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Epping Forest District Council

Local Plan Submission Version

Transport Assessment Report

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The sole purpose of this report and the associated services performed by Ringway Jacobs is to document the highway modelling developed to date for the Epping Forest District Local Plan Submission Version.

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Executive Summary

Background

Epping Forest District Council (EFDC) has prepared their Local Plan Submission Version (LPSV) for Examination in Public (EiP) by the Secretary of State. A series of assessments have been undertaken by Essex Highways, on behalf of EFDC and Essex County Council (ECC), to assess the potential transport related effects of the District's emerging Local Plan proposals and to help inform the final spatial strategy for submission.

As is made clear in the National Planning Policy Framework (NPPF) Planning Practice Guidance (PPG), this is an iterative process which becomes more refined and detailed as the process concludes. This report builds on the previous 'toolkit' of evidence prepared and provides an updated modelling methodology as well as a more detailed assessment of a potential highway mitigation package to accommodate future traffic growth associated with the LPSV.

The objectives of the study are to assess:

- the existing transport situation;
- the forecast transport situation with the LPSV;
- the future transport impacts and report the main transport issues;
- an initial package of future highway mitigation schemes; and
- the overall acceptability, in transport terms, of the LPSV.

The assessment is strategic in nature and based on a 'point in time' using available data. The eventual scale and delivery profile of development and associated traffic impact would need to be monitored across the Local Plan period to inform and update the ongoing need for mitigation.

The Epping Forest District (EFD) VISUM (v14) assisted spreadsheet Highway Assessment Model has been used to assess the Local Plan Submission Version (LPSV) future traffic growth. In addition to the principal model, there is a degree of overlap with the adjacent West Essex East Herts (WEEH) VISUM transport model and a VISSIM microsimulation model, which has also been developed to specifically assess air quality within the Epping Forest Special Area of Conservation (SAC). While the outcomes of this report focus on the outputs of the principal EFD Highway Assessment Model, reference is made to these associated models and latest outputs.

Existing Situation

The District is predominantly a rural commuter area in the south west of Essex on the north eastern edge of London. The District has a population of around 130,000, of which nearly three quarters live in the larger settlements of Loughton, Buckhurst Hill, Chigwell, Epping and Waltham Abbey.

There are several transport challenges focused around car travel and the impacts on congestion, air quality and overall network capacity. The primary focus of the Transport Assessment is to understand the traffic impact on the future highway situation and develop an initial mitigation strategy.

While it is recognised that any mitigation strategy is very likely to require physical improvements on parts of the network, to create additional capacity, it is also recognised that there are opportunities to not only capitalise on existing services, including the LUL Central Line, but improve sustainable transport infrastructure for buses, cycling and walking through the delivery of Local Plan development. These opportunities are discussed within the context of Local Plan development traffic and the overall strategy throughout this report.

Future Situation

The EFDC LPSV sets out the Council's strategy to deliver new homes; employment floor space; and school places, over the next 15 years. A range of scenarios have been assessed sequentially to demonstrate the iterative impacts of Local Plan development traffic, mitigation proposals and changes in driver behaviour, against the Existing situation and Do-Minimum situation. This provides a benchmark for overall acceptability of the Local Plan in transport terms.

The analysis shows that several junctions and links are currently either approaching or exceeding capacity. The Do-Minimum growth, where the full scale of development of the new Local Plan is not delivered, increases traffic levels by approximately 18% from current levels leading to additional capacity issues across the network.

The introduction of some sustainable transport choices reduces the traffic impact, from unconstrained levels. However, noting this is considered a worst-case assessment, the analysis highlights that the Local Plan Submission Version (LPSV) increases traffic levels by up to 36% with residual impacts on key junctions and corridors, with the need for more substantial physical highway interventions as well as further improvements to sustainable travel options.

A package of highway improvements has been tested and shown to either improve on the Do-Minimum or generate a similar level of performance at key junctions and links. The highway mitigation package remains at the concept design stage and would be subject to more detailed feasibility, design and potential change as or when brought forward.

While mitigation is evidently needed, and the package delivers significant benefits to highway capacity, there are residual impacts requiring further investigation. Considering DfT guidance on 'Peak Spreading', two further assessments have been undertaken of the existing network and mitigated network to examine the impacts of peak hour traffic redistributing into available peak shoulder spare capacity. These subsequent assessments allow a more moderate level (8% reduction) of traffic growth

to be assessed against the existing network and potential mitigated network during the peak hours. The analysis indicates that the full scale of mitigation tested may not be needed and that a proportionate approach, through monitoring and the promotion of other behavioural change measures, should be considered prior to the delivery of costly physical highway schemes.

Conclusions

The analysis demonstrates that the combination of more ambitious sustainable modal shift, changes in travel behaviour and a package of physical highway improvements could potentially mitigate the most significant impacts of the Local Plan. In many instances, junction approaches would deliver a similar level of performance over the existing situation, or at the least, improve on the 2033 Do-Minimum scenario, where no Local Plan growth or transport improvements are delivered.

The impact of traffic growth across the District will need to be monitored across the Plan period to ensure any mitigation proposed is either required or appropriate in scale.

It is acknowledged that the analysis identifies some localised residual impacts on part of the network, largely due to the challenges associated with delivering junction improvements in constrained urban or rural areas. The potential mitigation package should be considered as a minimum, on some parts of the network, and the scale of any required scheme will need to be monitored and refined throughout the Local Plan period. Any development coming forward would need to promote and test any mitigation within a Transport Assessment and Travel Plan, as part of a planning application, to ensure mitigation is delivered at an appropriate scale and 'fit for purpose'.

The ongoing assessment work for the West Essex East Herts (WEEH) Districts growth, including EFD sites at in the wider Harlow area, also identify that significant infrastructure improvements and ambitious sustainable modal shift is required to address impacts in and around Harlow and the M11.

1 Introduction

1.1 Overview

1.1.1 Epping Forest District Council (EFDC) has prepared their Local Plan Submission Version (LPSV) for Examination in Public (EiP) by the Secretary of State. A series of assessments have been undertaken by Essex Highways, on behalf of EFDC and Essex County Council (ECC), to assess the potential transport related effects of the District's emerging Local Plan proposals and to help inform the final spatial strategy for submission.

1.1.2 The work that has been undertaken accords with the approaches to developing a robust assessment of the transport impacts of both existing development as well as that proposed as set out in the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG). The work has been used to inform the development of the LPSV, particularly in relation to understanding the opportunities to improve the sustainability of transport provision, improving accessibility and understanding the transport implications of development proposals. This report, and the work undertaken to support it, forms one part of the 'toolkit' of evidence that the Council has used to inform the development of the LPSV.

1.1.3 As is made clear in the PPG this is an iterative process which becomes more refined and detailed as the process concludes. This report updates the previous assessments and sets out the concluding transport evidence for the LPSV. This includes updated methodologies and assessments to reflect more up to date data, more detailed development information and refinements to the package of mitigation measures and interventions required to support the Local Plan.

1.1.4 The transport evidence that has been developed also supports other evidence and the Council's, and its partners, understanding of any likely significant effects of air quality on the Epping Forest Special Area of Conservation (the SAC) arising from traffic growth. The transport work has therefore considered, for example, potential growth in traffic arising from development outside of the Epping Forest District administrative boundary, to assess the 'in-combination' effects of development on the SAC. It has also modelled all proposed housing and employment land, including factoring in development on windfall sites. In doing so it is important to recognise, based on experience, that there are occasions when a site allocated for development does not come forward as anticipated. As such the outputs contained in this report represent a worst-case with regard to traffic growth and therefore provides a robust assessment of the traffic related effects of the LPSV.

1.1.5 The EFDC LPSV Transport Assessment is a traffic modelling-based study to inform the decision-making surrounding the acceptability of allocated development sites and initial highway mitigation proposals at a strategic level. The modelling assessment has made use of a VISUM assisted spreadsheet model covering the key highway network and settlements within the District.

1.1.6 A range of scenarios have been tested previously to evolve and support the development of the emerging Local Plan through the pre-submission and consultation processes up to this point. The scenarios tested include: development available for future residential; commercial and educational land uses; infrastructure requirements; and opportunities to encourage sustainable travel choices.

1.1.7 This report sets out details of the transport model, the forecasting methodology, as well as the results and analysis of the traffic impacts of the LPSV development scenario as well as transport mitigation proposals. Further consideration is also given to the need for more ambitious sustainable travel (rail, bus and active modes) targets and as well as the possible impact of changes in travel behaviour e.g. Peak Spreading.

1.2 Objectives

1.2.1 The purpose of this report is to evaluate the likely transport impacts of the development proposed in the LPSV and potential mitigation proposals.

1.2.2 The objectives of the study are to:

- assess the existing transport situation on the principal highway network within Epping Forest District (EFD);
- identify and calculate the volume and distribution of vehicle trips based on the quantum and location of allocated developments, including residential, commercial and educational land uses, from the planning data provided by EFDC;
- forecast the transport impacts of the allocated development and report the main transport issues;
- forecast the transport impacts, including the benefits, or otherwise, of an initial package of future highway mitigation projects proposed in the Infrastructure Delivery Plan of the LPSV; and
- provide evidence of the overall acceptability, in transport terms, of the LPSV.

1.3 Interdependencies

1.3.1 Further consideration has also been given to 'cross boundary' impacts with the neighbouring Harlow District to the north. The EFD LPSV is inherently linked to growth at Harlow and includes four strategic sites, known as Garden Town Communities, either located on the boundary of the two Districts or which straddle the administrative boundaries. Separate ongoing modelling work is being undertaken to ensure the impacts of both Local Plans, as well as neighbouring East Herts and Uttlesford Districts, are considered holistically and, where available, the most recent results are discussed in this report.

1.3.2 The 'cross boundary' impacts with neighbouring Broxbourne District Council, particularly between Waltham Abbey and Waltham Cross, Uttlesford District

and Chelmsford City Council have also been considered as well as wider growth in outer London Boroughs.

1.3.3 The assessments included in this report account for external traffic growth from outside the District using the Department for Transport's (DfT) TEMPro planning tool, in addition to EFD LPSV growth, to ensure increases in cross boundary and through traffic are captured.

1.4 Report Structure

1.4.1 This report provides details of the transport modelling approach used to test and support the Local Plan Submission Version (LPSV). The following sections set out the modelling methodology, development assumptions, results and recommended next steps:

Section 2 Study Background – summary of work undertaken to date and key subsequent updates to modelling assumptions and methodology.

Section 3 Transport Base Model – methodology used to construct the Highway Assessment base model including traffic data, software and overall study area.

Section 4 Existing Transport Situation – description of the existing transport situation and challenges in the District.

Section 5 Local Plan Development – details the quantum and scale of development land uses promoted in the LPSV and tested.

Section 6 Model Forecasting, Trip Generation, Distribution and Assignment – overview of the Local Plan Submission Version and committed development scenarios tested with details of traffic forecasting.

Section 7 Future Sustainable Travel – identifies committed and potential sustainable travel schemes and opportunities within the District and wider area.

Section 8 Model Results and Analysis – Existing Network – summarises the traffic impact of Do-Minimum and Do-Something forecast scenarios on the existing highway network without mitigation.

Section 9 Future Transport Supply & Mitigation – describes an initial package of physical highway improvements to mitigate forecast Local Plan traffic related impacts.

Section 10 Model Results and Analysis – Mitigated Network – summarises the traffic impact of Do-Something forecast scenarios on the potential mitigated highway network.

Section 11 Model Results and Analysis – Peak Spreading – summarises the traffic impact of Peak Spreading assumptions on the existing and mitigated highway network.

Section 12 Wider & Cross Boundary Impacts – summarises the status of separate transport modelling being undertaken in parallel to assess interdependent, as well as wider effects, including Harlow District.

Section 13 Summary – a non-technical summary drawing together key findings and conclusions to the study.

2 Study Background

2.1 Previous Work

2.1.1 The EFD LPSV has been developed over the past five years using the outcomes of different technical assessments to determine the most sustainable and appropriate distribution of development across the District. While a range of different planning and environmental disciplines have contributed to this process, the transport assessment work has been used to assess the impact on the highway network, identify opportunities for sustainable travel and develop a package of reasonable highway interventions to mitigate the potential effects of additional traffic on the highway network as a result of Local Plan development.

2.1.2 The transport evidence base[1] prepared to date includes the following documents:

- **Essex Highways Technical Note 1: Base year junction capacity modelling (October 2013) –** an initial base year assessment to provide an understanding of highway performance.
- **Essex Highways Technical Note 2: Spreadsheet model development, latest study position and next steps (January 2014)** – supporting technical information on the development of a spreadsheet-based transport model to test future Local Plan development scenarios.
- **Essex Highways Technical Note 3: Early-Stage Forecast Modelling Results – Background Growth Only and Initial Local Plan 'Scenario' (May 2014)** – results of an initial Local Plan scenario test and comparison with a Do-Minimum situation.
- **Essex Highways Technical Note 4: Forecast Modelling Results from 7 x Development Scenario Tests (June 2014)** – results of further testing of 7 development scenarios to assess the traffic impacts of different spatial strategies and refine a preferred option.
- **Essex Highways Technical Note 5: Preliminary Mitigation Measures Modelling (July 2014)** – high-level assessment of initial transport and highway mitigation concepts to accommodate future Local Plan generated traffic growth.
- **Essex Highways Technical Note 6: Sustainable Accessibility Mapping and Analysis (December 2014)** – analysis and initial scoring of potential development sites in relation to access to sustainable travel modes and local services.
- **Essex Highways Technical Note 7: Sustainable Accessibility Ranking, Mapping and Analysis (April 2015)** – updated analysis of

[1] www.efdclocalplan.org/local-plan/evidence-base/

sustainable access and ranking of the sites included in the latest Strategic Land Availability Assessment (SLAA).

- **Essex Highways Technical Note 8: Sensitivity Testing / Car Ownership & Use Mapping (June 2016)** – further sensitivity testing of sustainable accessibility ranking with car ownership and journey to work mapping.
- **Highway Assessment Report (December 2017)** – further testing of the spatial strategy including an assessment of three site selection **Technical Assessments** and the Regulation 19 **Proposed Local Plan Submission Version** development scenario. The report set out the overall modelling methodology, further mitigation testing and modelling outputs.

2.2 Current Study

2.2.1 This report builds on the 'toolkit' of evidence summarised above and provides an updated detailed transport assessment of the LPSV development scenario.

2.2.2 The assessment includes updates to the modelling methodology as well as a more detailed assessment of a potential highway mitigation package to accommodate future Local Plan traffic growth. The key updates are summarised below and will be discussed in more detail throughout the report:

- **Rail Heading Car Trips** – The overall distribution of vehicle trips was previously based on car-based journey to work census data. It was considered that this methodology did not account for a proportion of vehicle trips that travel to nearby railway stations completing the journey to work by rail as the 'main mode' within the journey to work data. As a result, the model was perceived to be underestimating rail heading vehicle trips particularly within the main urban areas.
- **NTM / TEMPro** - The TEMPro methodology for background traffic growth in EFD has been updated to be more consistent with wider air quality assessment work. The updates include adjustments for the latest Local Plan (adopted and emerging) development information in neighbouring authorities and accounts for separate freight growth factors from the 2015 Road Traffic Forecasts (RTF).
- **'Car-Free / Reduced Car Parking' Development** – Policy T1 Sustainable Transport Choices of the LPSV makes provision for 'Car-Free' development at several sites within 400m of London Underground stations and 'Reduced Car Parking' development at sites located in EFD town centres. As EFD specific parking standards are yet to be developed and adopted, a conservative approach has been made to adjust trip rates at these sites and acknowledge some reduction in parking.
- **Junction Modelling Demand Profile –** Previous junction modelling assessments have used the Junction 9 ONE HOUR (ODTAB) demand profile to assess network performance. This methodology is utilised where only hourly data is available and synthesises an additional artificial peak

period within any peak hour assessment as a conservative worst-case. A more detailed review of available traffic data has been undertaken, which highlighted a more evenly distributed profile across the peak hours, and all modelling has been updated using the Direct Entry demand profile to account for actual peak hour patterns as a more realistic case.

- **Mitigation Package** – The initial package of mitigation, tested previously, has been reviewed to account for the latest modelling and updated with an improved level of design. While any mitigation still forms an initial package of conceptual designs for information purposes, and would be subject to feasibility and detailed design, the assessment does provide a greater level of confidence in deliverability and observed constraints than previously tested.
- **Peak Spreading** – Modelling has previously focussed on the peak hours when, by definition, the junctions are likely to be at their most congested. Increasing congestion in the peak hour is likely to result in a number of different responses in travel behaviour from the people making those trips. The Design Manual for Roads and Bridges (DMRB) outlines that Peak Spreading refers to 'a reduction in the proportion of traffic in the most congested part of the peak period, with corresponding increases immediately before and after the height of the peak' across the preceding and / or subsequent hour. While this is not necessarily considered as a mitigation measure, it is important to acknowledge and test these potential effects on the future traffic situation based on the available data. An additional assessment has been undertaken to understand the potential availability of capacity in the AM and PM 'peak shoulders', both with and without mitigation schemes, to supplement the peak hour assessments.

2.2.3 The adjusted modelling and assessment methodology has been applied to the LPSV development scenario to provide the most up to date assessment of the future traffic situation at the end of the Plan period.

2.2.4 As previously stated, the assessment is strategic in nature and based on a 'point in time' using available data. The eventual scale and delivery profile of development and associated traffic impact would need to be monitored across the Local Plan period to inform and update the ongoing need for mitigation.

3 Transport Base Model

3.1 Model Extent

3.1.1 The Epping Forest District (EFD) VISUM (v14) assisted spreadsheet Highway Assessment Model has been used to assess the Local Plan Submission Version (LPSV) forecast traffic growth.

3.1.2 The model includes the key road networks within EFD with a focus on the Waltham Abbey, Loughton and Epping settlements. In addition to the principal model, there is a degree of overlap with the adjacent West Essex East Herts (WEEH) / 'Harlow' VISUM transport model and a VISSIM microsimulation model, which has also been developed to specifically assess air quality within the Epping Forest Special Area of Conservation (SAC). While the outcomes of this report focus on the outputs of the principal EFD Highway Assessment Model, reference is made to these associated models and latest outputs.

3.1.3 Figure 3-1 below illustrates the extent of the principal Highway Assessment Model area as well as the extents of the associated WEEH / 'Harlow' VISUM and Epping Forest SAC VISSIM models for reference.

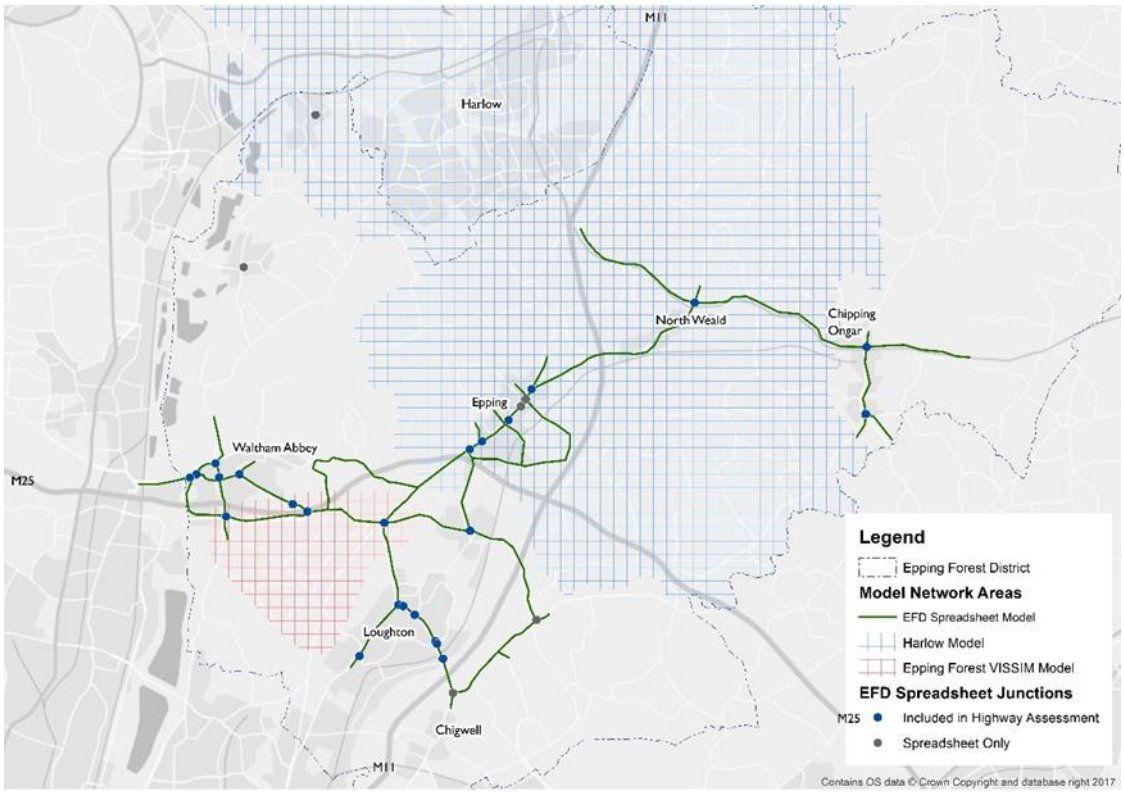


Figure 3-1 Model Extents

3.1.4 Figure 3-2 references the specific junctions tested in the Highway Assessment Model as well as peripheral junctions included in the model for information purposes only.

