of scheme development.

Table 7.9 High Level Option Costings (Q2 2015, rounded to £0.1m)

Element	Junction 7a	Junction 7	Junctions 7 & 7a	Northern Bypass	Northern Northern Bypass	Southern Relief Road
Construction	44.3	48.1	92.4	234.6	190.3	155.1
Land	2.2	2.0	4.2	9.4	7.3	7.1
Preparation	8.2	8.9	17.1	43.5	25.3	28.7
Supervision	2.2	2.0	4.2	9.4	7.3	6.1
Maintenance	27.0	20.5	47.5	114.7	87.7	150.5
Total (£m)	83.8	81.6	165.4	411.6	327.8	346.5

8.17. Monetised journey time saving benefits for each of the options were generated through applying WebTAG Values of Time (November 2014 release, v1.3b) to the journey time savings forecast within the VISUM modelling. These monetised benefits were discounted to 2010 values, as were the scheme costs to provide Net Present Values of Benefits (PVB) and Net Present Values of Costs (PVC).

EAST High-Level Evaluation

8.18. The DfT's EAST tool was used as the third element of option evaluation within the OAR.

8.19. EAST is consistent with Transport Business Case principles and has been developed to summarise and present evidence on options in a clear and consistent format. It utilises a simple 5-point Red/Amber/Green (RAG) system for each of the assessment areas, which aims to facilitate the early assessment and comparison of scheme options.

8.20. In addition to the use of the EAST spreadsheet tool, a further process was undertaken whereby each of the key elements of the EAST evaluation was weighted. This provided a simple scoring framework and enabled a broad

spreadsheet-approach evaluation of all of the options to identify what were likely to be the most beneficial schemes to take forward for more detailed analysis. The weighting was determined with reference to previous scheme evaluations, and comprised the averaged weighting from three independent reviewers, in order to provide as neutral a value process as possible.

8.21. Full details as to the EAST methodology applied and supporting worksheets are contained within the OAR.

9. Model Forecasting Report (15 March 2017)

9.1. The 2017 Model Forecasting Report (MFR) was produced following various updates to the traffic modelling and assessments reported with the 2016 MFR. This report formed part of the Stage 3 PCF Gateway.

9.2. The forecast models were developed for three future years: 2021 which at the time of writing, was the anticipated opening year of the scheme, and a forecast year 2036. The third assessment year, 2041, was developed and used for economic assessment purposes only.

9.3. The 2017 MFR was developed in line with TAG guidance published in November 2014.

9.4. As per the 2016 MFR, three growth scenarios were developed for these assessment years, however the components of these scenarios differed within the 2017 MFR covering an NTEM Growth Scenario, a Medium Growth Scenario and a High Growth Scenario.

- A low growth scenario (known as the NTEM Growth Scenario) based on NTEM 6.2 growth; and
- A core scenario (known as the Medium Growth Scenario) considered at the time by the scheme promoters to be the most likely growth scenario taking into account discussions with District officers and likely achievable build out rates;
- A high growth scenario (known as the High Growth Scenario).

9.5. TAG guidance states that the Core Scenario should be the growth scenario, which represents the least level of uncertainty. TAG states that this is usually defined as a scenario which:

- Includes NTEM growth in demand;
- Includes sources of local uncertainty that are ‘near certain’ or ‘more than likely to occur’; and
- Uses appropriate general modelling assumptions.

9.6. The core scenario growth level was based on NTEM within the 2016 MFR. However, the emerging Local Plans were indicating a very much higher level of growth than NTEM. In order to assess the design capability of the highway scheme and ensure that it could accommodate a higher level of growth, a ‘central’ level of growth was used, termed as Medium, and considered to be a realistic level of deliverable growth within the Plans period. Essex County Council and the Jacobs project team met with Craig Drury of Highways England who verbally advised that this was a reasonable and realistic approach to take.

9.7. As a result, the Core scenario assessed within the 2017 MFR was the Medium growth scenario.

9.8. In line with TAG guidance, an Uncertainty Log was developed which contained the latest land use and infrastructure development assumptions which would affect future travel demand and supply. To help identify appropriate development to be included in the three alternative forecast models, a list of prospective developments was provided by ECC and the districts within the study area. This Uncertainty Log was developed in collaboration with the four key districts (Harlow, East Herts, Uttlesford and Epping Forest).

9.9. The Uncertainty Log contained:

- Locations and magnitude of future development sites, obtained from the various districts and key documents;

- future year transport schemes collated from discussions with local authorities in collaboration with Planning Officers and co-ordination with Highways staff; and
- classification of the likelihood of development and transport schemes coming forward based on table A2 of TAG unit M4.

9.10. The core scenario (Medium Growth) includes all “near certain” and “more than likely”, as well as some “reasonably foreseeable” schemes, but there are no “hypothetical” schemes included.

9.11. The tables below show the total number of dwellings and jobs added for each modelled year and for each growth scenario. Note that TEMPro factors were used to represent the growth in trips between 2033 and 2036.

Table 4.1 : Forecast Dwellings

	2014-2021			2014-2033		
District	**NTEM**	**Medium**	**High**	**NTEM**	**Medium**	**High**
Harlow	1,431	3,034	3,034	3,658	7,216	7,216
East Herts	2,953	4,434	5,727	5,794	9,857	15,195
Epping Forest	340	2,253	3,620	1,287	4,924	8,731
Uttlesford	3,917	3,997	3,997	6,353	9,433	9,763
TOTAL	8,641	13,718	16,378	17,092	31,430	40,905

Table 4.2 : Forecast Jobs

	2014-2021			2014-2033		
District	**NTEM**	**Medium**	**High**	**NTEM**	**Medium**	**High**
Harlow	3,514	3,514	8,531	8,531	8,531	8,531
East Herts	0	436	2,847	543	2,847	2,847
Epping Forest	147	1,071	7,954	818	2,443	7,954
Uttlesford	1,459	3,605	14,143	2,825	9,576	14,143
TOTAL	5,120	8,626	33,475	12,717	23,397	33,475

9.12. For areas outside of the four districts presented in the table above, TEMPro growth forecasts were used. These TEMPro growth factors were consistent between the three scenarios.