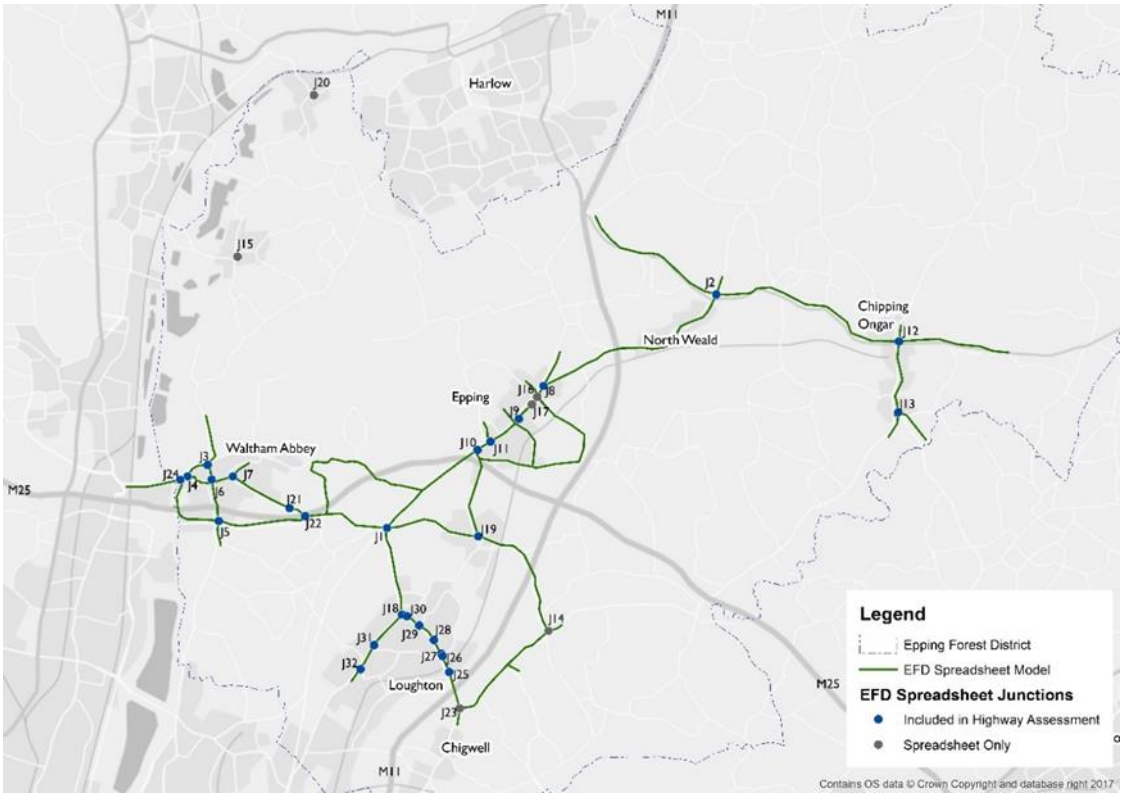


Figure 3-2 Highway Assessment (HA) Model Network and Junctions

3.1.5 The EFD Highway Assessment Model generates the forecast vehicle trip generation, distribution and assignment for the different future development and network scenarios. Model outputs are subsequently assessed in industry standard junction modelling software including:

- TRL's Junctions 9 to assess network performance of priority (T-Junctions and non-signalised cross roads) and roundabout junctions; and
- JCT's LINSIG v3.0 to assess network performance of traffic signals.

3.1.6 It is important to note that the model outputs do not account for detailed considerations including traffic interactions, dynamic reassignment and individual driver behaviour. The model can however, provide an appraisal of traffic problems across the core EFD geographical area including vehicle demand, junction performance and stretches of road likely to be operating above their theoretical capacity. These outputs will highlight areas where some form of mitigation is likely to be required to reduce the traffic impact of forecast development.

3.1.7 The modelling approach has been prepared in line with DfT / WebTAG modelling principles and was deemed reasonable in scale and fit for purpose, by Essex Highways in consultation with ECC and EFDC, to assess the highway network within the District under the given scenarios. This section discusses the overall methodology in more detail.

3.2 Spreadsheet Model Development Structure

3.2.1 The EFD Highway Assessment Model combines a spreadsheet interface with observed traffic data, estimated development trip data, TEMPro growth and a VISUM assignment module to derive different traffic scenarios across the modelled network.

3.3 Base Year

3.3.1 The model base year is 2017 and has been derived from a combination of 2013 and 2017 traffic data as well as TEMPro growth for 2013-2017.

3.4 Transport Modes

3.4.1 The model is not multi-modal and only includes the following vehicle classes:

- Car/Light Goods Vehicles (LGV); and
- Heavy Goods Vehicles (HGV).

3.4.2 Traffic flows are ultimately converted into Passenger Car Units (PCUs) for Junctions 9 and LINSIG junction modelling purposes.

3.5 Model Time Periods

3.5.1 The model includes the weekday AM and PM peak hours for the following periods:

- AM Weekday 0800-0900
- PM Weekday 1700-1800

3.5.2 These time periods have been identified as the typical network peak periods across the week and generally represent the typical peak traffic generation periods of future development proposed in the LPSV. The model time periods are therefore considered a robust worst-case for assessment purposes and do not reflect typical traffic conditions across the whole day.

3.5.3 A separate model has been created for the purposes of the Peak Spreading assessment. An average hour model has been created for the following AM and PM peak 3-hour periods to assess available capacity in the 'peak shoulders':

- AM Weekday 0700-1000
- PM Weekday 1600-1900

3.6 Model Area Zones

3.6.1 The model area has been divided into a series of zones to represent a geographical area where vehicle trips are generated by existing settlements and proposed development land uses. Zone sizes are determined by the concentration of highway network and routing options using larger zone

allocations in more rural and peripheral areas, with fewer roads, and smaller zones in more complex networks within urban areas.

3.6.2 The zone shapes and sizes were reviewed throughout the process to ensure they were suitable for the assessment of the potential pattern of development and to ensure that the vehicle trips generated would access the highway network at a relevant point. This ensured that the impact on the highway network could be captured more accurately. Figure 3-3 illustrates the zoning structure used within the model.

Figure 3-3 Map of Model Zones

3.7 Base Year Traffic Assignment

3.7.1 The 2017 base year traffic assignment is based solely on observed turning counts at the key junctions included in the model (see Figure 3-2). The data was sense checked against available automated traffic counts (ATCs) to ensure a typical day was captured at each junction.

4 Existing Transport Situation

4.1 Overview

4.1.1 Epping Forest District (EFD) is predominantly a rural commuter area in the south west of Essex on the north eastern edge of London. The District has a population of around 130,000, of which nearly three quarters live in the larger settlements of Loughton, Buckhurst Hill, Chigwell, Epping and Waltham Abbey. The remaining quarter live in settlements in the surrounding rural areas such as Chipping Ongar, Roydon, Nazeing, North Weald and Theydon Bois. The larger settlements are located on the edges of the Epping Forest Special Area of Conservation (the SAC), to the west of the District, and linked together by a radial road network focused on (Junction 1 see Figure 3-2) B1393 / A121 Wake Arms roundabout in the centre of the Epping Forest SAC.

4.1.2 This section provides a summary of the existing transport situation in EFD and includes an indication of the challenges presented by the delivery of significant development across the District in the next 15 years.

4.2 Travel Patterns

4.2.1 The rural nature of the District lends itself to a higher dependency on car or van travel. Table 4-1 summarises the method of travel for journey to work (JTW-Census 2011) in EFD, ECC and the East of England. Overall, while car travel is marginally lower in the District when compared to the county and regional averages, more sustainable modes, including rail, bus, cycle and walking are all lower too. However, access to the London Underground (LUL) Central Line generates a significantly higher proportion of underground users within the District.

JTW Method	East of England	Essex	EFDC
Work mainly at or from home	3.8%	3.6%	4.1%
Underground, metro, light rail, tram	0.8%	1.6%	13.0%
Train	4.8%	7.1%	3.0%
Bus, minibus or coach	2.5%	2.2%	1.4%
Taxi	0.3%	0.4%	0.8%
Motorcycle, scooter or moped	0.5%	0.5%	0.7%
Driving a car or van	41.4%	40.4%	37.8%
Passenger in a car or van	3.4%	3.1%	2.2%
Bicycle	2.4%	1.4%	0.6%
On foot	6.8%	6.1%	4.1%
Other	0.4%	0.4%	0.4%
Not in employment	32.9%	33.2%	32.0%
Total	**100.0%**	**100.0%**	**100.0%**

Table 4-1 EFDC, ECC & East of England Journey to Work Method of Travel (Census 2011)

4.2.2 The JTW-Census (2011) Origin-Destination data, summarised in Table 4-2, indicates that 28% of car or van commuter trips remain within the District with a further 29% travelling to neighbouring Broxbourne, Harlow and the wider Essex area. Overall, 32% of car journeys travel towards the eastern London

Boroughs and 11% towards the rest of London. When all modes are considered, journeys to work remaining within the District are relatively similar at 26%, however, London bound commuter trips increase to 52% again reflecting the impact of LUL connectivity.

JTW Destinations (%)	Epping	Loughton	North Weald / Ongar	Waltham Abbey	Rest of Epping Forest	EFDC Total	Harlow Broxbn. Uttsfd.	Wider Essex	East London	West London	Rest of UK	Total
Epping	14	8	1	1	10	34	16	6	27	8	9	**100**
Loughton	3	19	0	2	9	34	6	4	41	9	7	**100**
North Weald / Ongar	6	4	9	1	10	29	11	23	25	5	7	**100**
Waltham Abbey	3	5	0	11	8	27	17	3	20	23	10	**100**
Rest of Epping Forest	4	6	1	2	11	24	14	7	35	10	11	**100**
EFDC Total	5	9	1	3	10	28	13	6	32	11	9	**100**

Table 4-2 EFDC Car Journey to Work Origins and Destinations (Census 2011)

4.3 Road Network

4.3.1 The District is bisected by the east-west M25 and north-south M11 with accesses to the Strategic Road Network (SRN) at M25 Junction 26, M11 Junction 5 and Junction 7. The principal A414 route bisects the eastern part of the District and links Chelmsford, located to the east, with the M11. Routes throughout the District are predominantly single carriageway A-roads and B-roads, which link up the principal settlement areas. Figure 4-1 illustrates the principal road network within the District.

4.3.2 The volume of traffic using roads throughout the District can generally be accommodated throughout most periods of the day. However, periods of congestion do occur during the typical weekday periods of 0700-0900 and 1600-1800 within the urban areas and at key junctions across the network, including Wake Arms roundabout. **Appendix A** includes AM and PM peak hour congestion plots generated from DfT Trafficmaster data. The diagrams illustrate that the more congested parts of the network are:

- B1393 through Epping;
- A121 through Epping Forest Wake Arms Roundabout;
- A121 to the west of Waltham Abbey;
- A121 at M25 Junction 26;
- Junctions along A1168 to south east of Loughton; and
- B170 between Chigwell and Buckhurst Hill.

4.3.3 The impacts of congestion and mitigating the addition of LPSV development traffic are discussed later in detail as the principal focus of this Transport Assessment.

Figure 4-1 Epping Forest District Road Network

4.4 Road Safety

4.4.1 While this Transport Assessment does not specifically address matters of Road Safety, this section provides a high-level summary of the typical injury-collision trends affecting the District. Data has been analysed from the STATS19 injury-collision data for Epping Forest District for the most recent 5-year period up to 2017.

4.4.2 There are typically between 350-450 injury-collisions per annum on roads across the District. Approximately 1.5% of these result in a fatality each year and around a 25% result in serious injury. The remaining 74% of collisions result in slight injuries. Incidents are most likely to occur during the typical weekday periods of 0700-0900 and 1600-1800 in urban areas, with Friday evening recording the highest frequency.

4.4.3 Over half of the collisions occurred on urban roads (all roads up to and including 40mph). A fifth were on trunk roads (70mph dual carriageways), which in Epping Forest District comprises the Highways England (HE) network of the M25 and M11. The remaining 20% of collisions were on rural roads.

4.4.4 Figure 4-2 provides a 'heat-map' of injury-collisions for all severities on all roads for the 5-year period of 2012-2016. This includes the SRN at the M11/M25. The higher concentrations are shown in red and yellow and are more prevalent in the busier urban areas of Epping, Loughton and Waltham Abbey. There are also pockets of incidents at the M11 and M25 junctions, as well as at the Wake Arms roundabout located in the centre of the Epping Forest SAC.

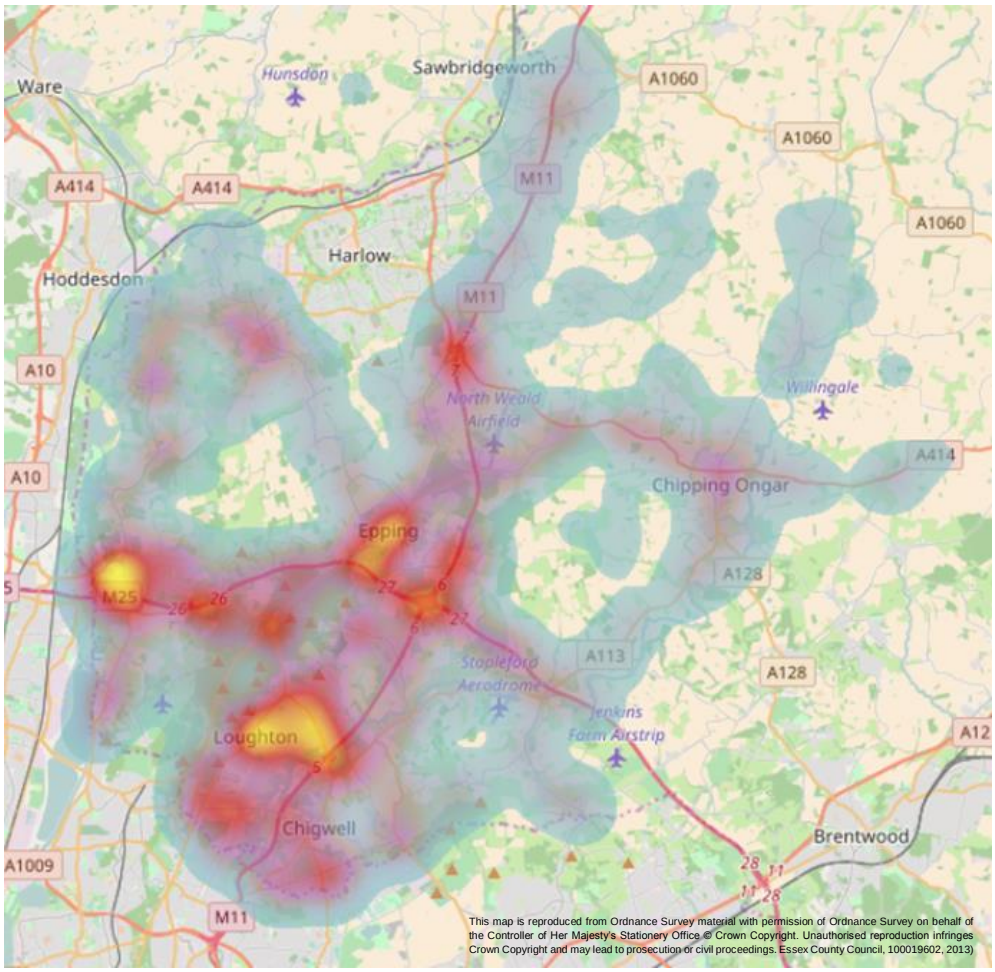


Figure 4-2 Injury-Collision Concentrations (All Severities) 2012-2016

4.4.5 Figure 4-3 shows the route analysis for collisions occurring between 2012-2016, which are classified as Killed or Seriously injured (KSI) on A-roads & B-roads in the District only and excludes the Highways England SRN. This shows the main concentrations of KSI collisions are in Loughton.

4.4.6 There is a notable cluster in Lower Nazeing comprising 6 serious collisions in 5 years within 400m of the junction between the B194 and local roads. There are also notable clusters on the A1168 and A121 in Loughton as well as at Buckhurst Hill. Several incidents have been recorded on stretches of the A414 between Chipping Ongar and North Weald; the B1393 through Epping towards Wake Arms roundabout; and sections of the B194 and A121 to the north and south of Waltham Abbey respectively.

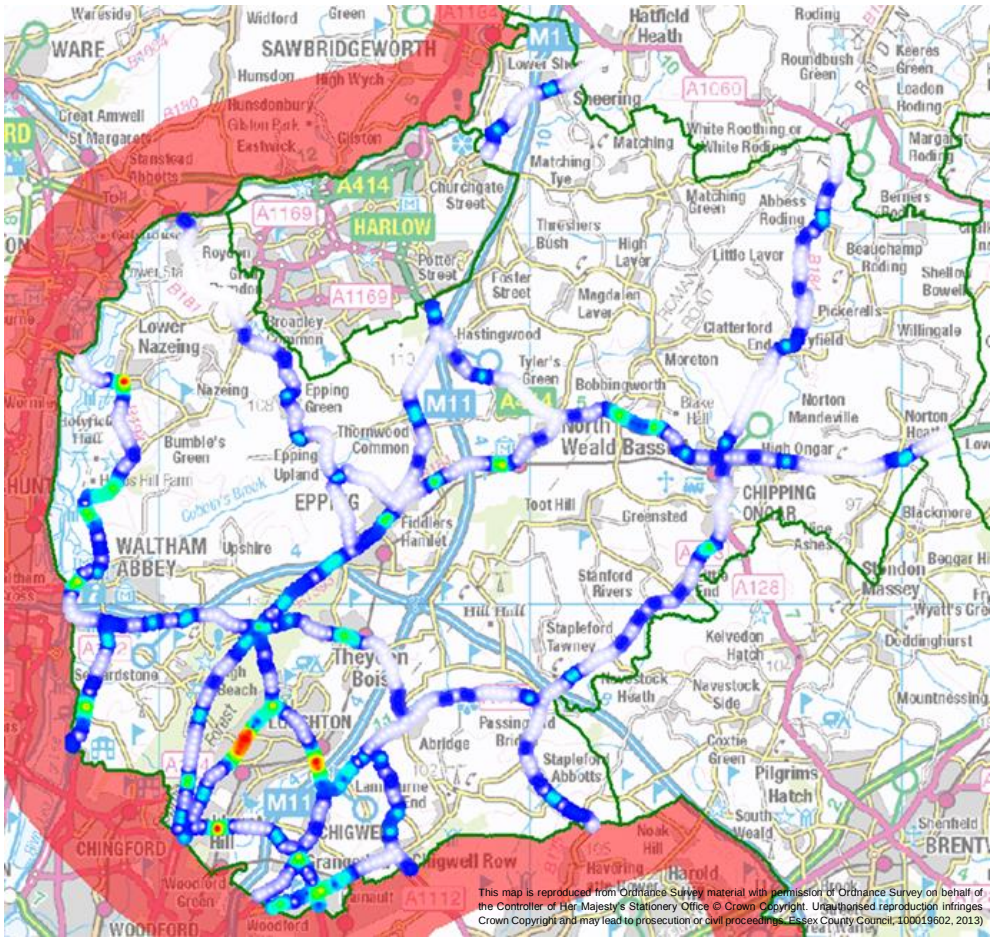


Figure 4-3 Route Analysis Killed or Seriously Injured 2012-2016

4.4.7 Vulnerable road users, including pedestrians, cyclists and motorcyclists, represent almost 25% of casualties. Over 10% of all casualties are motorcyclists, while typically accounting for only 0.5% of the distance travelled by all modes. When considered with the demographic of 16 to 25-year-old males being most at risk of being involved in an injury-collision across all modes, the relative risk is even greater to motorcyclists, given their ability to access this mode.

4.4.8 Pedestrians and cyclists are more seasonally affected. Cycling is generally preferred during the summer months, due to improved weather, and the number of cycle related injury-collisions increase March and September, peaking in July. There is also a higher frequency of cycling related incidents in the District than other areas of Essex, particularly, when considered alongside the relatively low level of cycling. Pedestrian incidents notably increase in the autumn and winter months, potentially due to darker evenings and more frequent adverse driving conditions. Figure 4-4 shows the seasonal trends of all collisions and vulnerable road users.

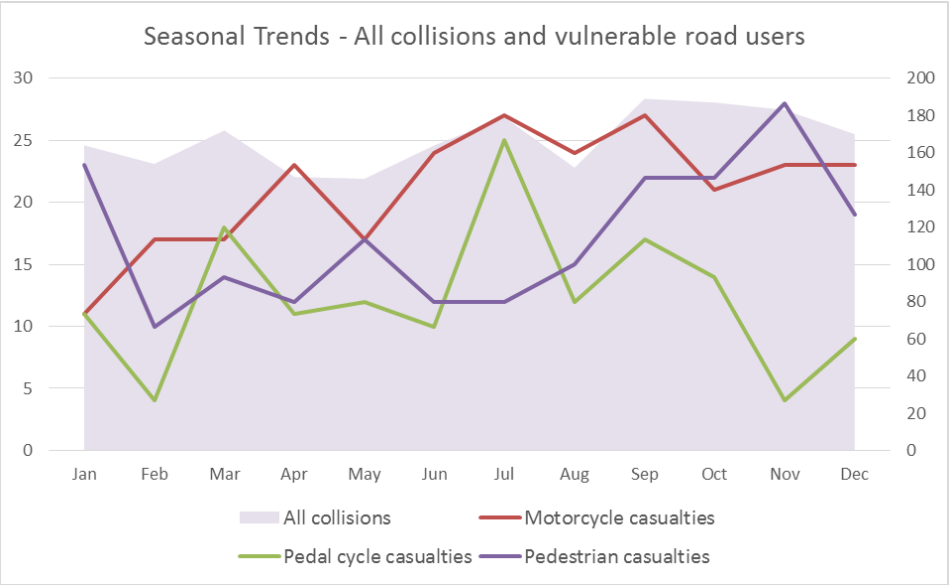


Figure 4-4 Seasonal Trends – All Collisions and Vulnerable Road Users 2012-2016

4.4.9 The overall injury-collision analysis does not highlight any specific issues on District roads, with the trends for 30-40mph urban roads and 50-60mph roads generally reflecting the wider county averages. The sections of the M11 and M25 running through the District do raise the rate of injury-collisions in the District but should be considered within the context of the wider SRN and are outside of the control of both EFDC and ECC.

4.4.10 The busier urban areas within the District, particularly Loughton and 30mph roads, generate higher concentrations and frequencies of injury-collisions. Provision needs to be made as part of any mitigation measures, promoted as part of a development, to minimise the impact of any new development traffic on road safety for all road users, including the need for Road Safety Audits on any new road schemes

4.5 Air Quality

4.5.1 The main source of air pollution in the District is road traffic. While two large motorways (M25 / M11) bisect the District, air quality issues are in the urban areas, principally caused by stop-start traffic congestion.

4.5.2 An Air Quality Management Area (AQMA) was declared in August 2010 at the junction at Bell Common, Epping. The declared pollutant is Nitrogen Dioxide (NO_2) and attributed to unspecified road transport.

4.5.3 Further monitoring is continuously under review in Epping and Loughton, for Nitrogen Dioxide from stop-start traffic, and the potential to offset further pollution through the delivery of ongoing general improvements in cleaner vehicle technology.

4.5.4 Furthermore, a bespoke Air Quality assessment has been undertaken by AECOM to support the Local Plan and specifically assesses the potential

impacts of additional Local Plan traffic on the Epping Forest SAC. This separate study has been provided as part of the overall evidence base.

4.5.5 Any future development and associated traffic will need to consider and potentially mitigate the respective impacts on air quality within the District.

4.6 Public Transport

4.6.1 The rural nature of large parts of the District, and the distribution of population centres, currently presents challenges for the connectivity of local public transport, particularly, buses. However, this is not the case in Loughton, Waltham Abbey and Chigwell, which are served by sections of the London Bus network. The London Underground Line (LUL) stations of Epping, Theydon Bois, Debden, Loughton, Buckhurst Hill, Roding Valley, Chigwell and Grange Hill also provide frequent services to London, including Stratford and the City.

Bus

4.6.2 Bus patronage in the District accounts for only 1.4% of journeys to work (Census 2011), which is lower than the average of 2.2% across Essex and 2.5% in the East of England region. The majority (85%) of the bus network is run commercially by different private companies. The remaining services receive funding assistance from ECC. Table 4-3 summarises the principal bus routes[2] and typical frequencies serving the main settlements within the District.

EPPING				
Epping South			**Frequency**	
418	Harlow	Loughton	60	mins
Epping East				
214	Epping	Waltham X	60	mins
380-382	Ongar	Harlow	90	mins
Epping Stn				
418	Harlow	Loughton	60	mins
419	Harlow	Epping	20	mins
420	Ongar	Harlow	35	mins
380-382	Ongar	Harlow	90	mins
Epping High Rd				
213-214	Waltham X	Epping	60	mins
Epping High St				
380-382	Ongar	Harlow	90	mins
418	Harlow	Loughton	60	mins
419	Harlow	Epping	20	mins
420	Ongar	Harlow	35	mins
Epping North				
418	Harlow	Loughton	60	mins
419	Harlow	Epping	20	mins
420	Ongar	Harlow	35	mins
380-382	Ongar	Harlow	90	mins

[2] Only key bus routes and frequencies (correct at 2018) are listed for information purposes. School, low / intermittent frequency or Demand Responsive Transport (DaRT) services are not included.

EPPING				
Epping West				
380-382	Ongar	Harlow	90	mins
LOUGHTON / DEBDEN				
Debden			**Frequency**	
542A	Loughton	Debden	60	mins
Rectory Lane				
418	Harlow	Loughton	60	mins
Loughton East				
20	Walthamstow	Debden	10	mins
167	Hainault St	Loughton Stn	15	mins
Loughton West				
20	Walthamstow	Debden	10	mins
66	Debden	Waltham X	30	mins
397	Debden	Crooked Billet	30	mins
418	Harlow	Loughton	60	mins
Loughton North				
20	Walthstow	Debden	10	mins
WALTHAM ABBEY				
86	Waltham X	Harlow	60	mins
505	Harlow	Chingford	120+	mins
NORTH WEALD				
380-382	Ongar	Harlow	90	mins
419	Harlow	Epping	20	mins
420	Ongar	Harlow	35	mins
ONGAR				
380-382	Ongar	Harlow	90	mins
420	Ongar	Harlow	35	mins
CHIGWELL				
167	Hainault St	Loughton Stn	20	mins
462	Copperfield	Ilford Stn	14	mins

Table 4-3 Bus Routes – Waltham Abbey / North Weald / Ongar / Chigwell

4.6.3 Table 4-4 provides a summary of the services and illustrates that, while key destinations are served, bus frequency is relatively low and destinations beyond the District are not well served with multiple interchanges required.

KEY SERVICE SUMMARY				
418	Harlow	Loughton	60	mins
167	Hainault St	Loughton Stn	20	mins
214	Epping	Waltham X	60	mins
380-382	Ongar	Harlow	90	mins
419	Harlow	Epping	20	mins
420	Ongar	Harlow	35	mins
213-214	Waltham X	Epping	60	mins
542A	Loughton	Debden	60	mins
418	Harlow	Loughton	60	mins
20	Walthstow	Debden	10	mins
66	Debden	Waltham X	30	mins
397	Debden	Crooked Billet	30	mins

KEY SERVICE SUMMARY				
86	Waltham X	Harlow	60	mins
505	Harlow	Loughton	60	mins

Table 4-4 Bus Routes – District Summary

4.6.4 The level of bus service within the District reflects the predominantly rural and dispersed nature of the main settlement areas. Bus routes need to be commercially viable to be sustained and only limited funding is available to support additional services to more isolated areas. The additional housing development and population growth associated with the LPSV present new opportunities for increased demand and funding to significantly enhance the existing network and service frequencies.

National Rail

4.6.5 The only National Rail station is located at Roydon on the northern edge of the District. This is reflected in a District wide modal share for rail of only 3% (Census 2011) compared to 7.1% for the wider Essex area.

4.6.6 Greater Anglia trains operate half hourly services between Cambridge and London Liverpool Street and an hourly service between Bishops Stortford and Stratford during the peak periods. However, the station is remotely located from the principal settlements within the District and provides a more viable rail option for neighbouring Harlow.

4.6.7 Harlow Town station, in neighbouring Harlow District, would be readily accessible to the Strategic Sites / Garden Town Communities included in the EFD LPSV to the south and west of the town. The station is served by the Stansted Express, linking residents with one of the major local employment locations, as well as the Victoria line at Tottenham Hale station.

4.6.8 Stations in neighbouring Broxbourne Borough provide convenient stations on the same line as Roydon, at Waltham Cross and Broxbourne, for residents living to the west of the District including at Nazeing and Waltham Abbey. These stations also provide services towards Hertford.

London Overground

4.6.9 Cheshunt and Theobalds Grove, also in neighbouring Broxbourne Borough, are served by London Overground with a 20-minute service frequency between Cheshunt and London Liverpool Street during the peak periods. Again, these stations provide a realistic travel option for residents to the west of the District.

London Underground

4.6.10 The London Underground Central Line is the primary rail option for the District serving eight locations. The main Central Line connects Epping (Zone 6), at the eastern end of the line, with central London (Zone 1), Ealing (Zone 3) and West Ruislip (Zone 6) to the west. This line also serves Theydon Bois, Debden, Loughton (all Zone 6) and Buckhurst Hill (Zone 5) to the south of the

District. Service frequencies at peak periods are generally every 4-6 minutes reducing throughout the peak shoulders and off-peak periods.

4.6.11 The Central Line includes the 'Fairlop Loop' serving Roding Valley, Chigwell and Grange Hill (all Zone 4) running additional services via the London Borough of Redbridge towards central London, Ealing and West Ruislip. Service frequencies at peak periods are generally every 14-16 minutes.

4.6.12 More than 13% (Census 2011) of journeys to work are made by LUL in the District, which is significantly higher than the wider Essex average of 1.6% and is more reflective of travel patterns in the neighbouring London Borough of Redbridge.

4.6.13 The Central Line provides a high frequency service towards London and is a key connection to the primary labour market in the south east for commuters from within the District and from further afield. With more than 1,000,000 passengers boarding the Central Line per day over the entire network, the service is the second busiest after the Northern Line. Table 4-5 and Table 4-6 summarises the typical weekday daily and peak period demand (boarders and alighters) from each of the stations in the District.

Station	Line	Dir.	- 7am	7am- 10am	10am- 4pm	4pm- 7pm	7pm- 10pm	10pm+	Total
Buckhurst Hill	Central	W	400	1,859	703	436	140	53	3,591
Chigwell	Central	W	14	378	25	31	20	2	470
Debden	Central	W	478	1,502	1,014	804	178	43	4,019
Epping	Central	W	1,180	2,607	1,127	725	170	58	5,867
Grange Hill	Central	W	31	623	96	6	20	5	781
Loughton	Central	W	648	2,831	1,223	625	204	68	5,600
Roding Valley	Central	W	20	315	42	23	8	12	420
Theydon Bois	Central	W	286	724	275	165	43	22	1,515
Total	**Central**	**W**	**3,057**	**10,839**	**4,505**	**2,815**	**783**	**263**	**22,263**

Table 4-5 TfL (2017) RODs Data – Epping Forest District Central Line Stations Westbound Borders (Source TfL Data Feeds)

Station	Line	Dir.	- 7am	7am- 10am	10am- 4pm	4pm- 7pm	7pm- 10pm	10pm+	Total
Buckhurst Hill	Central	E	34	298	501	1,620	800	346	3,599
Chigwell	Central	E	8	124	109	182	127	13	563
Debden	Central	E	30	799	790	1,339	514	244	3,716
Epping	Central	E	153	739	1,036	2,719	1,189	623	6,459
Grange Hill	Central	E	5	40	139	154	145	24	507
Loughton	Central	E	47	685	1,116	2,284	1,149	502	5,782
Roding Valley	Central	E	3	30	169	173	95	41	510
Theydon Bois	Central	E	15	95	238	614	265	133	1,361
Total	**Central**	**E**	**295**	**2,810**	**4,098**	**9,085**	**4,284**	**1,926**	**22,497**

Table 4-6 TfL (2017) RODs Data – Epping Forest District Central Line Stations Eastbound Alighters (Source TfL Data Feeds)

4.6.14 The data shows that approximately 45,000 two-way journeys are made towards / from the London direction per weekday at stations within the District accounting for 4.5% of the total number of Central Line boarders across the route network. Approximately 50% of these journeys occur in the traditional peaks with 10,800 westbound journeys departing in the 3-hour AM peak period

(0700-1000) and 9,085 eastbound journeys returning in the 3-hour PM peak period (1600-1900).

4.6.15 The main Central Line stations have significantly higher demand (>40,000 two-way journeys per day) than the 'Fairlop Loop' stations (>3,000 two-way journeys per day). Epping and Loughton are the most used stations (>5,000 peak period[3] two-way journeys at each station). Chigwell and Roding Valley have the lowest demand (approximately 500 peak period[3] two-way journeys at each station).

4.6.16 The Central Line provides a valuable commuter service for the District towards the inner and outer London labour markets. While it is recognised that the Central Line currently experiences high demand across the whole route network, it should also be recognised that access to LUL provides a sustainable transport solution to support lower parking / zero car dependency development and travel within the District, particularly in the 8 station areas.

4.7 Cycling

4.7.1 Notwithstanding high levels of leisure cycling that occur within the Epping Forest open space areas, actual utility or journey to work cycle trips (0.6%) are significantly lower than the Essex average (1.4%) and East of England average (2.4%). Cycling infrastructure in the District is limited at present (as shown in Figure 4-5).

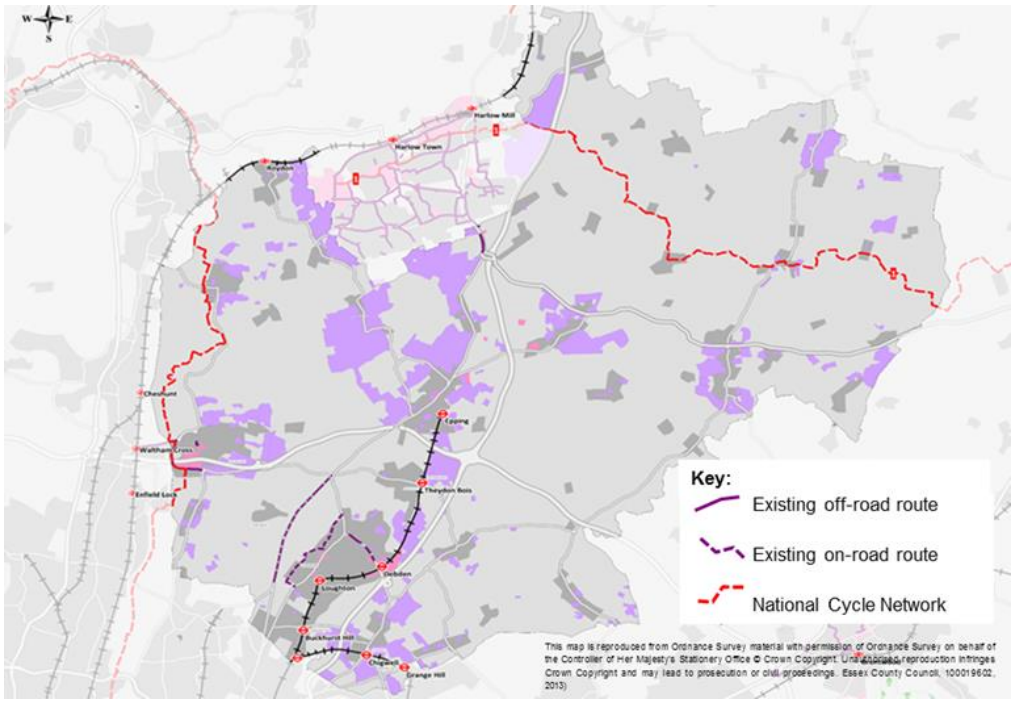


Figure 4-5 Existing Cycle Infrastructure in District

[3] 3-Hour AM Peak Period Westbound Boarders + 3-Hour PM Peak Period Eastbound Alighters

4.7.2 In the main settlement areas there are currently no on-road cycle lanes provided within the town of Epping. There are limited and sporadic short sections of on and off-road routes to the north of Loughton, Debden and throughout Waltham Abbey, where the National Cycle Network enters part of the District.

4.7.3 Cycle parking in most of the main settlements is of limited quality and largely underutilised. At the LUL stations cycle parking is limited, and where it is provided it is often reaching capacity (see Table 4-7). Chigwell and Grange Hill stations on the 'Fairlop Loop' do not make provision for any cycle parking and Roding Valley only provides 6 stands.

Tube Station	Cycle Parking Spaces
Buckhurst Hill	16
Chigwell	0
Debden	8
Epping	38
Grange Hill	0
Loughton	20
Roding Valley	6
Theydon Bois	10

Table 4-7 LUL Station Cycle Parking Provision

4.7.4 In the more rural areas of the District, there is a lack of off-road cycle routes, and limited provision of quiet lanes and signed routes between settlements. This is of significance between North Weald Bassett and Epping, where the busy road network and high vehicle speeds at points along the B181 are a deterrent to cycling.

4.7.5 Table 4-8 shows the total number (and severity) of recorded injury collisions involving cyclists for the District and Essex for the 5-year period between August 2012-July 2017. It also shows the total number of people who cycle to work in the District and Essex. Epping Forest District only accounts for 3% of the total number of people who cycle to work in Essex, this is significantly below the 18% and 24% recorded in Chelmsford and Colchester respectively, but is consistent with the trends in other more rural Districts e.g. Maldon or Uttlesford. However, the District does account for 8% of cycle related injury collisions, which presents the highest ratio of collisions to number of people cycling. Cycle demand in the District is therefore currently low in relation to other parts of Essex and the statistics indicate that the environment for cycling is not as safe.

District	Fatal	Serious	Slight	Grand Total	% of total cycle collisions in Essex	Number cycling to work[4]	% of total cycle to work trips in Essex
EPPING FOREST	1	36	105	142	8%	482	3%
ESSEX	**12**	**412**	**1285**	**1709**		**13891**	

Table 4-8 Personal Injury Collisions involving cyclists August 2012 to July 2017

4.7.6 An Epping Forest District Cycling Action Plan has been prepared and a review of the baseline conditions has identified the following key barriers to cycling in the District:

- Lack of signed routes;
- Lack of existing infrastructure provision generally in main populated areas;
- Where infrastructure exists, it is generally isolated and does not cater for cyclists when they reach either end;
- High traffic flows and speeds on main roads;
- Lack of off-road cycle routes as alternatives to busy and fast roads;
- Lack of road width on key routes, preventing fully segregated routes alongside the carriageway;
- Relatively few crossings that cater for cyclists as well as motorised users over/under the London Underground Central Line, primarily in the south of the District;
- Hilly topography (e.g. NW Loughton, NW Epping); and
- Lack of cycling infrastructure on rural roads, and poor awareness of all road users' needs in these areas.

4.7.7 The Cycle Action Plan includes an analysis of existing cycle demand, using Census Data, and the propensity for uptake in the main settlements. A summary is set out below.

Loughton, Chigwell and Buckhurst Hill

4.7.8 There are several areas in Loughton where cycling could be encouraged. The number of cycle trips made directly to work are very low and occur over short distances in the north east of Loughton. Outside of Loughton, very few cycle trips are made as the main mode of transport to work.

4.7.9 The LUL stations around Loughton are all well used to get to work, with trips usually made to the one closest to commuters' homes. Cycling infrastructure connecting to LUL stations would likely attract commuters living further than would be viewed as a normal walking distance. Car trips also generally occur over short distances within Loughton. There is therefore potential for a mode switch to cycling for short journeys to shops, services and workplaces if appropriate infrastructure was provided. Some longer trips made from north to south of Loughton or from Chigwell and Theydon Bois into Loughton are less

[4] Office for National Statistics (2011) https://www.ons.gov.uk/ons/rel/census/2011-census.../cycling-to-work/reftable.xls

frequent than shorter trips occurring solely within Loughton, so would likely be less of a priority.

Waltham Abbey

4.7.10 Census analysis shows that cycling trips to work made in Waltham Abbey all occur heading east to west and all train commuters use Waltham Cross station located in neighbouring Broxbourne Borough. The opportunity to provide cycling infrastructure connecting eastern areas of Waltham Abbey and converging on Waltham Cross could be potentially well used by commuters and serve as cycle connectors for trips made within Waltham Abbey. It should be noted that a significant number of car trips are taken in a similar way across Waltham Abbey. However, creating cycle routes that do not significantly reduce existing road capacity may be problematic.

Epping

4.7.11 Census analysis shows that little or no one in Epping used cycling as their main form of transport to work in 2011. A large number of train commuters head to Epping station to use the train and improved cycle infrastructure connecting the station to the surrounding area would likely encourage commuters to make their journey by bicycle rather than car. Car journeys to work generally occur across the centre of the town over short distances. There is potential to provide links across the town for cyclists and encourage car users to switch with the appropriate infrastructure.

4.7.12 The Cycle Action Plan includes a range of recommendations for improvements throughout the District to tie in with neighbouring local authority and national strategies, which could reasonably be supported by the delivery of Local Plan development. These are discussed in more detail later in this report (see Section 7).

4.8 Summary

4.8.1 This section has provided a high-level review of the existing transport situation across the District as context for the Transport Assessment. The focus of the review highlights the opportunities and challenges presented across different modes of travel and identify where any new development proposed in the Local Plan could contribute to achieving travel away from the car, minimise impacts on the highway network and support improvements in highway safety.

4.8.2 There are several transport challenges focused around car travel and the impacts on congestion, air quality and overall network capacity. The primary focus of the Transport Assessment is to understand the traffic impact on the future highway situation and develop an initial mitigation strategy.

4.8.3 While it is recognised that any mitigation strategy is very likely to require physical improvements, to create additional capacity, it is also recognised that there are opportunities to not only capitalise on existing services, including the London Underground Central Line, but improve sustainable transport infrastructure for buses, cycling and walking through the delivery of Local Plan development to benefit existing and future residents. These opportunities are

discussed within the context of Local Plan development traffic and the overall strategy throughout this report.

5 Local Plan Development

5.1 Introduction

5.1.1 This section provides an overview of the committed and proposed development included in the LPSV up to 2033 used to generate a 'Do-Minimum' Reference Case, which is used as a 'benchmark' for the evaluation of the Local Plan, and 'Do-Something', where the Local Plan is delivered in full. A description of the different scenarios tested is included in Section 6.

5.1.2 The following development types are discussed within the context of the different scenarios used to assess the transport impact of the LPSV.

- Committed Developments; and
- New Local Plan Development.

5.2 Committed Developments

5.2.1 The committed developments represent those housing sites which had planning permission as of 31 March 2017 and were yet to be implemented. Growth in traffic in this regard is considered independent of the Local Plan allocations and what is expected to take place whether the Local Plan is implemented or not. This is in line with national best practice.

5.2.2 A comprehensive list of the committed developments has been provided by the Council and is included at **Appendix B.** Based on the specified land use allocations, all the committed development comprises residential development equating to a total of 1,801 dwellings (as a mix of houses and flats). This has been discounted by 10% to 1,621 dwellings to reflect the non-delivery rate used in Table 2.3 (Housing land supply: 2011-2033) of the Local Plan Submission Version.

5.2.3 While every effort has been made to code all committed sites into the forecast model, an element of interpretation has been applied to account for the fact that there are several 'small' residential sites distributed across the District. As such, detailed site information is only provided for 1,189 dwellings and a further 432 dwellings have been proportionally distributed across the principal settlement areas to account for these additional sites with planning permission. Table 5-1 provides a summary of the committed development included in both the 'Do-Minimum' and 'Do-Something' scenarios.

Settlement	Dwellings	Settlement	Dwellings
North Weald Bassett	101	Sewardstone	14
Waltham Abbey	187	Roydon	13
Harlow	176	Chigwell	21
Chigwell	192	Rural	74
Loughton	477	Woodford	10
Broxbourne	23	Ongar	95
Stapleford Abbots	70	High Ongar	27
Epping	107	Buckhurst Hill	11

Settlement	Dwellings	Settlement	Dwellings
Lower Sheering	23	**Total**	**1,621**

Table 5-1 Summary of Committed Developments

5.3 Local Plan Development

5.3.1 The LPSV development includes all new allocations in addition to the committed development including an element of 'Windfall' development. The overall 'future housing requirement' for the District has calculated the delivery of 10,020 new dwellings between 2017-2033. However, modelling assumptions for the LPSV assessments make provision for the 'total projected housing supply available' (13,152 dwellings) which includes:

- Housing Completions 2011-2017 – 1,330 dwellings
- Committed Development – 1,621 dwellings (including Lapse Rate)
- New Residential Allocations – 9,816 dwellings
- Windfall – 385 dwellings
- **Total – 13,152 dwellings**

5.3.2 The model base year is 2017 and all development anticipated to be delivered beyond this date, i.e. excluding completions, has been added to the model – totalling 11,822 dwellings. As a worst-case the LPSV has therefore been tested for the 'total projected housing supply available', including factoring in development on windfall sites, rather than the actual calculated 'future housing requirement' for the District.

5.3.3 In addition to residential development the LPSV also includes:

- New Employment Allocations – 94,760 sqm (B1/B2/B8) *
- Primary Schools (New and Expanded) – 2,640 pupils
- Secondary Schools (New and Expanded) – 3,570 pupils

***** It is acknowledged that some of the employment sites allocated have reasonable potential to deliver additional floorspace and enhanced densities, over and above the employment area stated, particularly at more sustainable locations in Loughton and at Harlow. As detailed throughout this report, the modelling approach has applied several worst-case assumptions to different traffic demand variables as a conservative approach. It was subsequently agreed with ECC that there was sufficient headroom within the model forecasting, to adequately accommodate any associated increases in floorspace, and that further model assessments were not required at this stage.

5.3.4 A list of new allocations and site references are included at **Appendix C**. Full details of the site locations, delivery trajectory and specific policy requirements are set out in the LPSV document[5] and its Appendix 5 'Housing, Employment and Traveller Trajectories' and Appendix 6[6] 'Site Specific Requirements'.