9.13. The growth factors used for Good Vehicles are presented within the table below. These factors are consistent with the 2016 MFR.

Year	Growth Factor	
	LGVs	HGVs
2021	1.1893	1.0684
2036	1.6000	1.2557

9.14. For the key growth generator of Stansted, airport zone growth factors were calculated separately and applied to the zones that cover Stansted Airport in the model.

9.15. Growth factors were provided between 2014 and 2025, which is the point at which MAG estimates that Stansted Airport will reach 35mppa on current projections. Linear interpolation was applied to estimate growth factors for the 2015 to 2021 period. Traffic growth was assumed to be capped at the levels predicted for 2025 as at this point the Airport would not be able to accommodate any additional passenger growth within the current planning application.

9.16. The growth factors applied to the Stansted model zones are presented within the table below.

Year	Time Period	Direction	Forecast Growth Scenario		
			NTEM	Medium	High
2021	AM	Destination	1.58	1.58	1.58
2021	AM	Origin	1.62	1.62	1.62
2021	IP	Destination	1.57	1.57	1.57
2021	IP	Origin	1.71	1.71	1.71
2021	PM	Destination	1.20	1.20	1.20
2021	PM	Origin	1.13	1.13	1.13

Year	Time Period	Direction	Forecast Growth Scenario		
			NTEM	Medium	High
2036	AM	Destination	1.91	1.91	1.91
2036	AM	Origin	1.98	1.98	1.98
2036	IP	Destination	1.89	1.89	1.89
2036	IP	Origin	2.12	2.12	2.12
2036	PM	Destination	1.32	1.32	1.32
2036	PM	Origin	1.21	1.21	1.21

9.17. Primary and secondary school growth was derived from advice provided by Essex County Council and information obtained from draft Local Plans and development masterplans.

9.18. Also incorporated into the Uncertainty Log was a list of highway schemes and their levels of uncertainty. Those with ‘Near Certain’ or ‘More than Likely’ levels of certainty were coded into the core scenario models. An opening year was provided for each scheme and this determined which future year models each highway scheme was included in. This was consistent with that undertaken within the 2016 MFR.

9.19. The generalised cost parameters were updated in the forecast models to reflect the changes in value of time and vehicle operating costs anticipated for 2021 and 2036. These projections were taken from the November 2014 version of the WebTAG databook, as referred to in TAG Unit M4. This is consistent with those included within the assessments reported in the 2016 MFR.

9.20. The do-something network was created through the additional coding of the highway scheme elements presented within the table below. These scheme elements applied to both the 2021 and 2036 assessment year do-something models.

Table 3.7 : List of Highway Schemes for 2021, 2036 and 2041 Do-Something Models

Scheme Description	Scheme Probability	Opening Year	Dependant upon	2021, 2036 & 2041		
				NTEM DS	Medium DS	High DS
J7a Scheme		2021		Y	Y	Y
Lower Sheering Rd, local access only	More than likely	2021	J7a	Y	Y	Y
Reduced speed limit on Gilden Way	More than likely	2021	J7a	Y	Y	Y
HGV ban through Old Harlow and Churchgate St	More than likely	2021	J7a	Y	Y	Y

9.21. The M11 scheme link coding is presented within the figure below. The additional arm to the south east of the new roundabout of Sheering Road represents the primary access to the Harlow East housing development. In a change to that assessed within the 2016 MFR, the Churchgate Roundabout to the south-west of the scheme on Gilden Way was coded as a hamburger roundabout. Although this was not included within the scheme drawing it was agreed with ECC that this is would be a likely complementary scheme to M11 J7a and therefore should be coded in to the do-something models.

9.22. The results of the fixed demand assignments (non-variable demand modelling), were considered consistent with the scale of growth generated by the forecasting methodology and its assumptions.

9.23. Given the value and strategic importance of the M11 J7a scheme for road traffic in Essex, Hertfordshire and the wider region it was decided that a Variable Demand Model (VDM) was necessary to accurately simulate future traffic conditions.

9.24. All forecast models achieved convergence within the parameters set. The models reached a suitable level of stability and proximity, and consequently the forecast models can be seen as fit for purpose for appraising the proposed scheme. It should be noted that the models did not reach the same levels of convergence as the base year models.

10. Summary

10.1. This supporting evidence provided by Chris Macdonald has provided information as to the genesis and developing process of the traffic modelling undertaken in support of the M11 J7a scheme.

10.2. This evidence has required the review of numerous technical documents and presented these in chronological order in order to demonstrate the development and evolution of the traffic model from inception through to PCF Stage 3.

10.3. The table below presents the reports reviewed as part of the evidence base.

Date	Document
18/03/2014	Harlow Stansted Gateway Traffic Model Audit
24/03/2014	Recommendations Report
31/03/2014	Software Review
01/10/2014	Appraisal Specification Report
12/07/2016	Traffic Data Collection Report
06/05/2016	Local Model Validation Report
12/04/2016	Model Forecast Report (Stage 2)
10/05/2016	Option Assessment Report
15/03/2017	Model Forecast Report (Stage 3)