[5] http://www.efdclocalplan.org/wp-content/uploads/2018/03/EB114-Epping-Forest-District-Local-Plan-Submission-Version-2017.pdf

[6] http://www.efdclocalplan.org/wp-content/uploads/2018/03/EB114A-Epping-Forest-District-Local-Plan-Submission-Version-2017-Appendix-6-Site-Specific-Requirements.pdf

5.3.5 A high-level illustration of the spatial distribution of the principal residential and employment allocations is shown in Figure 5-1 for information purposes. For a detailed map of all relevant policy designations and site allocations please refer to the LPSV – Policies Map[7].

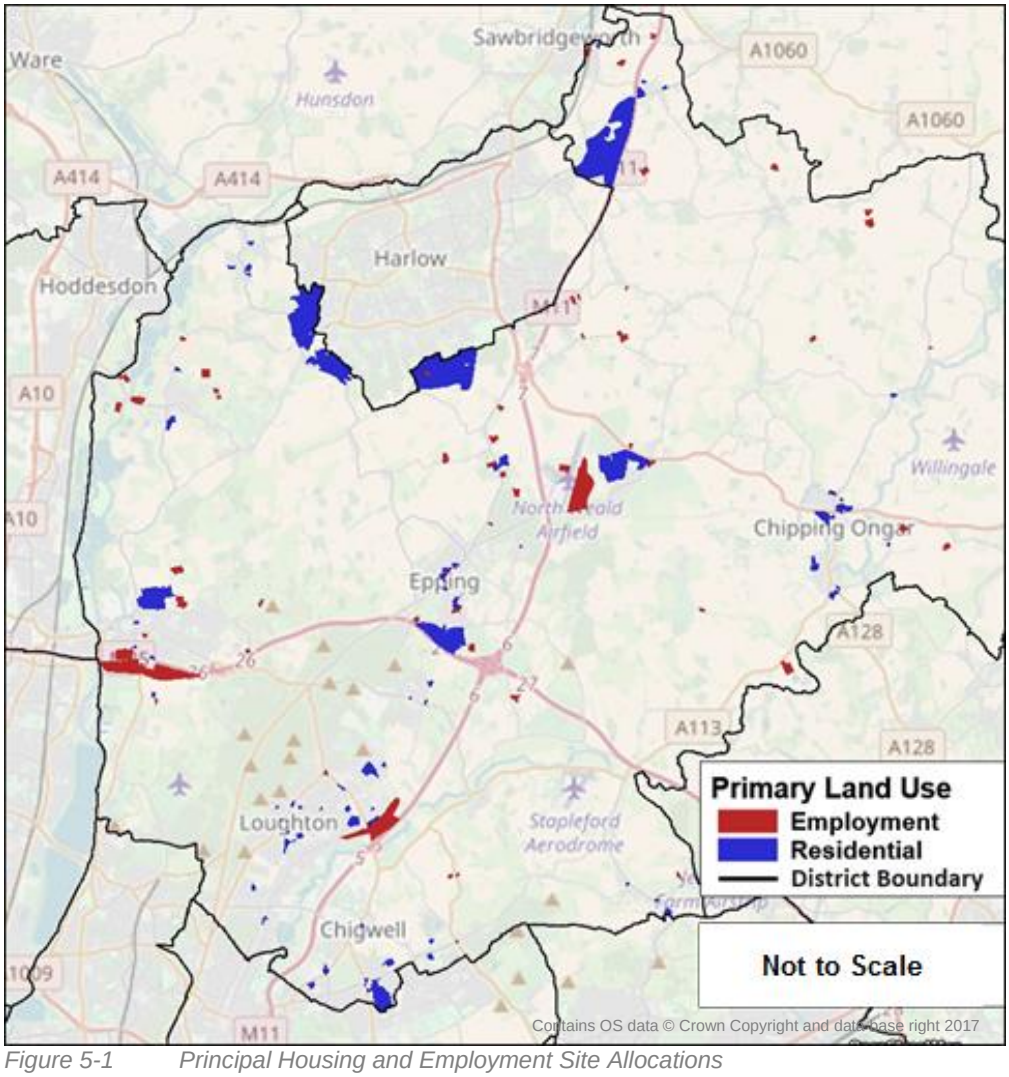


Figure 5-1 Principal Housing and Employment Site Allocations

5.3.6 A summary breakdown of the scale of development by settlement area is listed in Table 5-2. This identifies that the Strategic / Garden Town Community sites around Harlow will account for 40% of the housing delivery within the District. These sites complement the growth aspirations centred around neighbouring Harlow and East Hertfordshire Districts to deliver sustainable Garden Town Communities. The remaining housing growth is distributed relatively evenly between the main settlements of Epping, Loughton, Waltham Abbey and North Weald Basset, with the remaining allocations located in Ongar and multiple smaller scale sites across the District.

[7] http://www.efdclocalplan.org/wp-content/uploads/2018/03/EB114B-Epping-Forest-District-Local-Plan-Submission-Version-2017-Policies-Map.pdf

5.3.7 The allocated employment floor space is largely focused on Waltham Abbey and North Weald Bassett, with smaller site allocations in Loughton and at the strategic sites around Harlow. Several smaller existing employment sites have also been allocated to safeguard employment land across the District. These sites are currently in use and no net gain in floor space has been specifically attributed to them.

5.3.8 New primary and secondary schools will be built to deliver 3,360 pupil spaces to support the new housing at the strategic sites around Harlow. A further 2,850 pupil spaces will be created in Loughton, Epping, North Weald Bassett and Waltham Abbey, as well as smaller villages, to support future housing and address existing shortfalls.

Settlement	Dwellings	%	Employment Floorspace (SQM)	%	Schools (Pupils)	%
Strategic Sites around Harlow	3,900	39.7%	5,640	6.0%	3,360	54.1%
Epping	1,305	13.3%		0.0%	420	6.8%
Loughton	1,021	10.4%	4,000	4.2%	1,050	16.9%
Waltham Abbey	858	8.7%	45,120	47.6%	210	3.4%
Ongar	590	6.0%		0.0%	105	1.7%
Buckhurst Hill	87	0.9%		0.0%		0.0%
North Weald Bassett	1,050	10.7%	40,000	42.2%	420	6.8%
Chigwell	376	3.8%		0.0%	420	6.8%
Theydon Bois	57	0.6%		0.0%	105	1.7%
Roydon	62	0.6%		0.0%		0.0%
Nazeing	122	1.2%		0.0%	120	1.9%
Thornwood	172	1.8%		0.0%		0.0%
Coopersale	6	0.1%		0.0%		0.0%
High Ongar	10	0.1%		0.0%		0.0%
Fyfield	14	0.1%		0.0%		0.0%
Lower Sheering	14	0.1%		0.0%		0.0%
Stapleford Abbotts	47	0.5%		0.0%		0.0%
Sheering	84	0.9%		0.0%		0.0%
Rural East	41	0.4%		0.0%		0.0%
Total	**9,816**	**100%**	**94,760**	**100%**	**6,210**	**100%**

Table 5-2 New Allocations Development Summary by Settlement Distribution

5.4 Summary

5.4.1 The Local Plan Submission Version (LPSV) sets out the proposed growth strategy to deliver the required level of housing and jobs for the District. The 'total projected housing and employment supply' has been included in the modelling to assess a 'worst case', on the assumption that the actual 'future housing requirement' is approximately 18% lower.

5.4.2 The following development has been assessed for the LPSV for the period 2017 (model base year) to 2033 (end of Local Plan period):

- Committed Development – 1,621 dwellings (Lapse Rate factored in)
- New Residential Allocations – 9,816 dwellings
- Windfall – 385 dwellings

- New Employment Allocations – 94,760 sqm (B1/B2/B8)
- Primary Schools (New and Expanded) – 2,640 pupils
- Secondary Schools (New and Expanded) – 3.570 pupils

6 Model Forecasting, Trip Generation, Distribution and Assignment

6.1 Overview

6.1.1 The base year spreadsheet element of the Highway Assessment Model was adapted to assign future development related traffic growth across the District and forecast traffic flows at the identified key junctions. The forecast model was created with a degree of flexibility and included a range of different development proposals, which could be toggled 'ON' or 'OFF' for scenario testing.

6.1.2 This section outlines the methodologies used to derive forecast year traffic scenarios for modelling and assessment.

6.2 Forecast Year

6.2.1 The model forecast year is 2033 and is consistent with the Local Plan period. The forecast scenarios assume that all development identified is fully built-out, occupied and operational by 2033.

6.3 Forecast Scenario Testing

6.3.1 The Local Plan process has been refined over the past five years through a series of scenario tests to assess the impact of different development allocation patterns and define an initial package of complementary transport mitigation interventions. The initial scenario testing culminated in the Draft Local Plan (DLP) published under Regulation 18 for public consultation in October 2016.

6.3.2 A subsequent round of option testing was undertaken through three 'Technical Assessments' in 2017 to further refine the current DLP into the LPSV. The 'Technical Assessments' did not constitute actual proposed development scenarios and were undertaken specifically to test the impact of different distributions of development across the District. The Technical Assessments were based on the outcomes of the following information:

- an updated Employment Review;
- detailed analysis of the public consultation outcomes and key issues identified; and
- the submission of additional or amended sites for consideration.

6.3.3 The LPSV has been tested for the 'total projected housing supply available', including factoring in development on windfall sites, rather than the actual calculated 'future housing requirement' for the District. It is important to recognise, based on experience, that there are occasions when a site allocated for development does not come forward as anticipated. As such the outputs contained in this report represent a worst-case scenario, with regard

to traffic growth, and therefore provide a robust assessment of the traffic related effects of the LPSV.

6.3.4 A summary of each of the Do-Minimum and Do-Something scenarios assessed in this report are provided below:

- **Scenario 1 '2017 Base Year'** - an assessment of network performance for the current situation;
- **Scenario 2 '2033 Do-Minimum'** - includes all residential development sites that have received planning permission within EFDC to October 2016, other TEMPro planning assumptions across the Plan period along with full background traffic growth. This scenario assumes no new highway schemes or sustainable modal shift to rail, bus or active modes;
- **Scenario 3 '2033 Do-Something Existing Network'** – continuation of Scenario 2 with the addition of LPSV development with adjusted TEMPro background traffic growth. This scenario assumes the inclusion of reasonable sustainable transport improvements with no new highway schemes;
- **Scenario 4 '2033 Do-Something Mitigated Network'** – continuation of Scenario 3 with the inclusion of a package of highway improvement schemes;
- **Scenario 5 '2033 Do-Something Peak Spreading Existing Network'** – continuation of Scenario 3 with the application of Peak Spreading factors. Assumes the inclusion of reasonable sustainable transport improvements and with no new highway schemes;
- **Scenario 6 '2033 Do-Something Peak Spreading Mitigated Network'** – continuation of Scenario 5 with the inclusion of a package of highway improvement schemes.

6.3.5 Scenario 1 provides an overview of the existing situation for baseline information purposes. Scenario 2 acts as the forecast reference case i.e. the 'Do-Minimum' for comparison with the forecast 2033 Do-Something scenarios. This contains all development permitted by planning permission plus TEMPro background traffic growth up to 2033.

6.3.6 The Do-Minimum, therefore, does not contain any LPSV growth other than committed developments identified from the base year of 2017. These comprise developments which are in the process of construction or have planning permission. Additional planning assumptions within TEMPro have also been included to account for assumed growth that would take place in the absence of the LPSV up to the forecast year of 2033.

6.3.7 The Do-Something scenario forecasts contain LPSV allocation sites for growth across EFD within the proposed Local Plan period, as well as local and strategic mitigation measures. Any additional housing or employment growth within EFD has been removed from the TEMPro calculation to provide background growth only to avoid double counting Local Plan development related traffic growth.

6.3.8 The following Table 6-1 summarises the scale of development and land uses assessed in each of the scenarios discussed above.

Scenario	Houses (units)	Employment (sqm)	Schools (pupils)	Summary
1-Current Situation	-	-	-	Existing traffic conditions
2-Do-Minimum	1,621	-	-	No Local Plan Background traffic growth Committed development traffic growth No mode shift
3-Local Plan Submission Version Existing Network	11,822*	94,760**	6,210	Committed development traffic growth LPSV traffic growth Reasonable Modal shift
4-Local Plan Submission Version Mitigated Network	11,822*	94,760**	6,210	Committed development traffic growth LPSV traffic growth Reasonable Modal shift Highway Improvements
5-Local Plan Submission Version Peak Spreading Existing Network	11,822*	94,760**	6,210	Peak Spreading factors applied Committed development traffic growth LPSV traffic growth Reasonable Modal shift
6-Local Plan Submission Version Peak Spreading Mitigated Network	11,822*	94,760**	6,210	Peak Spreading factors applied Committed development traffic growth LPSV traffic growth Reasonable Modal shift Highway Improvements

Table 6-1 Development Scenario Assumptions

Notes:

*All Do-Something housing numbers are based on the 'total projected housing supply available', which is 18% higher than the calculated future housing requirement, and the assessments are therefore considered robust and as worst-case.

**As previously stated, it is acknowledged that the allocated employment sites have reasonable potential to deliver additional floorspace and enhanced densities.

6.3.9 An overview of the various scenarios and the relevant transport demand and supply assumptions assessed is summarised in Figure 6-1.

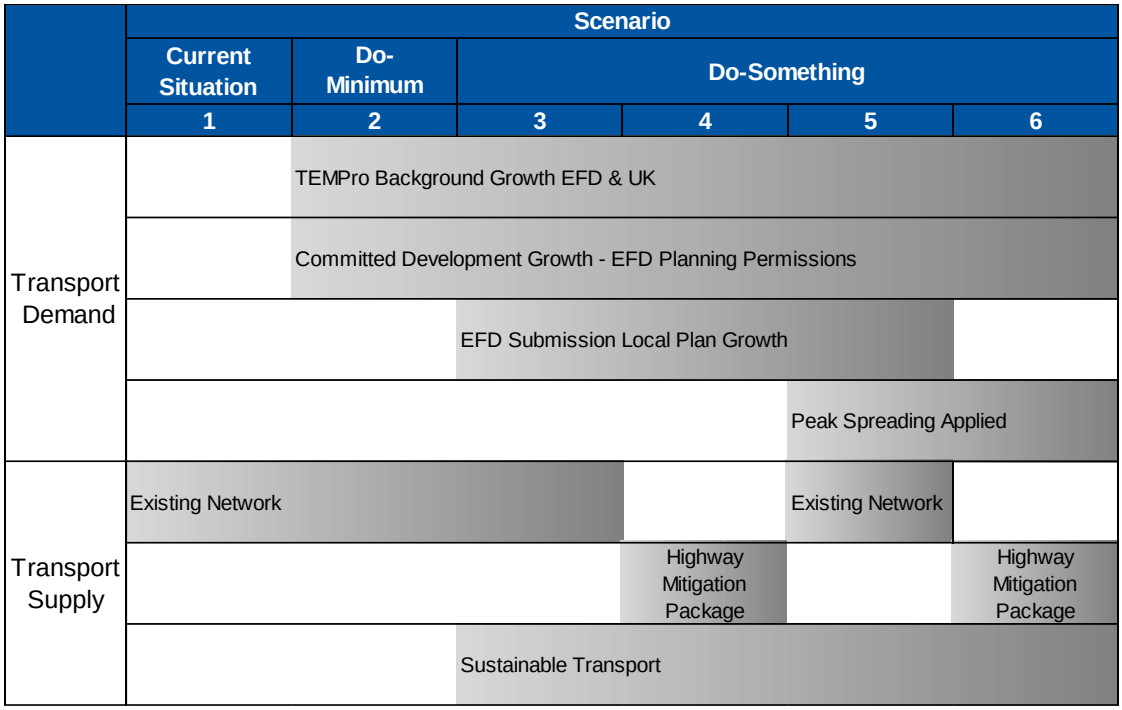


Figure 6-1 Scenario Overview

6.4 Vehicle Trip Generation Method

6.4.1 The EFD Highway Assessment Model includes information on car, LGV and HGV traffic converted in to Passenger Car Units (PCUs) for assessment purposes. In the first instance, all vehicle trips generated by each committed and proposed development site were calculated using the development information provided by EFDC and Trip Rate Information Computer System (TRICS) version 7.4.2 (2017). All trips were then converted using PCU weighting factors.

6.4.2 TRICS is the national industry standard database system of multi-modal trip generation and analysis used in the planning process. The database holds an extensive catalogue of trip rate surveys generated by different land uses and location type. The TRICS Good Practice Guide informed the methodology used to derive appropriate site selections for inclusion in the model.

6.4.3 The TRICS methodology was refined into the following two-tier approach to account for the beneficial impact of the reasonable sustainable transport improvements assumed in some of the scenarios assessed, including:

- 'Low Sustainability' (Do-Minimum Scenario) – This assumes no sustainable transport improvements and therefore higher vehicle trip rates have been applied to new development as a worst-case;

- 'Medium Sustainability' (Do-Something Scenarios) – Reasonable sustainable transport improvements with lower (15%-22% reduction[8]) vehicle trip rates applied to new development as a likely case; and
- 'Car-Free / Reduced Parking Development' (Do Something Scenarios) – Several sites within town centre locations and at LUL Stations have been allocated as 'Car-Free / Reduced Parking' development. While 'Car-Free' sites are expected to provide parking at around 10% of parking standards and at 50% 'Reduced Parking Sites', a robust approach has been adopted, which applies an approximate 50% reduction to the typical trip rates used for residential sites to both 'Car-Free' and 'Reduced Parking' residential sites to reflect lower car ownership.

6.4.4 In the absence of detailed development schedules and Masterplans, the distribution of different residential types was determined for each town in the District using 2011 Census data, including the LPSV Housing Policy H2 target of 40% affordable housing. Developments not located in the main towns in the District were assigned a housing-type split derived from the average of all the towns. Table 6-2 summarises the distribution of different residential types in the principal District settlements.

	Epping	Wider Harlow	Ongar	North Weald	Waltham Abbey	Loughton	Epping Forest Av.
2011 Census Data – Residential Type by Settlement							
% Houses	79%	75%	86%	84%	68%	76%	78%
% Flats	21%	25%	14%	16%	32%	24%	22%
EFDC Local Housing Policy (H1-H4) Target							
% Private	60%	60%	60%	60%	60%	60%	60%
% Affordable	40%	40%	40%	40%	40%	40%	40%

Table 6-2 Housing Mix and Accommodation Types in Epping Forest District

6.4.5 Any 'Car-Free' and 'Low Parking Development' will predominantly be flats, given the nature and location of these developments, and the trip generation methodology has been adapted accordingly to reflect a mix of private and affordable flats for these sites.

6.4.6 The distribution of 23 hectares of employment sites, based on likely floor space (94,760 sqm) created from the number of hectares to be allocated and their use class, has been assessed in line with the need identified in the West

[8] A range of trip rate reductions were applied to different land uses following the application of the EPTAL Trip Rate Methodology outlined in paragraph 6.5.7

Essex/East Hertfordshire Assessment of Economic Need October 2017 and as set out in Table 6-3.

Land Use	Floor Space (SQM)
B1a Office	7,640
B1c/B2 Industrial	19,280
B8 Warehousing	67,840
Total	**94,760**

Table 6-3 Employment Land Use Distribution

6.5 Peak Hour Development Vehicle Trip Rates

6.5.1 Trip generation was calculated separately for vehicles arriving and departing at each development site. For the purposes of this assessment, all development related trips have been assumed to be new trips and, except for some school sites, and no allowance has been made for pairing with new employment, linked, pass-by, diverted, transferred or internalised trips and present a worst-case.

6.5.2 Unless otherwise stated, all trip rates are provided as per:

- 100m² gross floor area (GFA) for employment uses
- unit for residential uses
- pupil for schools
- Vehicle trip rates have been converted to Passenger Car Units (PCUs) for modelling purposes

6.5.3 The PCU trip rates used for the respective scenarios are summarised in the following tables throughout this section.

Do-Minimum Scenario

6.5.4 The Do-Minimum scenario reflects the forecast situation whereby only limited development comes forward in the absence of a new Local Plan. These limitations extend to anticipated improvements to the highway infrastructure and sustainable transport.

6.5.5 Table 6-4 provides the trip rates applied to committed developments in the Do-Minimum scenario regardless of location, which include little or no provision for sustainable modal shift i.e. 'Low Sustainability' assumptions. These are generally higher than the rates applied to the Do-Something scenarios, as discussed in the subsequent sections.

	Private house	Affordable house	Private flat	Affordable Flat	Emp. - Office	Emp. - Warehouse	Emp. - Industrial Units	Emp. - Businesss Park
AM ARRIVALS								
Default	0.232	0.154	0.101	0.125	1.323	0.120	0.744	1.343
AM Departures								
Default	0.453	0.305	0.286	0.198	0.210	0.058	0.115	0.210
PM ARRIVALS								
Default	0.614	0.283	0.317	0.216	0.160	0.053	0.070	0.161
PM Departures								
Default	0.132	0.218	0.174	0.072	1.189	0.141	0.595	1.166

Table 6-4 'Low Sustainability'/Default Land Use Trip Rates per Unit (PCU)

Do-Something Scenarios

6.5.6 The 'Medium Sustainability' approach, for the Do-Something scenarios, is based on the Essex Public Transport Accessibility Level (EPTAL). The EPTAL methodology is an evidence-based approach that combines TRICS trip rates for different location classifications (i.e. town centre, edge of town centre, suburban and edge of town) with weightings for Essex specific Car Ownership and Usage Levels (COUL), from the 2011 Census data, and existing levels of public transport accessibility i.e. distances to interchanges and frequency of services.

6.5.7 The EPTAL approach provides an Essex focus to development trip forecasting and sustainable accessibility, to better understand the level of access to public transport in different areas and their relationship with TRICS location classifications for wards in Essex. EPTAL has therefore been used to provide a more appropriate TRICS trip rate for new development to target, based on the likely sustainable access characteristics brought about by reasonable improvements in particular locations.

6.5.8 It should be noted that the use of EPTAL in Scenarios 3-6 resulted in reductions for most land use classification trip rates. However, there were some instances of trip rates increasing, particularly for employment land uses, potentially due to low sample sizes held on TRICS for these land uses. Notwithstanding these minor anomalies, the EPTAL method has been applied across all Do-Something land uses as a 'Medium Sustainability' scenario for consistency.

6.5.9 Table 6-5 summarises the EPTAL trip rates, as discussed in the previous section and applied to Scenarios 3/4 with a more detailed assessment of the impact of development location and the potential for reasonable improvements to sustainable transport choices and modal shift i.e. 'Medium Sustainability' assumptions.

6.5.10 No provision has been made for evolving travel to work patterns, including a greater propensity for home or flexible working, nor the impact of advances in information and communication technology. The potential for changes in working and travel practices, along with more ambitious sustainable transport improvements, is discussed later in this report.

	Private house	Affordable house	Private flat	Affordable Flat	Emp. - Office	Emp. - Warehouse	Emp. - Industrial Units	Emp. - Businesss Park
AM ARRIVALS								
Town Centre	0.162	0.186	0.010	0.038	0.551	0.171	0.420	1.407
Edge of Town Centre	0.162	0.186	0.076	0.118	1.622	0.171	0.420	1.407
Suburban	0.137	0.186	0.075	0.118	1.474	0.098	0.461	1.361
Edge of Town	0.130	0.161	0.089	0.098	1.365	0.081	0.781	1.588
AM Departures								
Town Centre	0.278	0.252	0.036	0.065	0.058	0.069	0.104	0.144
Edge of Town Centre	0.278	0.252	0.203	0.156	0.205	0.069	0.104	0.144
Suburban	0.351	0.252	0.262	0.156	0.468	0.118	0.089	0.165
Edge of Town	0.396	0.288	0.262	0.156	0.119	0.056	0.143	0.252
PM ARRIVALS								
Town Centre	0.158	0.264	0.057	0.066	0.039	0.064	0.180	0.116
Edge of Town Centre	0.158	0.264	0.195	0.114	0.163	0.064	0.180	0.116
Suburban	0.327	0.264	0.274	0.114	0.347	0.085	0.030	0.112
Edge of Town	0.330	0.264	0.317	0.144	0.061	0.035	0.065	0.197
PM Departures								
Town Centre	0.203	0.192	0.042	0.075	0.533	0.242	0.442	1.159
Edge of Town Centre	0.203	0.192	0.114	0.105	1.479	0.242	0.442	1.159
Suburban	0.195	0.192	0.129	0.105	1.306	0.125	0.386	1.031
Edge of Town	0.180	0.192	0.174	0.105	1.167	0.090	0.573	1.368

Table 6-5 'Medium Sustainability' Land Use Trip Rates per Unit (PCU)

Car-Free / Reduced Parking Development

6.5.11 Policy T1 Sustainable Transport Choices advises that 'Reduced car parking, including car free, development in sustainable locations will be supported' and 'Where practicable and within 400m of a railway station, the Council will seek reduced car parking, including car free, development'.

6.5.12 It is acknowledged that at this stage the precise parking provision would need to be defined at the detailed planning stage based on the end development mix and type. However, it is anticipated that Car-Free developments parking provision would be a 90% reduction of ECC standards and at Reduced Parking developments parking provision would be approximately 50% of ECC standards or lower where practicable.

6.5.13 A precautionary approach has been adopted for assessment purposes and all relevant sites have been considered as a Reduced Parking development as a worst-case. A review of TRICS revealed a selection of sites in the outer London Boroughs of Havering and Hounslow provided similar levels of public transport accessibility and parking provision to the proposed EFD allocated sites, including:

- Poor (2) – Medium (3) PTAL rating
- National Rail or LUL approximately 1km from site
- Parking at approximately 50% of typical standards – 0.7 space per dwelling

6.5.14 The trip rates from TRICS, as summarised in Table 6-6, have been applied to all Car Free and Reduced parking development. It is anticipated that the Car-Free sites would generate significantly lower vehicle trip rates in reality.

	Car Free / Reduced Parking Flats
AM ARRIVALS	0.048
AM DEPARTURES	0.096
AM TOTAL	**0.144**
PM ARRIVALS	0.089
PM DEPARTURES	0.068
PM TOTAL	**0.157**

Table 6-6 Car-Free / Reduced Parking Trip Rates per Unit (PCU)

School

6.5.15 The following primary and secondary school trip rates (see Table 6-7) have been used to assess the Do-Something scenarios for the LPSV. Initial local assumptions have been applied to account for likely catchment areas for primary schools and their location relative to the modelled network including:

- Only teacher/employee trips (at 10% of trip rate) included at primary schools located at a strategic site / Garden Town Community or >1km from detailed model area;
- 50% reduction to trip rate at primary schools >500m from detailed model area; and
- A notional 10% reduction to secondary school trip rates to represent some linked / pass-by trips associated with a wider commuter trip.

	Primary School	Secondary School
AM ARRIVALS	0.269	0.159
AM DEPARTURES	0.181	0.104
AM TOTAL	**0.450**	**0.263**
PM ARRIVALS	0.030	0.014
PM DEPARTURES	0.044	0.027
PM TOTAL	**0.074**	**0.041**

Table 6-7 School Trip Rates per Pupil (PCU)

6.6 Peak Spreading

6.6.1 Section 11 provides details of the methodology used to develop a 'Peak Spreading' assessment. The scenario assesses the potential for changes in travel behaviour, e.g. changes in commuting times, to use less congested periods on the highway network across the AM (0700-1000) and PM (1600-1900) peak periods.

6.6.2 The EPTAL methodology used to derive the peak hour assessments has also been adopted to provide a consistent approach and determine average hourly development trip rates for the AM (0700-1000) and PM (1600-1900) peak periods. The trip rates used for the 'Peak Spreading' assessment for each land use are summarised in Table 6-8.

	Private house	Affordable house	Private flat	Affordable Flat	Emp. - Office	Emp. - Warehouse	Emp. - Industrial Units	Emp. - Businesss Park
AM ARRIVALS								
Town Centre	0.105	0.045	0.014	0.037	0.424	0.117	0.246	0.831
Edge of Town Centre	0.105	0.047	0.066	0.089	1.168	0.117	0.246	0.831
Suburban	0.121	0.078	0.055	0.089	1.239	0.085	0.324	0.787
Edge of Town	0.110	0.106	0.114	0.087	0.831	0.074	0.407	1.022
AM Departures								
Town Centre	0.179	0.060	0.026	0.040	0.049	0.061	0.071	0.130
Edge of Town Centre	0.179	0.121	0.156	0.058	0.184	0.061	0.071	0.130
Suburban	0.260	0.194	0.165	0.058	0.401	0.062	0.077	0.154
Edge of Town	0.275	0.250	0.172	0.151	0.100	0.046	0.092	0.207
PM ARRIVALS								
Town Centre	0.133	0.061	0.055	0.068	0.050	0.090	0.075	0.102
Edge of Town Centre	0.133	0.163	0.152	0.103	0.143	0.090	0.075	0.102
Suburban	0.258	0.217	0.203	0.103	0.325	0.060	0.041	0.107
Edge of Town	0.298	0.239	0.257	0.167	0.065	0.035	0.056	0.203
PM Departures								
Town Centre	0.157	0.068	0.034	0.059	0.369	0.163	0.217	0.718
Edge of Town Centre	0.157	0.109	0.091	0.096	1.071	0.163	0.217	0.718
Suburban	0.172	0.127	0.122	0.096	1.122	0.085	0.328	0.630
Edge of Town	0.176	0.121	0.162	0.099	0.765	0.077	0.351	0.913

Table 6-8 Peak Spreading Average Peak Period Land Use Trip Rates per Unit (PCU)

6.7 Peak Hour Development Vehicle Trips

6.7.1 The resulting overall trip generation values applied to each of the development land uses assessed in the scenarios are summarised in Table 6-9 for both the weekday AM and PM peak hours. All trips represent the additional volume of new development only, committed and allocated, related PCU trips added to the network to generate the 2033 Do-Minimum and Do-Something scenarios.

6.7.2 It should be noted that, as a further precautionary approach, the EFD Highway Assessment Model added an additional 'Fuel and Income' factor of 6% to the development trip rates. While this is not necessarily applicable for development planning purposes, it provides additional headroom to the traffic demand modelled to account for economic changes and the cost of travel, providing a further worst-case variable to the overall methodology.

Scenario		AM Peak Hour			PM Peak Hour		
		Arrivals	Departs.	Total	Arrivals	Departs.	Total
2	Do-Minimum	173	349	522	424	149	573
3/4	Do-Something	2,428	3,927	6,355	3,161	2,300	5,462
5/6	Peak Spreading	1,618	2,704	4,322	2,746	1,938	4,684

Table 6-9 Development Scenarios – Total Peak Hour PCU Trips

6.7.3 The trip rates defined for this assessment have been calculated in the absence of detailed design information for proposed developments and are subject to change. Any development coming forward would need to agree appropriate

trip rates with EFDC and ECC through the planning process based on the scale, layout and accessibility of the overall site.

6.8 External and Background Traffic Growth

Overview

6.8.1 The background traffic growth represents the traffic growth which will occur independently of any committed developments within EFD or as a result of allocations within the Local Plan. This generally represents economic growth in the region; other planning assumptions; growth outside the District including Harlow, Uttlesford, East Hertfordshire and Broxbourne as well as some London Boroughs, including Enfield, Hackney, Haringey, Newham, Redbridge and Waltham Forest; and changes in car ownership.

6.8.2 The Department for Transport (DfT) TEMPro v7.2 planning tool was interrogated to determine external and background traffic growth forecasts throughout the District. TEMPro provides a forecast level of growth for an area, based on the predicted level of employment and housing specified in the regional development forecast for origins and destinations.

6.8.3 The Do-Minimum applies committed development related traffic growth to an unadjusted TEMPro growth forecast (i.e. current planning assumptions for housing and employment) to account for economic growth, other development planning assumptions and wider UK growth to generate a forecast scenario without the intervention of the LPSV.

6.8.4 In the Do-Something scenarios only background growth, accounting for just economic and wider UK growth from TEMPro, has been applied. Any other planning assumptions (additional housing or employment growth) included within TEMPro for the District up to 2033 were removed. LPSV and committed development traffic was then added to the adjusted TEMPro background growth as a more accurate development forecast to avoid double counting and presenting an overly pessimistic future traffic situation.

Wider Area

6.8.5 The review and adjustment of TEMPro for the neighbouring authorities, both within the Housing Market Area (HMA) and outside, including the adjacent outer London Boroughs, added in adopted Local Plan information, and where possible, was supplemented with emerging Plan information where known (including from the emerging London Plan which is currently the subject of Examination). These adjustments would therefore account for the full anticipated development growth in the wider area rather than just adopted Plan information, including growth at Stansted Airport and emerging London Plan targets.

6.8.6 The full adjusted TEMPro growth (including the most up to date planning assumptions) from outside of the District accounts for 26.6% growth. However, this would only apply to through traffic travelling on the EFD road network, given all other trips either have an origin or destination in EFD and this growth would be picked up by the addition of the EFD Local Plan. Analysis of 2011

Census JTW data and the wider WEEH Harlow VISUM model indicates that less than 1% of traffic is typically through traffic using the EFD road network, with the remainder having a journey purpose within the District. As a conservative approach, in acknowledgement that traffic flows could fluctuate, a higher 3% assumption of through traffic has been assumed and applied as a weighting factor to this wider growth.

LGV / HGV Growth

6.8.7 In addition to TEMPro growth, separate 2015 Road Traffic Forecasts (RTF) growth for goods vehicles (LGV / HGV) has been weighted and applied. 2017-2033 growth factors have been extracted for Eastern England including 40% growth for LGVs and 14.8% growth for HGVs.

6.8.8 Analysis of existing traffic data calculates that 11.3% of all traffic within EFD are LGVs and 1.84% are HGVs. The additional goods vehicles growth has been weighted on this basis and applied to the overall TEMPro calculation.

2017-2033 Background Growth

6.8.9 The combined calculation and assumptions used to determine 2017-2033 background traffic growth for the LPSV model forecast are summarised in Table 6-10.

2017-2033	Weighting (% of veh. class)	Do-Min Growth Factor	LPSV Background Growth Factor
Car (TEMPro)	87%	1.154	1.09
LGV (RTF)	11%	1.401	1.40
HGV (RTF)	2%	1.148	1.15
Modelled Growth		**1.182**	**1.126**

Table 6-10 2017-2033 Forecast Weighted Traffic Growth Factors

6.8.10 Existing traffic and background traffic growth have not been adjusted to account for any realistic sustainable transport improvements, i.e. modal shift opportunities for existing residents/workers arising from new transport improvements. The assessments are therefore considered a robust worst-case.

6.8.11 Furthermore, in their Road Traffic Forecasts 2018 Report[9] (p38-40), the DfT acknowledges that overall trip rates have been declining over the last 20 years with a reduction of 13% since 2002. Of relevance to the peak hour assessments of the LPSV, there have been downward trends in commuter (4% reduction between 2011-2016) and personal business trips. While these trends have been included in TEMPro v7.2 up to 2016, as a precautionary approach, they are held constant from 2016 rather than extrapolating the observed reduction into the future traffic growth assumptions. The potential for home-working and further Information Communication Technology (ICT)

9 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740399/road-traffic-forecasts-2018.pdf

advancements, indicate that there is a reasonable case that the growth assessed is an overestimation and therefore provides a potential additional worst-case variable to the overall methodology.

6.9 Trip Distribution

6.9.1 The origin and destinations of trips travelling to and from the development sites, known as trip distribution, has been derived from the 2011 Census journey to work (JTW) dataset. A model zone system was defined based on the Census JTW output areas and boundaries. It was then possible to aggregate the JTW data to fit within the zone definitions of the spreadsheet model. 116 internal and external zones were subsequently identified (see Section 3 for reference).

6.9.2 A matrix of Census JTW trips was subsequently derived and used as a basis for the creation of sectored distribution matrices for each of the four main settlements in the model, including Epping, Loughton, Ongar and Waltham Abbey, as well as for the wider District and beyond.

6.9.3 Individual developments were assigned to a specific zone and associated distribution pattern for each scenario. The distributions applied to any further development sites included in the study area are therefore based on 2011 observed trip patterns for specific areas in the District. Since the majority of travel from home to work occurs in the AM peak, it was assumed that the home end of the trip is the origin, and the work place the destination. This assumption was inverted to inform the PM peak. For the purposes of assessment, any school traffic has been distributed using the overarching JTW method discussed above.

6.10 Rail-Heading Trips

6.10.1 Further consideration has been given to the distribution of rail heading commuter car trips to station car parks. Development trips are assigned to the model network using VISUM. VISUM uses origin-destination information to assign trips to specific highway routes between the origin and destination entered. The distribution of development trip origins and destinations in the model has previously been based on census journey to work data with car as the primary mode. However, this method does not account for trips by multiple modes, for example, journeys with rail as the primary mode and car as a secondary journey to a station. This results in a trip assignment bias towards longer distance car trips, when realistically, some of the car journeys generated by new residential developments would be rail-heading towards a local railway or LUL station.

6.10.2 Although unlikely to make a significant difference in general on the network this potential trip assignment bias may make a local difference at some key junctions. Therefore, an adjustment has been made to the trip distribution source matrix to account for rail-heading car journeys. The methodology is described below.

- Analysis of census journey to work data for primary modes car and rail combined to identify potential additional car + rail journeys that may contribute to total car journey distributions and calculate primary mode car trips as a proportion of car + rail trips.
- Identification of nearest railway stations and distances between zones to set criteria for rail journeys to be considered car + rail: Minimum threshold distance of 1,500m between origin zone and nearest station applied to exclude rail trips from origins that are within walking or cycling distance of their nearest station.
- Apply the proportions and threshold distances generated in the previous steps to identify trips from the original car journey-to-work trip matrix to reassign from their original destination to the destination zone that contains the nearest railway station. This is implemented in a two-stage process: First, by applying factors to proportionally reduce the numbers of trips from the origin zones to destinations that are further than the nearest railway station; secondly to add the equivalent number of trips back on to the matrix with the same origin and amended destination as that containing the nearest station.
- Finally, the adjusted journey-to-work matrix is substituted for the census journey-to-work matrix in the model so that trip distribution proportions are calculated from the adjusted matrix accounting for mitigation for rail-heading car journeys.

6.10.3 The methodology makes a simple assumption that residents travelling by rail will use their nearest station and not drive to a station further away. Although there are several factors that may affect which station residents would drive to, e.g. parking supply, cost and service frequency, making assumptions based on more complex factors than distance to the station would require complex modelling beyond the capabilities of the EFD Highway Assessment Model.

6.10.4 Analysis of the overall impact of the rail-heading adjustment on Local Plan related traffic illustrates that only a limited number of development trips (~3%) across the network would typically be reassigned. However, impacts could be greater on some parts of the network with up to 9% of development trips either removed from or added to a junction.

6.11 Trip Assignment & Route Identification

6.11.1 The principal functionality of the EFD Highway Assessment Model is spreadsheet based. However, the model was enhanced to improve its efficiency while reducing bias and potential sources of errors. This included a simplified macro-strategic model application, using PTV VISUM v14, to assist trip assignment calculations within the area of interest with a particular emphasis on the following detailed and strategic modelling areas:

- Detailed Network – Epping, Waltham Abbey, Loughton

- Wider Strategic Network – Epping Forest District, North Weald, Ongar, Harlow, Nazeing & External

6.11.2 Figure 6-2 and Figure 6-3 overleaf illustrate the 'Detailed' and 'Wider Strategic' networks coded into the model in blue. The simplified route choice strategic model represents an attempt to simulate the current and potential future transport route choice to provide relevant forecasts to be used in the spreadsheet-based outputs for further testing in standalone junction assessment software. It should be noted that this stage of the modelling process is not a dynamic VISUM assignment model and route choice assumptions are fixed for all future development traffic arriving or departing from the different zones.

6.11.3 VISUM was selected for this modelling exercise due to its flexibility to assist a spreadsheet interface and ability to efficiently undertake highway route choice and assignment calculations. The model is also broadly compatible with other VISUM models developed by ECC across the county.

6.11.4 The modelled network area was created using the Integrated Transport Network (ITN). ITN segregates links into motorways, A-roads, B-roads, minor roads, local streets, private roads, and alleys, in descending order of importance. Private roads and alleys were excluded from the calculations since only the principal road network was the subject of the study.

6.11.5 The different highways classes or types were coded into the model, using guidance from COBA Volume 13 Section 1 part 5, to classify roads based on characteristics including: road class; number of lanes; and speeds. The following road classes were considered in the analysis:

- A-Road out of town
- A-Road in town
- Rest of town
- B-Road out of town
- B-Road in town
- Other rural/non-town links
- Motorways

6.11.6 In the external model area, only major highways (selected Motorways, A-roads and B-roads) were coded to guarantee good levels of accessibility. Due to the simplified nature of the model for basic assignment purposes, existing congestion and priorities on junctions were not considered as being critical regarding the final route choice. Therefore, no Volume Delay Functions or capacity restrictions were applied or coded into the model. Network delays were considered separately as part of the overall junction model outputs and network performance.

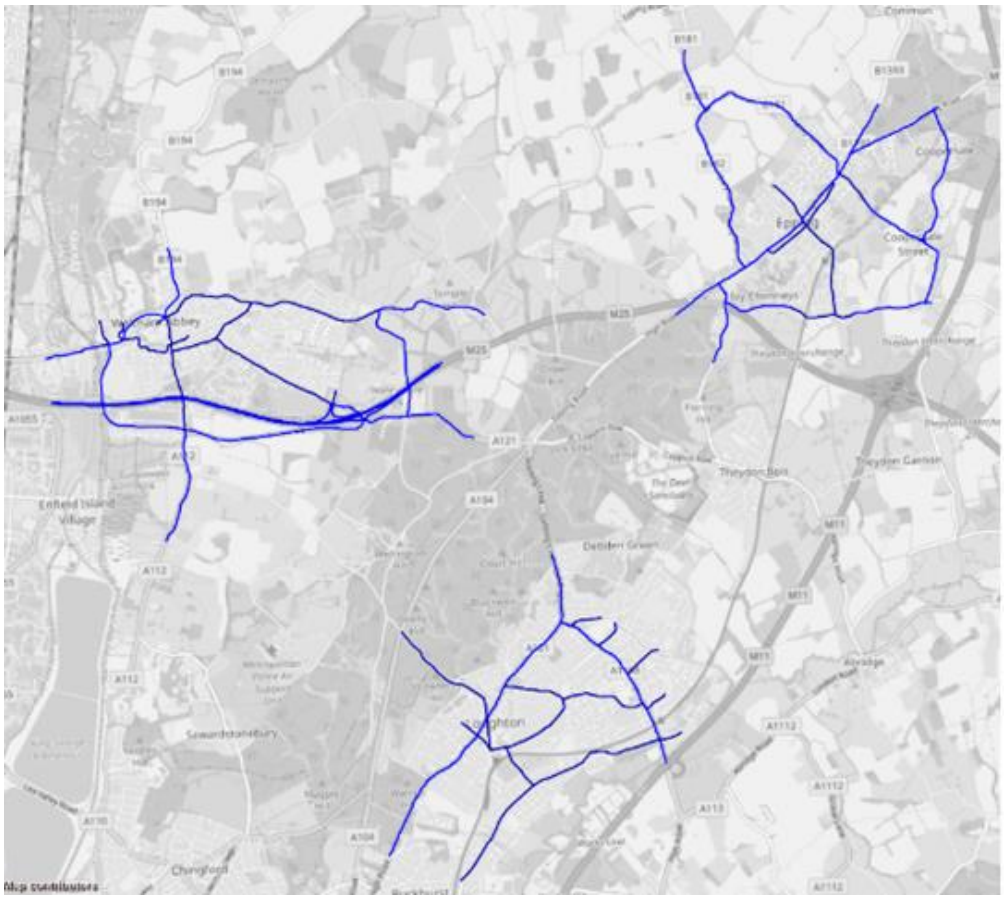


Figure 6-2 VISUM Detailed Network

Figure 6-3 VISUM Wider Strategic Model Area Network

6.11.7 The model uses the zonal system (see Figure 3-3) with a series of appropriate connectors to ensure that travelling times were realistic and loaded into the principal areas of interest. In addition, connector length was updated to a constant value so that route choice was chosen only based on OD characteristics and not based on travelling time.

6.11.8 The model has a limitation on performing micro-simulation specific tasks or taking into consideration the impact of existing or future levels of congestion on route or mode choice. Forecast matrices have therefore been fixed when assigned to the network and the modelling does not take account of reassignment likely to occur to other routes, modes and time periods, if capacity is not increased. As stated previously, the wider WEEH Harlow VISUM strategic model does not model the majority of the EFD network in detail, but does allow high level testing to be undertaken, which has indicated that up to 12%[10] of traffic could reassign to other parts of the network during the most congested periods. A robust worst-case has therefore been adopted, which allows the impact of the potential development sites to be assessed more transparently to simplify the scenario testing and decision-making processes.

6.11.9 The overall modelling approach follows recognised and accepted DfT / WebTAG principles and is therefore considered robust, fit for purpose and appropriate in scale for testing the LPSV and the type of highway network included in the study area.

[10] Indicative testing only of the principal B1393 / A121 corridor for information purposes

7 Future Sustainable Travel

7.1 Overview

7.1.1 The earlier iterations of Local Plan development scenarios, culminating in the LPSV, have been tested extensively over the previous 5 years to assess the transport impact. While the quantum and type of development have changed, along with specific modelling assumptions, it is acknowledged that a comprehensive package of mitigation is likely to be required to address future traffic growth.

7.1.2 In the first instance the mitigation approach targets a balance of implementing reasonable sustainable transport initiatives, including rail, bus and active modes, prior to the delivery of actual physical highway improvements. This methodology adopts a more sustainable approach and avoids the need for overproviding highway capacity, thus minimising impacts on the public purse, minimising urbanising/environmental effects and avoiding unconstrained car traffic growth.

7.1.3 As highlighted in the previous section an element of improvement to the existing level of sustainable transport supply has been factored in to derive a reasonable level of modal shift in the future. Previous studies indicated that these improvements could equate to a future 8% reduction in car trips when compared to a ('Low Sustainability') scenario where no improvements are added over and above the existing supply. This is very much the starting point and would be considered a minimum aspiration for any development coming forward to contribute to. In keeping with Garden Town Community principles to be adopted at the strategic sites around Harlow, including high sustainable modal share targets, there would be potential to roll out more ambitious targets at a wider District level and improve on what has been tested in this assessment.

7.1.4 The Do-Something Scenarios 3-6 all make provision for reasonable improvements to sustainable transport choices across the District and to neighbouring destinations e.g. Harlow and London. The analysis considers the sustainable access assumptions, taken from the EPTAL vehicle trip generation assessment, to provide a balance of what can be reasonably delivered by developers and public transport operators to encourage modal shift. It should be noted that more ambitious improvements could be delivered, e.g. through the Garden Town objectives, which could deliver further reductions in car travel across the district.

7.1.5 The cycling and bus teams at ECC and Essex Highways have been consulted to identify potential for improvements based on the likely pattern of development and recent studies including the Epping Forest Cycle Action Plan. Consideration has also been given to anticipated capacity improvements planned by TfL for the Central Line, Crossrail and Greater Anglia rail network.

7.1.6 This section provides an overview of recommended sustainable transport improvements, which would be expected to support the delivery of the LPSV and achieve this 'reasonable' level of modal shift. It is important to recognise

that it will be the responsibility of any developer or landowner to thoroughly test the related and cumulative multi-modal transport impacts, including reasonable mitigation measures, as part of any Transport Assessment /Statement provided to support a planning application.

7.2 Cycling

7.2.1 The Epping Forest Cycle Action Plan (2018) sets out a strategy to create an environment where cycling is normal for the residents of Epping Forest District, removes existing barriers to cycling and identifies a series of cycle routes with the aim of creating a connected cycle network over time for both key utility journeys and encouraging leisure cycling.

7.2.2 New infrastructure would need to be accompanied by high profile and targeted promotion of cycling to ensure the full cycling potential is realised, particularly in urban areas. The Cycle Action Plan makes the following key recommendations, which could reasonably be delivered in part, or full, by Local Plan development:

- Review existing route signage and lighting;
- Improve maintenance of existing routes (it is an aim of the overarching Essex Cycle Strategy to prioritise more frequent and improved maintenance of the cycle network);
- Prioritise improving cycle access and parking facilities in the town centres and at railway stations;
- Increase provision of direct and connected cycle routes in Waltham Abbey, Loughton/Buckhurst Hill and Epping;
- Fill obvious gaps in the existing cycle-route network (where the topography is cycle-friendly);
- Provide new infrastructure on key roads with cycle-friendly topography but no existing facilities;
- Update the existing cycle map every two years taking on board innovation in cycle-map design and promote it and disseminate it widely through a range of channels and outlets; and
- Implement the recommended Flagship Route located in Waltham Abbey to provide east-west connection to existing routes in Hertfordshire, Waltham Cross railway station and the National Cycle Network.

7.2.3 Figure 7-1 at the end of this section provides an overview of potential new on-road and off-road cycle routes in the District and where they connect with the Sustainable Travel Corridors (STCs) in Harlow.

7.3 Bus

7.3.1 The review of the existing District wide bus transport provision in Section 4 demonstrated that, while several services do operate between the main settlements, service frequencies are relatively low and journey times are high. The London Bus network serves the southwest of the District in Loughton,

Buckhurst Hill, parts of Chigwell and provides some higher frequency connectivity to the neighbouring London Boroughs. Bus priority measures are also limited within the District and provide little advantage over car travel on congested parts of the network.

7.3.2 Almost 30% of journeys to work made by car in the District have either a destination in the same main settlement area or in one of the other main settlements within the District. This increases to 45% when the neighbouring authorities of Harlow, Broxbourne and the London Boroughs of Havering and Redbridge are considered. These shorter internal and cross boundary car trips provide an opportunity to encourage modal shift through improvements to bus services.

7.3.3 These factors are largely symptomatic of settlement size, distribution and overall rural nature of the District. However, there are opportunities to improve bus travel through the delivery of Local Plan development. Potential improvements would include:

- Improved bus connectivity, service extensions and increased frequency between principal settlements and London Underground stations including Epping, Loughton, Chigwell, Harlow, North Weald, Waltham Abbey and Ongar;
- Creation of Sustainable Travel Corridors (STCs) to support Garden Town Communities at Harlow (as identified in the Harlow and Gilston Garden Town Transport Strategy);
- Real time passenger information and improved stop facilities;
- Upgraded fleet with lower / zero emission vehicles, improved passenger comfort and Wi-Fi access; and
- Options for bus priority on congested parts of the network including bus gates, bus transponder enabled signals and dedicated lanes; and
- Creation of routes and accessible stops within new developments or enhancement for sites within walking distance of existing bus routes.

7.3.4 Figure 7-1 at the end of this section provides a generalised illustration of the potential for new or enhanced bus routes in the District and the proposed Sustainable Travel Corridors (STCs) linking the strategic sites / Garden Town Communities around Harlow. Specific routes would need to be finalised within the eventual Masterplans of the principal development sites.

7.4 Rail

London Underground

7.4.1 Over the next decade, TfL are proposing to replace trains and signaling systems across the four 'Deep Tube' lines - the Piccadilly, Bakerloo, Central and Waterloo & City lines[11]. The proposals will include:

- 250 new Tube trains for the Piccadilly, Bakerloo, Central and Waterloo & City lines, with the first new trains serving the Piccadilly line from 2023;
- More capacity with a faster, more frequent service;
- More reliability as modern signalling systems will ensure fewer delays;
- Walk-through carriages helping to ease extra demand at peak times;
- Air-cooled carriages for a more comfortable journey; and
- Improved accessibility with step-free access at platform level.

7.4.2 Advances in technology and walk-through carriages mean that trains and signalling systems are capable of increased levels of automation leading to an increase capacity by approximately 25% on the Central Line, equivalent to an additional 12,000 customers per hour.

Crossrail/Crossrail2

7.4.3 The central section of Crossrail (the Elizabeth Line) is due to open in Autumn 2019, with the timescale for the opening of the entire route yet to be confirmed. While it does not specifically serve Epping Forest District, the route does include stations in the neighbouring London Boroughs of Havering and Redbridge, which would provide an alternative rail option to those to the south of the District.

7.4.4 Crossrail is anticipated to add 10% capacity to central London's rail network and reduce demand on existing London Underground services. The Crossrail route aligns closely with the east-west Central Line, particularly between Stratford and central London, which would potentially alleviate upstream demand pressures for commuters from the District. It should be noted that Transport for London has not objected to the level of growth proposed for Epping Forest District. As part of their representations to Regulation 18 Consultation on the Local Plan, TfL stated:

"Since 2012 further modelling work has been carried out to understand the likely impacts of Crossrail (now renamed the Elizabeth Line) on Central Line crowding. More detailed information on expected growth and trip generation has been used. The modelling indicates that there will be an overall reduction in Central Line trips and that those trips will be redistributed. Although there will be continued growth from the east into Stratford there will be reductions in trips in the central area where crowding is greatest. The Elizabeth Line is due to open in stages and will be fully open in December 2019. On the basis of

[11] https://tfl.gov.uk/campaign/tube-improvements/what-we-are-doing/improving-the-trains

current modelling data, TfL does not believe that Central Line capacity should act as a deterrent to planned growth in the Draft Local Plan (or any of the alternative models for distributing growth which might concentrate a higher proportion of growth within Epping Forest District into the Central Line corridor)."

7.4.5 With regards to station capacity TfL also stated:

"…the scale of development proposed in the Local Plan would likely warrant incremental change rather than a complete overhaul of existing facilities and that this could best be addressed through the use of CIL or Section 106 contributions towards station access and capacity improvements as part of the negotiations on specific large development proposals. It will be important that Epping Forest District Council require developers to prepare an assessment of station capacity and put forward proposals to mitigate any impacts where this is likely to be an issue".

7.4.6 TfL went on to confirm in their Regulation 19 Representations that these comments remained relevant to their position on Central Line and station capacity.

7.4.7 Crossrail2 is currently planned for 2030 and could provide a further 10% capacity to central London's rail network before the end of the Local Plan period. Again, the route would not specifically serve the District, but does serve the towns of Waltham Cross, Cheshunt and Broxbourne in neighbouring Broxbourne Borough, providing viable rail alternatives for those to the west of the District and similar upstream capacity benefits. This could result in a change to existing identified rail-heading travel patterns within the District.

National Rail

7.4.8 The national rail network runs close to the northern and western borders of the District providing one station within the District at Roydon. However, stations in neighbouring Broxbourne Borough at Waltham Cross, Cheshunt and Broxbourne also provide viable rail options for those to the west of the District in particular. Sustainable links between the Strategic Sites on the edge of Harlow and Harlow Town station will also be created providing high frequency and direct bus connections to rail services.

7.4.9 Greater Anglia plan improvements to introduce increased frequency and capacity over the next decade with longer single train design, improved stations, superfast Wi-Fi and flexible fare tariffs.

7.5 Car-Free / Alternative Fuels

7.5.1 Policy T1 Sustainable Transport Choices advises that 'Reduced car parking, including car free, development in sustainable locations will be supported' and 'Where practicable and within 400m of a railway station, the Council will seek reduced car parking, including car free, development'. This will reduce the overall need for car ownership and the number of car-based trips, while promoting the use of nearby and convenient sustainable travel options.

7.5.2 Policy T1 will also require the provision of electric vehicle charging points in all new development with vehicle parking spaces to promote the use of low emission vehicles and support improvements in air quality.

7.6 Travel Plans

7.6.1 Policy T1 Sustainable Transport Choices of the LPSV seeks to promote a safe, efficient and convenient transport system which will build on the strategic location of the District to promote sustainable transport choices.

7.6.2 Development proposals that generate significant amounts of movement must be supported by a Transport Statement or Transport Assessment and will normally be required to provide a Travel Plan. A Travel Plan is defined as a long-term management strategy for an organisation or site that seeks to deliver sustainable transport objectives through an action plan that monitored and regularly reviewed.

7.6.3 Development will, where appropriate, ensure that transport infrastructure will be of a high quality, sustainable in design, construction and layout, and offer maximum flexibility in the choice of travel modes, including walking and cycling, and with accessibility for all potential users. This includes opportunities to integrate with existing transport networks.

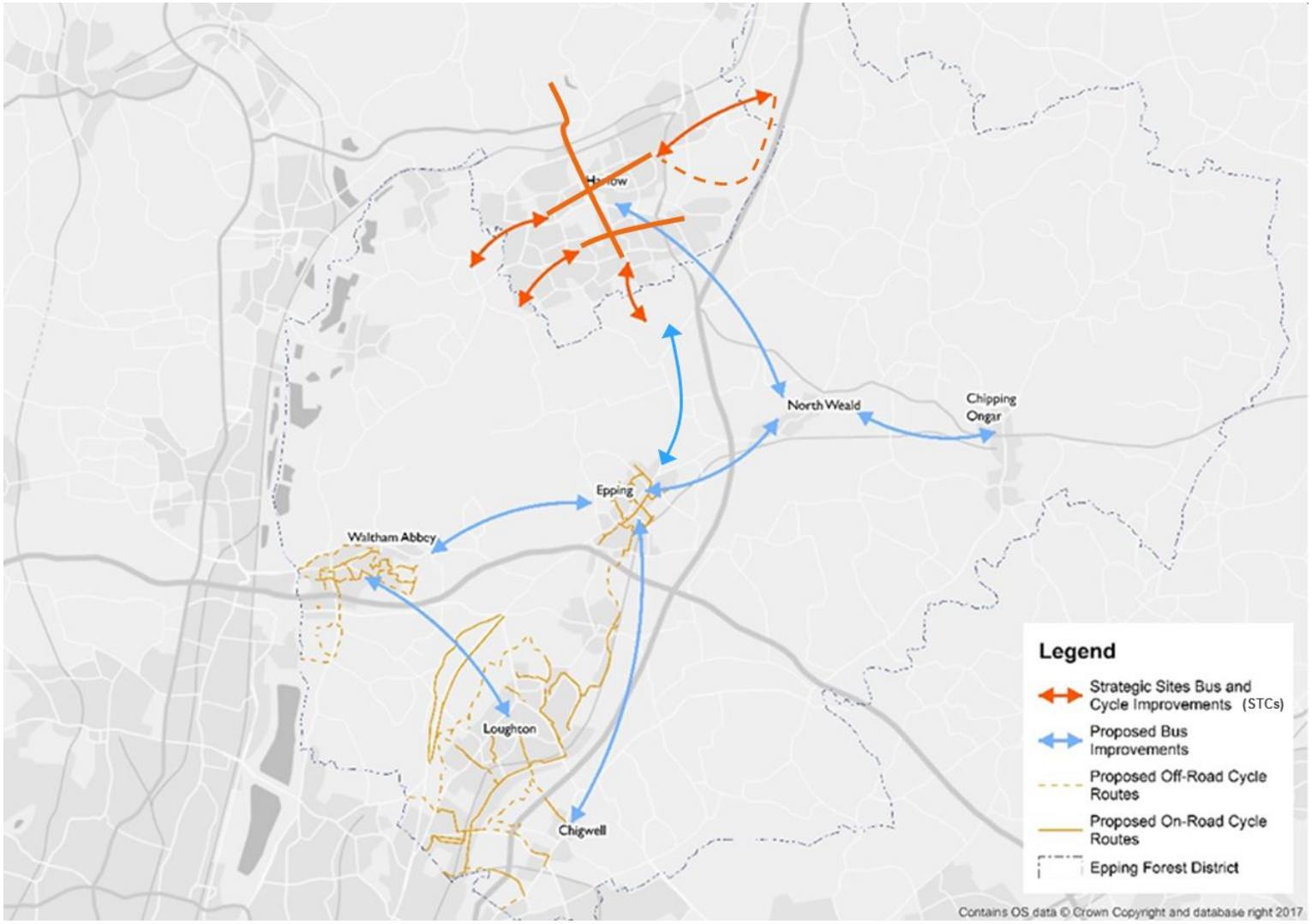


Figure 7-1 Overview of Potential Bus and Cycle Improvements and Wider Harlow Sustainable Travel Corridors (STCs)

8 Model Results and Analysis – Existing Network

8.1 Overview

8.1.1 The results presented in this report summarise modelled forecast traffic impacts on the highway in Epping Forest District. In this section the results are presented for all modelled forecast scenarios for the existing highway network, comprising the Do-Minimum (Scenario 2) and the Do-Something scenarios (Scenarios 3). Reference is also made to the current situation (Scenario 1) for information.

8.1.2 The Do-Minimum (Scenario 2) represents a future situation that excludes proposed Local Plan growth up to 2033, but accounts for full background traffic growth from DfT forecasts, as well as all committed residential developments and other planning assumptions in the District across the Plan period. The Do-Minimum is therefore a likely representation of the future transport situation if the proposed Local Plan was not adopted and therefore an appropriate benchmark for comparison with the Do-Something scenarios.

8.1.3 The Do-Something (Scenario 3) then adds a combination of LPSV development and the initial sustainable transport interventions, discussed in Section 7, for the District up to 2033, including:

- LPSV without an initial package of highway improvements
- Reasonable sustainable modal-shift

8.1.4 The assessment therefore accounts for and tests the transport demand from the LPSV in the period to 2033, including new homes, employment space and schools. It also accounts for all transport demand from the rest of the United Kingdom up to 2033 using the modelled network as either through trips or background growth.

8.2 Assessments

8.2.1 The model forecast year is 2033 to remain consistent with the plan period and accounts for all planned development, and windfall sites based on historic trends, across the District. The assessment makes best use of the outputs from the available modelling tools. While the transport modelling methodology has been deemed appropriate in scale and fit for purpose, it should be reiterated that the EFD Highway Assessment Model is essentially a spreadsheet interface, coupled to a fixed assignment model, with traffic outputs tested in separate standalone junction specific modelling software. The model does not therefore account for the likely reassignment of traffic to less congested alternative routes and presents a worst-case. Furthermore, the model does not include the range of network performance statistics and outputs usually associated with more complex modelling platforms e.g. journey time analysis, speeds, vehicle distances and time travelled across the network.

8.2.2 As a worst-case, the Highway Assessment makes no allowance for the impact of sustainable transport choices on background and existing traffic or fully account for any internalisation of trips within the larger sites, which would be expected at the strategic sites / Garden Town Communities around Harlow, including East Harlow, Latton Priory, Water Lane area (including West Katherine's and West Sumners) as well as at North Weald Bassett e.g. school trips between pupils' homes and schools on these sites.

8.2.3 The analysis uses the following model outputs as indicators of overall network performance to assess the different scenarios:

- Changes in traffic flow
- Ratio of Flow to Capacity (RFC) / Degree of Saturation (DOS)

8.2.4 As highlighted in Section 2 - Study Background, the junction modelling demand profile has been updated from the previous junction modelling assessments used to test earlier iterations of the Local Plan. A review of District wide traffic data indicted the Junction 9 ONE HOUR (ODTAB) demand profile presented an overly conservative worst-case by adding an additional peak period within the peak hour profile. The data identified that flows are more evenly distributed across the peak hour, and all modelling has been updated using the 'Direct Entry' demand profile to account for actual peak hour patterns as a more realistic case.

8.2.5 The following sequential approach to the analysis has been adopted to articulate the Highway Assessment outputs:

- **Assessment 1: Existing (Scenario 1) v Do-Minimum (Scenario 2)** – The existing situation has been appraised against the Do-Minimum to provide information of current network performance and likely future performance if the EFDC Local Plan was not implemented. The Do-Minimum has been taken forward as the benchmark for analysing the Do-Something scenarios.
- **Assessment 2: Do-Minimum (Scenario 2) v Do-Something (Scenario 3)** – The LPSV 'Medium' sustainable modal shift scenario has been assessed against the Do-Minimum and existing situation, as a starting point, to identify key pressures on the transport network.

8.3 Ratio of Flow to Capacity (RFC) / Degree of Saturation (DOS)

8.3.1 The RFC/DOS measures the performance of a road link or turning movement at a junction. An RFC/DOS value greater than 1.00 generally means that the stretch of road or turning movement has a higher level of traffic flow than its theoretical, or operational, capacity, with resulting flow breakdown, increased queuing and some congestion expected.

8.3.2 With the exception of signalised junctions, an RFC below 0.85 is typically considered acceptable as there is still potential to accommodate future growth

and daily fluctuations in traffic flows. For signalled junctions the DOS threshold is higher at 0.90 given the added traffic management capabilities. A value between 0.85 and 1.00, or 0.90 and 1.00 for signalled junctions, suggests the stretch of road or junction is starting to approach theoretical capacity with little or no spare capacity to accommodate additional growth or daily fluctuations, which can lead to periodic increases in delay, queues and driver stress.

8.3.3 The maximum modelled RFC/DOS across all approaches for each junction in the Highway Assessment have been applied to the results tables later in this section, to aid the interpretation of the model results.

8.3.4 A 'RAG' colour coding system has been adopted for ease of reference as summarised in Table 8-1. The 'RAG' system has been modified and identifies where there is spare capacity on the network with results <1.00 highlighted in green and yellow. An amber result denotes potential congestion points on the network (>1.00-1.15), but it is considered more ambitious sustainable access improvements, over and above those already suggested, could reasonably mitigate the impact. This approach adopts a more pragmatic approach, potentially avoiding the deployment of costly physical highway improvements, which could also encourage further unconstrained car use. Values over 1.15, and highlighted in red, identify areas of the network where a physical highway improvement may be required to address future capacity issues.

Colour Code	Definition	(RFC / DOS)
	Green denotes a junction with all approaches operating with a RFC/DOS of under 0.85 - which suggests that the junction has sufficient spare capacity.	<0.85
	Roundabout and Priority Junctions - Yellow indicates a junction with one or more approaches operating with a RFC/DOS of between 0.85 and 1.00 - which suggests that the junction is nearing capacity.	0.85 -1.00
	Signal Junctions - Yellow indicates a junction with one or more approaches operating with a RFC/DOS of between 0.90 and 1.00 - which suggests that the junction is nearing capacity.	0.90 -1.00
	Amber denotes a junction where one or more approaches is operating with a RFC/DOS of between 1.00 and 1.15 – junction is operating over capacity but further improvements to sustainable access could mitigate impact.	>1.00-1.15
	Red indicates a junction with one or more approaches operating with a RFC/DOS of 1.15 or over – junction is operating over capacity and could potentially require physical mitigation.	>1.15
	Some red coded junctions are denoted by an 'X', where an approach may be significantly over capacity, exceeding model parameters, and potentially require physical mitigation.	X

Table 8-1 Junction Assessment 'RAG' System

8.4 Changes in Traffic Flows

8.4.1 The EFD Highway Assessment Model is constructed from a series of demand matrices from observed and forecast flows at the key junctions modelled in the Highway Assessment area as shown in Figure 8-1.

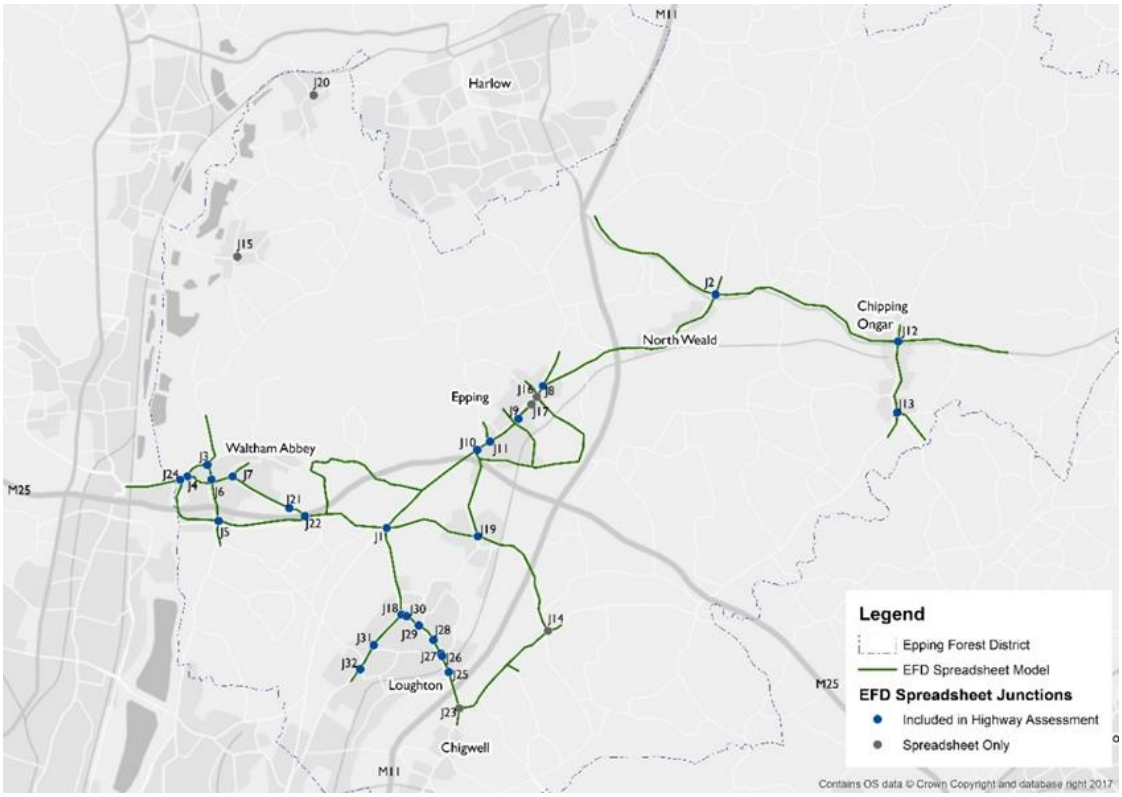


Figure 8-1 Highway Assessment (HA) Network and Junctions

8.4.2 Table 8-2 provides a summary of the percentage change in traffic flows across the modelled network as an indication of average traffic growth for each of the scenarios. Reference has also been made to the previous Regulation 19 Local Plan Proposed Submission Version assessment flows to demonstrate the effect of the various updates to the modelling methodology outlined in Section 2.

Scenario	% Change from Existing (Scenario 1) Av.	% Change from DM (Scenario 2) Av.	% Change from DS (Scenario 3) Av.
1 - Existing			
2 – Do-Minimum	18%		
3 – Do-Something	36%	15%	
Reg 19. Submission	36%	15%	0.2%

Table 8-2 Average Model Network Flow Changes by Scenario

8.4.3 As shown in Table 8-2, the impacts of higher TEMPro growth; Rail-Heading analysis; and addition of 'car-free / low parking' development, has resulted in a minimal overall change in demand between the latest LPSV assessment and the previous assessment undertaken to support the publication of the Regulation 19 submission. However, while there is no overall change, the impacts on demand at specific locations on the network are marginally higher and range between 0%-4% at different junctions.

8.4.4 The model outputs show that:

- Traffic levels would increase from current levels in the 2033 Do-Minimum (Scenario 2) by 18%, even without the introduction of any Local Plan growth; and
- The proposed LPSV (Scenario 3) generates 36% growth from the current situation and 15% additional growth over the Do-Minimum.

8.4.5 A review of TEMPro shows that if planning assumptions were adjusted to those promoted in the LPSV, the estimated growth would be approximately 27.5% from the existing situation rather than the 36% assessed. The modelling undertaken therefore includes an additional 7% traffic growth over the TEMPro forecast presenting a further worst-case variable in the assessment methodology.

8.5 Assessment 1 Results – Scenario 1 Existing & Scenario 2 Do-Minimum

8.5.1 The changes in traffic flows for Assessment 1 are summarised in Table 8-3 and the modelling assessment results, showing the worst performing junction arm in the peak hours, are shown Table 8-4 overleaf. **Appendix D** includes a summary of the modelling assessment results for all junction arms.

8.5.2 The modelling provides a representation of the current network performance. At least 6 of the junctions exceed theoretical capacity in at least one of the peak hours with a further 6 junctions approaching capacity.

8.5.3 The most notable of these is Junction 1 Wake Arms roundabout in the heart of the Epping Forest SAC. The junction is at the intersection of key routes (A121, B1393 and A104) linking the principal settlements of Epping, Waltham Abbey and Loughton, as well as providing access to Epping Forest and the nearby M25 Junction 26. A maximum recorded RFC of 1.19 in the AM and 1.12 in the PM peaks indicate there are already significant levels of congestion and delay occurring across several approaches. Over and above Junction 1 Wake Arms roundabout, the following key junctions currently exceed capacity:

- Junction 8 - B1393 Thornwood Road signals is the principal gateway to the north of Epping town leading north towards North Weald and M11 Junction 7 - The junction exceeds capacity in the existing PM situation.
- Junction 22 – M25 J26 where the westbound M25 off slip is exceeding capacity and eastbound queuing on the A121 Honey Lane exit can block the circulatory carriageway.
- Junction 24 - A121 Meridian Way signals forms a key east-west route leading to neighbouring Waltham Cross in the District of Broxbourne. The signals are exceeding capacity in both peak periods.

8.5.4 The Do-Minimum traffic adds approximately 18% growth across the network over the existing situation. Growth is generally uniform across the modelled network given the majority can be attributed to the addition of TEMPro to all base traffic data. There are minor increases over and above the average having factored in the delivery of 1,621 dwellings which are already committed

(taking into account a 10% Lapse Rate See Appendix 5 of the LPSV). Committed highway schemes at Junction 26-A1168 Chigwell Lane - The Broadway and Junction 27-A1168 Chigwell Lane - Borders Lane are also currently being constructed to convert existing roundabouts to signals and will be complete for all future scenarios.

8.5.5 The addition of Do-Minimum growth will worsen the already congested junctions and increase queues, delays and driver stress. The analysis (see Table 8-4) shows that up to 14 junctions would be exceeding their theoretical capacity, with a further 8 junctions approaching capacity, on at least one or more approaches in the Do-Minimum scenario.

8.5.6 Several key links and corridors are likely to be experiencing high levels of congestion, queuing and delay in the Do-Minimum scenario either due to the constrained junction nodes discussed or overall link capacity, including:

- B1393 corridor between M11 Junction 7, Epping, Bell Common and Epping Forest SAC;
- A1168/A121 corridor between M11 Junction 5, Loughton and Epping Forest SAC;
- A112/A121 links in Waltham Abbey;
- A121/A104 in Epping Forest SAC;
- A121 at M25 Junction 26; and
- A1168 at M11 Junction 5.

8.5.7 The analysis indicates that, even if the Local Plan was not delivered, the anticipated organic Do-Minimum growth would have a material impact across the network and at key junctions, requiring some form of mitigation in the future.

Junction	Scenario	1 Existing 2017 PCU/HR		2 Do-Minimum 2033 PCU/Hr		% Change from Existing	
		AM	PM	AM	PM	AM%	PM%
1	A121/B1393 Wake Arms PH - Epping Forest	3888	4115	4545	4821	17%	17%
2	A414/B181 Talbot PH - North Weald	2246	2163	2624	2532	17%	17%
3	B194 Crooked Mile - Waltham Abbey	2542	2993	2959	3478	16%	16%
4	B194 Highbridge St - Waltham Abbey	1575	1872	1844	2187	17%	17%
5	A121/A112 Sewardstone Rd - Waltham Abbey	2976	3282	3465	3820	16%	16%
6	Sewardstone Rd - Sun St - Farm Hill Rd	2364	2659	2748	3095	16%	16%
7	Honey Ln - Farm Hill Rd - Waltham Abbey	1234	1409	1435	1645	16%	17%

Junction	Scenario	1 Existing 2017 PCU/HR		2 Do-Minimum 2033 PCU/Hr		% Change from Existing	
		AM	PM	AM	PM	AM%	PM%
8	B1393 Thornwood Rd - Epping	2400	2569	2799	3001	17%	17%
9a/b	B1393 - St John's Rd - Station Rd - Epping	2224	2187	2599	2566	17%	17%
10	B1393 - Theydon Rd - Bell Common	2265	2102	2645	2465	17%	17%
11	B1393 - Bury Ln - Epping	2237	2183	2614	2558	17%	17%
12	A414 Wantz Service Stn - Ongar	3126	2987	3682	3529	18%	18%
13	Coopers Hill - Marden Ash, Ongar	1617	1651	1915	1959	18%	19%
14	A113 Ongar Rd - B172 Abridge Rd	1880	1824	2243	2188	19%	20%
18a/6	A121 Church Hill - A1168 Rectory Lane - Goldings Hill	2286	2087	2770	2542	21%	22%
19	B172 - Piercing Hill - Theydon Bois	1630	1486	1900	1739	17%	17%
21	M25 J26 Northern Rbt - Waltham Abbey	1816	2159	2116	2533	17%	17%
22	M25 J26 Southern Rbt - Waltham Abbey	2960	2806	3473	3299	17%	18%
24	A121/B194 Meridien Way Signals - Waltham Abbey	2517	2675	2943	3126	17%	17%
25	A1168 Chigwell Lane - Langston Rd - Oakwood Hill	2626	2415	3181	2947	21%	22%
26	A1168 Chigwell Lane - The Broadway	1515	1845	1862	2263	23%	23%
27	A1168 Chigwell Lane - Borders Lane	1081	1606	1353	1984	25%	24%
28	A1168 Rectory Lane - Westall Rd Rectory Lane	960	1401	1178	1704	23%	22%
29	A1168 Rectory Lane Pyrles Lane	1898	1780	2281	2146	20%	21%
30	A1168 Rectory Lane Hillyfields Priority	1532	1425	1867	1746	22%	23%
31	A121 High Rd Traps Hill	1276	1254	1538	1517	21%	21%
32	A121 High Rd - Old Station Rd - Ollards Grove	1557	1783	1864	2115	20%	19%

Table 8-3 Existing Situation V Do-Minimum Change in Total Peak Hour Junction Flows (PCU/Hr & % Change)

	Scenario	1 Existing 2017 RFC/DOS		2 Do-Minimum 2033 RFC/DOS	
	Junction	AM	PM	AM	PM
1	A121/B1393 Wake Arms PH - Epping Forest	1.19	1.13	1.58	1.40
2	A414/B181 Talbot PH - North Weald	0.75	0.64	0.92	0.80
3	B194 Crooked Mile - Waltham Abbey	0.48	0.48	0.60	0.61
4	B194 Highbridge St - Waltham Abbey	0.43	0.79	0.52	0.97
5	A121/A112 Sewardstone Rd - Waltham Abbey	0.47	0.60	0.60	0.74
6	Sewardstone Rd - Sun St - Farm Hill Rd	0.93	0.97	1.10	1.14
7	Honey Ln - Farm Hill Rd - Waltham Abbey	0.75	0.69	0.91	0.84
8	B1393 Thornwood Rd - Epping	0.89	1.18	1.45	1.74
9a	B1393 - Station Rd - Epping	0.78	0.78	0.97	0.97
9b	B1393 - St. Johns Rd - Epping	0.76	0.62	1.05	1.17
10	B1393 - Theydon Rd - Bell Common	0.95	0.82	1.23	1.16
11	B1393 - Bury Ln - Epping	0.94	0.92	1.19	1.14
12	A414 Wantz Service Stn - Ongar	0.78	0.69	1.01	0.91
13	Coopers Hill - Marden Ash, Ongar	0.81	0.67	1.01	0.87
14	A113 Ongar Rd - B172 Abridge Rd	1.04	0.90	X	1.39
18a	A121 Church Hill - A1168 Rectory Lane	0.65	0.75	0.82	0.99
18b	A121 Goldings Hill - Millsmead - Loughton	0.87	0.75	1.06	0.91
19	B172 - Piercing Hill - Theydon Bois	X	1.16	X	1.60
21	M25 J26 Northern Rbt - Waltham Abbey	0.36	0.48	0.43	0.58
22	M25 J26 Southern Rbt - Waltham Abbey	1.14	1.05	1.37	1.27
24	A121/B194 Meridian Way Signals - Waltham Abbey	1.11	1.21	1.34	1.43
25	A1168 Chigwell Lane - Langston Rd - Oakwood Hill	0.98	0.94	1.15	1.13
26	A1168 Chigwell Lane - The Broadway	0.54	0.71	0.85	0.73
27	A1168 Chigwell Lane - Borders Lane	0.49	0.73	0.76	0.97
28	A1168 Rectory Lane - Westall Rd Rectory Lane	0.54	0.32	0.69	0.46
29	A1168 Rectory Lane Pyrles Lane	0.67	0.59	0.91	0.74
30	A1168 Rectory Lane Hillyfields Priority	0.52	0.20	0.82	0.32
31	A121 High Rd Traps Hill	0.27	0.37	0.34	0.49
32	A121 High Rd - Old Station Rd - Ollards Grove	0.56	0.72	0.71	0.90

Table 8-4 Existing Situation V Do-Minimum Peak Hour Network Performance (RFC/DOS) – Results Present Worst Performing 'Arm' at each Junction

8.6 Assessment 2 Results – Scenario 3 Do-Something Non-Mitigated Network

8.6.1 The traffic impact of the LPSV has been assessed with the existing network, i.e. with no highway mitigation, using Do-Something Scenario 3 flows. This has been compared against the existing situation and Do-Minimum scenario to compare the likely future transport situation, with and without the implementation of the LPSV development, as well as provide an early indication of the overall level of acceptability in transport terms.

8.6.2 The changes in traffic flows for Assessment 2 are summarised in Table 8-5 and the modelling assessment results, showing the worst performing junction arm in the peak hours, are shown Table 8-6 at the end of this section. **Appendix E** includes a summary of the modelling assessment results for all junction arms.

8.6.3 The Do-Something scenario will generally increase traffic across the network by approximately 36% from the existing situation and 15% over the Do-Minimum. However, the impacts do fluctuate across the network, given the distribution of the 11,882 new dwellings and 94,760 sqm of employment floor space modelled, and some junctions would be subject to 50%-80% growth, particularly in the settlements of Epping and Waltham Abbey.

8.6.4 The modelling outputs reflect the additional increase in development traffic with most of the junctions (up to 21) exceeding theoretical capacity on at least one or more approach in either peak period. Demand generally exceeds capacity across the network leading to increased journey times, little or no network resilience and driver stress.

8.6.5 The key junctions, links and corridors, shown as constrained in Assessment 1, will therefore worsen with the addition of Do-Something Scenario 3 traffic growth. In some instances, RFCs/DOS values are approaching 2.0, reinforcing the case, made in previous studies, for further mitigation and improvements to support Local Plan growth.

8.6.6 In the first instance, the beneficial impacts of improved sustainable transport choices should always be considered before any physical highway intervention to encourage modal shift away from the car and prevent any oversupply of highway capacity, which would offset traveller propensity to consider alternative modes. The analysis shows that at least 6 out of the 21 junctions are within the 1.15 amber threshold, whereby more ambitious sustainable travel options could reasonably address network capacity issues prior to the need for physical intervention.

8.6.7 Notwithstanding the impact of further sustainable travel improvements, the results do demonstrate that LPSV growth could have significant impacts, including excessive bidirectional queuing and delay across, and beyond, the peak hours on the key corridors across the network including:

- B1393 corridor between M11 Junction 7, Epping, Bell Common and Epping Forest SAC;
- A1168/A121 corridor between M11 Junction 5, Loughton and Epping Forest SAC;
- A112/A121 links in Waltham Abbey;
- A121/A104 in Epping Forest SAC;
- A121 at M25 Junction 26; and
- A1168 at M11 Junction 5.

8.7 Summary

8.7.1 The analysis shows that the network is currently operating at or over capacity in the peak hours with ‘hot spots’ identified throughout the District. The addition of Do Minimum traffic growth, i.e. the likely situation if no Local Plan development was implemented, would exacerbate the existing issues leading to significant queuing and delay on key corridors.

8.7.2 While a worst-case scenario has been assessed, the increased traffic growth of the LPSV would significantly exceed capacity leading to bidirectional queuing and delay for much of the peak hour periods and beyond on parts of the network.

8.7.3 As an initial step, additional sustainable transport interventions would improve the situation, however, the analysis shows that parts of the existing highway network would struggle to accommodate all the LPSV growth. A package of physical improvements is, therefore, potentially needed to mitigate the most severe predicted impacts, as discussed in the subsequent sections.

Junction	Scenario	1 Existing 2017 PCU/Hr		2 Do-Minimum 2033 PCU/Hr		3 Do-Something 2033 PCU/Hr		% Change from Existing		% Change from Do-Minimum	
		AM	PM	AM	PM	AM	PM	AM%	PM%	AM%	PM%
1	A121/B1393 Wake Arms PH - Epping Forest	3888	4115	4545	4821	5441	5540	40%	35%	20%	15%
2	A414/B181 Talbot PH - North Weald	2246	2163	2624	2532	3611	3423	61%	58%	38%	35%
3	B194 Crooked Mile - Waltham Abbey	2542	2993	2959	3478	4109	4488	62%	50%	39%	29%
4	B194 Highbridge St - Waltham Abbey	1575	1872	1844	2187	2833	3044	80%	63%	54%	39%
5	A121/A112 Sewardstone Rd - Waltham Abbey	2976	3282	3465	3820	3647	3904	23%	19%	5%	2%
6	Sewardstone Rd - Sun St - Farm Hill Rd	2364	2659	2748	3095	3033	3258	28%	23%	10%	5%
7	Honey Ln - Farm Hill Rd - Waltham Abbey	1234	1409	1435	1645	1517	1710	23%	21%	6%	4%
8	B1393 Thornwood Rd - Epping	2400	2569	2799	3001	3465	3560	44%	39%	24%	19%
9a/b	B1393 - St John's Rd - Station Rd - Epping	2224	2187	2599	2566	3221	3106	45%	42%	24%	21%
10	B1393 - Theydon Rd - Bell Common	2265	2102	2645	2465	3413	3101	51%	48%	29%	26%
11	B1393 - Bury Ln - Epping	2237	2183	2614	2558	3270	3100	46%	42%	25%	21%
12	A414 Wantz Service Stn - Ongar	3126	2987	3682	3529	4203	3945	34%	32%	14%	12%
13	Coopers Hill - Marden Ash, Ongar	1617	1651	1915	1959	2156	2135	33%	29%	13%	9%
14	A113 Ongar Rd - B172 Abridge Rd	1880	1824	2243	2188	2348	2251	25%	23%	5%	3%
18a/6	A121 Church Hill - A1168 Rectory Lane - Goldings Hill	2286	2087	2770	2542	2950	2684	29%	29%	7%	6%
19	B172 - Piercing Hill - Theydon Bois	1630	1486	1900	1739	1898	1732	16%	17%	0%	0%
21	M25 J26 Northern Rbt - Waltham Abbey	1816	2159	2116	2533	2421	2833	33%	31%	14%	12%
22	M25 J26 Southern Rbt - Waltham Abbey	2960	2806	3473	3299	4018	3715	36%	32%	16%	13%
24	A121/B194 Meridian Way Signals - Waltham Abbey	2517	2675	2943	3126	3928	3969	56%	48%	33%	27%
25	A1168 Chigwell Lane - Langston Rd - Oakwood Hill	2626	2415	3181	2947	3276	3041	25%	26%	3%	3%
26	A1168 Chigwell Lane - The Broadway	1515	1845	1862	2263	2014	2372	33%	29%	8%	5%
27	A1168 Chigwell Lane - Borders Lane	1081	1606	1353	1984	1494	2072	38%	29%	10%	4%
28	A1168 Rectory Lane - Westall Rd Rectory Lane	960	1401	1178	1704	1274	1784	33%	27%	8%	5%
29	A1168 Rectory Lane Pyrles Lane	1898	1780	2281	2146	2296	2187	21%	23%	1%	2%
30	A1168 Rectory Lane Hillyfields Priority	1532	1425	1867	1746	1996	1855	30%	30%	7%	6%
31	A121 High Rd Traps Hill	1276	1254	1538	1517	1677	1599	31%	27%	9%	5%
32	A121 High Rd - Old Station Rd - Ollards Grove	1557	1783	1864	2115	1884	2059	21%	15%	1%	-3%

Table 8-5 Existing Situation & Do-Minimum Change in Total Peak Hour Junction Flows (PCU/Hr & % Change)

	Scenario	1 Existing 2017		2 Do-Minimum 2033		3 Do-Something 2033	
	Junction	AM	PM	AM	PM	AM	PM
1	A121/B1393 Wake Arms PH - Epping Forest	1.19	1.13	1.58	1.40	1.86	1.73
2	A414/B181 Talbot PH - North Weald	0.75	0.64	0.92	0.80	1.31	1.26
3	B194 Crooked Mile - Waltham Abbey	0.48	0.48	0.60	0.61	1.02	0.95
4	B194 Highbridge St - Waltham Abbey	0.43	0.79	0.52	0.97	0.78	1.42
5	A121/A112 Sewardstone Rd - Waltham Abbey	0.47	0.60	0.60	0.74	0.63	0.76
6	Sewardstone Rd - Sun St - Farm Hill Rd	0.93	0.97	1.10	1.14	1.29	1.14
7	Honey Ln - Farm Hill Rd - Waltham Abbey	0.75	0.69	0.91	0.84	0.97	0.88
8	B1393 Thornwood Rd - Epping	0.89	1.18	1.45	1.74	1.29	1.64
9a	B1393 - Station Rd - Epping	0.78	0.78	0.97	0.97	1.15	1.22
9b	B1393 - St. Johns Rd - Epping	0.76	0.62	1.05	1.17	1.48	1.35
10	B1393 - Theydon Rd - Bell Common	0.95	0.82	1.23	1.16	1.73	1.62
11	B1393 - Bury Ln - Epping	0.94	0.92	1.19	1.14	1.60	1.31
12	A414 Wantz Service Stn - Ongar	0.78	0.69	1.01	0.91	1.19	1.13
13	Coopers Hill - Marden Ash, Ongar	0.81	0.67	1.01	0.87	1.15	0.95
14	A113 Ongar Rd - B172 Abridge Rd	1.04	0.90	X	1.39	X	1.48
18a	A121 Church Hill - A1168 Rectory Lane	0.65	0.75	0.82	0.99	0.93	1.10
18b	A121 Goldings Hill - Millsmead - Loughton	0.87	0.75	1.06	0.91	1.09	0.96
19	B172 - Piercing Hill - Theydon Bois	X	1.16	X	1.60	X	1.55
21	M25 J26 Northern Rbt - Waltham Abbey	0.36	0.48	0.43	0.58	0.47	0.60
22	M25 J26 Southern Rbt - Waltham Abbey	1.14	1.05	1.37	1.27	1.86	1.48
24	A121/B194 Meridian Way Signals - Waltham Abbey	1.11	1.21	1.34	1.43	1.90	1.81
25	A1168 Chigwell Lane - Langston Rd - Oakwood Hill	0.98	0.94	1.15	1.13	1.15	1.15
26	A1168 Chigwell Lane - The Broadway	0.54	0.71	0.85	0.73	0.97	1.00
27	A1168 Chigwell Lane - Borders Lane	0.49	0.73	0.76	0.97	0.85	1.07
28	A1168 Rectory Lane - Westall Rd Rectory Lane	0.54	0.32	0.69	0.46	0.72	0.48
29	A1168 Rectory Lane Pyrles Lane	0.67	0.59	0.91	0.74	0.83	0.71
30	A1168 Rectory Lane Hillyfields Priority	0.52	0.20	0.82	0.32	1.05	0.45
31	A121 High Rd Traps Hill	0.27	0.37	0.34	0.49	0.42	0.58
32	A121 High Rd - Old Station Rd - Ollards Grove	0.56	0.72	0.71	0.90	0.77	0.87

Table 8-6 Existing Situation & Do-Minimum V Do Something Network Performance (RFC/DOS) – Results Present Worst Performing 'Arm' at each Junction

9 Future Transport Supply & Mitigation

9.1 Overview

9.1.1 The overall mitigation package has been refined throughout the assessment process and this section provides an overview of the latest local highway and wider strategic physical transport improvement schemes relevant to the EFD road network.

9.1.2 It is worth noting that the potential to improve the network within the EFD Highway Assessment Model area is significantly constrained by several factors including the Epping Forest SAC boundaries, third-party land ownership, building lines and other infrastructure. Any schemes are still at the concept stage and would be subject to further feasibility, detailed design and potential change as or when eventually needed / delivered.

9.1.3 National Planning Policy Framework (NPPF) guidance on Plan making does not refer to Local Plan mitigation being required to improve the traffic flow on local roads impacted by development. Rather, the guidance states that:

'Significant adverse impacts…should be avoided and, wherever possible, alternative options which reduce or eliminate such impacts should be pursued. Where adverse impacts are unavoidable, measures to mitigate the impact should be considered. Where adequate mitigation measures are not possible, compensatory measures may be appropriate'.

9.1.4 The mitigation approach targets a balance of implementing reasonable sustainable transport initiatives, including rail, bus and active modes, prior to the delivery of actual physical highway improvements. As previously stated, it will be the responsibility of any relevant development proposals coming forward to promote adequate mitigation and thoroughly test the related and cumulative transport impacts as part of any Transport Assessment /Statement through a planning application.

9.2 Local Highway Schemes

9.2.1 The local highway schemes focus on the potential for mitigation on the Epping Forest District road network within the Highway Assessment area. A summary of the latest concepts is provided in Table 9-1 overleaf including the current layout type (Roundabout / Signals / Priority) and proposed enhancements for each of the key junctions in the assessment area. In some instances, where either capacity is not considered a significant problem or where there is a lack of a viable alternative, an improvement option has not been proposed. Committed schemes currently being installed at Junctions 26 and 27 in south Loughton are included for information.

9.2.2 Concept drawings are included at **Appendix F**, for information purposes only, which provide an improved level of detail and basic consideration of constraints and deliverability from previous assessments. The concepts have

been developed to, where possible, improve capacity and at an appropriate scale to acknowledge deliverability and viability constraints. However, it should be emphasised that schemes are still at a concept stage and would be subject to further assessment, design and testing as development comes forward and using the most up to date traffic information available at that time. Third-party land take is shown in some instances and any future design process would look to reduce or remove this requirement altogether in consultation with respective landowner(s).

9.3 Strategic Highway Schemes

9.3.1 The following strategic highway schemes, while not explicitly modelled in the EFD Highway Assessment Model, are being assessed as part of the separate ongoing wider WEEH Harlow modelling. These are detailed further in the Infrastructure Delivery Plan published to support the LPSV.

9.3.2 Combinations of the following schemes have been tested and would potentially be required to deliver strategic sites in and around Harlow, as well as wider growth proposed as part of the emerging Local Plans of neighbouring authorities:

- Potential interim and long-term improvements to Junction 7 on the M11
- Provision of a through route at the interchange roundabout from Harlow; A414 southbound to the B1393 to Epping Southbound, and minor widening works on the western side of the roundabout;
- Provision of new Junction 7a and associated improvements to include:
  - widening of Gilden Way from the London Road roundabout to Marsh Lane
  - new road to link the improved Gilden Way to the M11 via a new Sheering Road roundabout.
  - new road link to reconnect to Sheering Road just south of Pincey Brook
  - new roundabouts on either side of the M11 and connected by a new bridge over the M11
  - slip roads on and off the M11 for both north-bound and south-bound traffic;
- New second Stort Crossing to the east of the existing crossing: Additional road crossing of the River Stort in Harlow, comprising a dual carriageway linking the A414 at Eastwick with a new 3-arm roundabout north of the River Stort, and a further single carriageway link to River Way towards the eastern end of A414 Edinburgh Way;
- A414 improvements - including Edinburgh Way, Howard Way and Harlow Retail Park, East Road and River Way, First Avenue;
- Highways improvements to A1025 Third Avenue, First Avenue and Second Avenue; and
- Possible enhancements to Water Lane/A1169 roundabout; A1025/ Abercrombie Way signals; and, traffic calming along the A1169.

Junction Ref.		Existing	Potential	Mitigation Summary
1	A121/B1393 Wake Arms PH - Epping Forest	Rbt	Rbt	A121-Woodridden Hill: Flare extensions, and improvement on entry lane from single lane to a single lane plus flare approach A1393 Epping Road: Flare extensions to existing single lane plus flare approach, including improvement to existing single lane exits to two lane exits B172: Flare extensions to existing single lane plus flare approach A121 Golding's Hill: Flare extensions, and improvement on entry lane from single lane to a single lane plus flare approach Exit lane to be improved to two lane exit for a short stretch A104 Epping New Road: Flare extensions, and improvement on entry lane from single lane to a single lane plus flare approach Improved circulatory movements with increased Inscribed Circle Diameter to 65m
#	A104 New Epping Road Robin Hood Roundabout	Rbt	Rbt	Additional mitigation to complement J01 improvements and provide additional capacity on approach arms to meet future demand.
2	A414/B181 Talbot PH - North Weald	Rbt	Rbt	Weald Bridge Road: Flare extensions and improvement on entry lane from single lane to a single lane plus flare approach A414 High Road: Flare extensions to existing single lane plus flare approach B181 High Road: Flare extensions and improvement on entry lane from single lane to a single lane plus flare approach A414 (west): Flare extensions, and improvement on entry lane from single lane to a single lane plus flare approach Improved circulatory movements with increased Inscribed Circle Diameter
3	B194 Crooked Mile - Waltham Abbey	Rbt	Rbt	Mitigation not required
4	B194 Highbridge St - Waltham Abbey	Rbt	Rbt	B194 (western arm)- improvement to include lane widening from existing single lane to a two-lane approach linking with J24 Meridian signals eastbound two-lane exit
5	A121/A112 Sewardstone Rd - Waltham Abbey	Rbt	Rbt	Mitigation not required
6	Sewardstone Rd - Sun St - Farm Hill Rd	Sig	Sig	A121 Crooked Mile: repositioning of the central island to facilitate widening of the existing single lane plus flare approach to two lanes for approximately 150m stretch Farm Hill Road: extension of the existing single lane plus flare approach
7	Honey Ln - Farm Hill Rd - Waltham Abbey	Rbt	Rbt	Mitigation not required
8	B1393 Thornwood Rd - Epping	Sig	Sig	B1393 Palmers Hill: extension of existing right turn flared lane to 200m long lane
9a	B1393 - Station Rd - Epping	Rbt	Sig	Both Station Road and St John's Road junction to be converted to a staggered signal junction.

Junction Ref.		Existing	Potential	Mitigation Summary
				B1393 High Street eastbound and westbound arms proposed to accommodate two lanes approach. Both Station Road and St. John's Road arms to remain as a single lane approach
9b	B1393 - St Johns Rd - Epping	Rbt	Sig	Westbound B1393 approach at St John's Road to have a two-lane plus a right turn lane configuration. Signalised pedestrian crossing to be accommodated at both locations
10	B1393 - Theydon Rd - Bell Common	Sig	Sig	B1393 Epping Road: existing single lane approach to be widened to a lane plus right turn flare approach B1393 High Road: existing single lane to be approach widened to a lane plus left turn flare approach Theydon Road: existing single lane approach to be realigned and widened to a lane plus right/left turn flare approach subject to third-party land agreement
11	B1393 - Bury Ln - Epping	Rbt	Rbt	Segregated slip lanes at both the B1393 approaches B182 Bury Lane: single lane approach to be widened to a lane plus flare approach
12	A414 Wantz Service Stn - Ongar	Rbt	Rbt	B184 Fyfield Road: flare extensions and improvement on roundabout approach from single lane to a lane plus flare approach A414 Chelmsford Road: flare extensions and improvement on entry lane from existing a lane plus flare approach to two lanes plus flare approach A414 Epping Road: flare extensions and improvement on existing a lane plus flare approach
13	Coopers Hill - Marden Ash, Ongar	Rbt	Rbt	A113 (northern arm): minor extension to flare length to create a lane plus flare approach A113 (southern arm): minor extension to flare length to create a lane plus flare approach St James Avenue (western arm): minor improvement to entry widths at the approach
14	A113 Ongar Rd - B172 Abridge Rd	Priority	Priority	Mitigation not considered feasible due to highway and building constraints
18a	A121 Church Hill - A1168 Rectory Lane	Rbt	Rbt	Reconfigured double roundabout option All approaches to be improved to a lane plus flare configuration
18b	A121 Goldings Hill - Millsmead - Loughton	Rbt	Rbt	Upgraded to tie in with Junction 18a improvements
19	B172 - Piercing Hill - Theydon Bois	Priority	Mini	Potential mini roundabout considered with approach flaring
21	M25 J26 Northern Rbt - Waltham Abbey	Rbt	Rbt	Mitigation not required
22	M25 J26 Southern Rbt - Waltham Abbey	Rbt	Rbt	A121 Honey Lane (eastern approach) - existing single lane approach to be improved to a single lane plus long flared approach

Junction Ref.		Existing	Potential	Mitigation Summary
				Potential local widening and extension of two lane approach on M25 westbound off-slip, with supporting road markings and lining to encourage more equal lane usage Additional second lane merge on westbound exit on A121 Dowding Way to support more equal lane usage on M25 off-slip Honey Lane northern approach- minor flare extensions to provide a single lane plus short flared approach
N/A	A121 Honey Lane Woodgreen Rd	Priority	Priority	Additional mitigation to complement J22 improvements and address eastbound queueing at junction blocking back into J22.
24	A121/B194 Meridian Way Signals - Waltham Abbey	Sig	Sig	A121 Station Road (western arm): existing two-lane approach to be widened to provide a dedicated right turn lane Beaulieu Drive (northern arm): proposed to have Toucan crossing and shared footway joining to existing two-way cycle track located at the northern side of the junction B194 Highbridge Street (eastern arm): existing exits to be widened to a two lane exit and existing pedestrian crossing to be improved to a Toucan crossing A121 Meridian Way (southern arm): increased flare lengths to existing a lane plus flare approach
25	A1168 Chigwell Lane - Langston Rd - Oakwood Hill	Sig	Sig	Upgrade Microprocessor Optimisation Vehicle Actuation (MOVA) [12] local lane widening
26	A1168 Chigwell Lane - The Broadway	Rbt	Sig	Committed scheme currently being implemented to convert existing roundabouts to signal layouts
27	A1168 Chigwell Lane - Borders Lane	Rbt	Sig	
28	A1168 Rectory Lane - Westall Rd Rectory Ln	Priority	Priority	Mitigation not required
29	A1168 Rectory Lane Pyrles Lane	Priority	Priority	Mitigation not required
30	A1168 Rectory Lane Hillyfields Priority	Priority	Priority	Mitigation not required
31	A121 High Rd Traps Hill	Priority	Priority	Mitigation not required
32	A121 High Rd - Old Station Rd - Ollards Gr	Rbt	Rbt	Mitigation not required

Table 9-1 Potential Local Highway Improvement Package

[12] https://webarchive.nationalarchives.gov.uk/20090511041303/http://www.dft.gov.uk/adobepdf/165240/244921/244924/TAL_3-971

9.4 Key Considerations

9.4.1 The Wake Arms Roundabout (Junction 1) is centred on the principal radial road network linking the principal settlements in the District, of Epping, Loughton and Waltham Abbey, as well as access to the M25. The junction is already exceeding capacity and all approaches are immediately bound by the Epping Forest Special Area of Conservation (SAC), SSSI and land within the ownership of the Conservators of Epping Forest. While it is acknowledged that a more substantial scheme would ordinarily be required to address the potential level of traffic growth at the junction, the mitigation solution put forward has sought to minimise the overall scale of third-party land take and encroachment on the SAC/SSSI required to deliver a degree of meaningful capacity improvements.

9.4.2 Notwithstanding the steps taken to minimise the impact of any scheme, a portion of third-party land take would be required to deliver any such capacity improvements. While this would require agreement from Natural England and the Conservators of Epping Forest, the benefits of any mitigation scheme would need to be considered against the overall impact on air quality as well as overall operational interaction with other key parts of the highway requiring mitigation, including the M25 at Junction 26; Bell Common; Epping High Street; and A121 towards Loughton.

10 Model Results and Analysis – Mitigated Network

10.1 Overview

10.1.1 The results presented in this section summarise the modelled forecast traffic impacts of Assessment 3, which tests the LPSV on the mitigated highway (Scenario 4) in Epping Forest District.

10.1.2 The analysis uses the same indicators of overall network performance (RFC / DOS) and 'RAG' status to assess the scenario and remain consistent with Assessments 1 and 2. The results are presented in Table 10-1 alongside the previously modelled scenarios for the existing highway network, comprising the Existing, Do-Minimum (Scenario 2) and the Do-Something (Scenario 3) scenarios for reference purposes. Please note, changes in peak hour total junction flow will remain the same as in Table 8-5, given there is no change to the demand being modelled only the supply. **Appendix G** includes a summary of the modelling assessment results for all junction arms.

10.2 Assessment 3 Results – Scenario 4 Do-Something Mitigated Network

10.2.1 The potential package of highway improvements has been tested with the reasonable sustainable modal shift assumptions, as previously applied to the Do-Something scenario, to identify whether any significant adverse impacts associated with the LPSV traffic growth could be reasonably mitigated. to a similar level of network performance as the Do-Minimum situation, or where possible, back to the current situation.

10.2.2 This potential package of interventions provides an initial strategy to deliver physical improvements to accommodate the LPSV growth, but does not represent the final package, which will need to be refined as eventual development patterns are realised.

10.2.3 The Do-Something Scenario 4 has been assessed against the existing, Do-Minimum and Do-Something scenarios to benchmark the likely effect of the potential mitigation package. The results are summarised in Table 10-1 at the end of this section. In the first instance, and as would be expected, the package of mitigation demonstrates an improvement over the non-mitigated Do-Something Scenario 3 with 15 junctions operating over theoretical capacity (>1.00 RFC/DOS) in either peak compared to 21 junctions without mitigation.

10.2.4 Over and above this, 23 junctions would be operating within the amber (>1.00-1.15 RFC/DOS) threshold, compared to 14 junctions in the without mitigation assessment. This indicates that the combination of local highway mitigation schemes and higher levels of modal shift, than have been modelled, could provide significant improvements to support the delivery of LPSV development. Furthermore, consideration of other future changes in travel behaviour would need to be factored in throughout the Plan period to account for further uptake of home-working, increasing costs of car ownership and the

rapid technological advances around autonomous and alternative fuel vehicles.

10.2.5 As an illustration, Table 10-2 at the end of this section, provides a high-level comparison of the Do-Something mitigated network against the existing situation and Do-Minimum network. Please note, an allowance of 5% has been applied to also include where a junction has generally been mitigated to at least a similar level of performance (RFC / DOS).

10.2.6 When compared to the Do-Minimum, the analysis shows that the mitigation package could deliver an improvement at several junctions (16-AM and 22-PM) and along key corridors identified in Assessments 1 and 2, including:

- Junction 1 Wake Arms roundabout
- Junction 6 Sewardstone Road / Sun Street / Farm Hill Road
- Junction 24 A121/B194 Meridian Way Signals - Waltham Abbey
- A112/A121 links in Waltham Abbey
- A121 at M25 Junction 26

10.2.7 As a reference, the analysis demonstrates that the package is limited to returning a maximum of 6 junctions (2-AM and 6-PM) to their current level of performance in either peak.

10.3 Residual Impacts

10.3.1 Overall the analysis demonstrates that proposed physical measures could reasonably deliver a similar level of network capacity, or even improve on, the Do-Minimum scenario. However, while this is a desired minimum, there would be some residual impacts at key locations on the network (see **Appendix G** for overall junction summaries).

10.3.2 Wake Arms roundabout (Junction 1) would exceed capacity on at least one arm in each of the peak periods existing situation. Similarly, all arms of Thornwood Road signals (Junction 8) would exceed capacity. The junctions are key nodes on the network at either end of the B1393 corridor and would experience significant levels of queuing and delay over and above the existing situation.

10.3.3 A121 / B194 Meridien Way signals (Junction 24) to the west of Waltham Abbey would exceed capacity in the PM and increase queueing and delay over the existing situation. However, the results indicate that the scheme would improve on the AM existing situation.

10.3.4 The double roundabout at A1168 Rectory Lane / A121 Church Way / Millsmead (Junctions 18a/18b) in Loughton mitigates the northern gyratory but adds some additional delay into the southern gyratory during the AM peak.

10.3.5 The A1168 Chigwell Lane / Oakwood Hill signals (Junction 26) delivers significant improvements in the forecast scenario. However, it does not fully

mitigate the junction back to the existing situation, with additional northbound queuing on the A1168. This has potential implications for the M11 Junction 5 off slip approximately 250m to the south, which currently experiences some delays due to A1168 queues blocking flows during the peak periods.

10.3.6 The existing network, mitigation proposals and residual impacts discussed above are given further consideration in the Peak Spreading assessments described in subsequent sections where the impact of changes in travel behaviour and more moderate growth assumptions during the critical peak hours are assessed.

10.4 Summary

10.4.1 The EFD Highway Assessment Model area is significantly constrained by several factors including the Epping Forest SAC boundaries, third-party land ownership, building lines and other infrastructure. This has presented several challenges to delivering potential workable mitigation solutions within the highway network. Noting that any schemes are still at the concept stage and would be subject to further feasibility, detailed design and potential change as or when eventually delivered.

10.4.2 The introduction of the potential package of physical mitigation measures in the LPSV scenario has demonstrated that some of the more severe traffic impacts can be removed. Overall, the network could operate at a similar, or improved, level of performance to the Do-Minimum situation, where a Local Plan would not be adopted, and only relatively minor development and transport improvements are delivered.

10.4.3 However, the analysis does show that there are some residual significant impacts across the network at key locations on the network, including the B1393 corridor at Wake Arms roundabout and Thornwood Road signals. These residual impacts are given further consideration in the subsequent Peak Spreading assessments.

Scenario		Base 2017		Do Minimum 2033		Local Plan 2033		Local Plan 2033 - Mitigation	
	Junction	AM	PM	AM	PM	AM	PM	AM	PM
Junction 1	A121/B1393 Wake Arms PH - Epping Forest	1.19	1.13	1.58	1.40	1.86	1.73	1.30	1.35
Junction 2	A414/B181 Talbot PH - North Weald	0.75	0.64	0.92	0.80	1.31	1.26	0.95	0.80
Junction 3	B194 Crooked Mile - Waltham Abbey	0.48	0.48	0.60	0.61	1.02	0.95	1.02	0.95
Junction 4	B194 Highbridge St - Waltham Abbey	0.43	0.79	0.52	0.97	0.78	1.42	0.72	0.79
Junction 5	A121/A112 Sewardstone Rd - Waltham Abbey	0.47	0.60	0.60	0.74	0.63	0.76	0.63	0.76
Junction 6	Sewardstone Rd - Sun St - Farm Hill Rd	0.93	0.97	1.10	1.14	1.29	1.14	1.07	1.07
Junction 7	Honey Ln - Farm Hill Rd - Waltham Abbey	0.75	0.69	0.91	0.84	0.97	0.88	0.97	0.88
Junction 8	B1393 Thornwood Rd - Epping	0.89	1.18	1.45	1.74	1.29	1.64	1.24	1.47
Junction 9a	B1393 - Station Rd - Epping	0.78	0.78	0.97	0.97	1.15	1.22	1.07	0.86
Junction 9b	B1393 - St. Johns Rd - Epping	0.76	0.62	1.05	1.17	1.48	1.35	1.06	1.01
Junction 10	B1393 - Theydon Rd - Bell Common	0.95	0.82	1.23	1.16	1.73	1.62	0.98	1.06
Junction 11	B1393 - Bury Ln - Epping	0.94	0.92	1.19	1.14	1.60	1.31	1.09	0.82
Junction 12	A414 Wantz Service Stn - Ongar	0.78	0.69	1.01	0.91	1.19	1.13	0.94	0.89
Junction 13	Coopers Hill - Marden Ash, Ongar	0.81	0.67	1.01	0.87	1.15	0.95	1.15	0.87
Junction 14	A113 Ongar Rd - B172 Abridge Rd	1.04	0.90	X	1.39	X	1.48	X	1.48
Junction 18a	A121 Church Hill - A1168 Rectory Lane	0.65	0.75	0.82	0.99	0.93	1.10	1.22	1.03
Junction 18b	A121 Goldings Hill - Millsmead - Loughton	0.87	0.75	1.06	0.91	1.09	0.96	0.95	0.98
Junction 19	B172 - Piercing Hill - Theydon Bois	X	1.16	X	1.60	X	1.55	0.99	0.68
Junction 21	M25 J26 Northern Rbt - Waltham Abbey	0.36	0.48	0.43	0.58	0.47	0.60	0.47	0.60
Junction 22	M25 J26 Southern Rbt - Waltham Abbey	1.14	1.05	1.37	1.27	1.86	1.48	0.96	0.67
Junction 24	A121/B194 Meridian Way Signals - Waltham Abbey	1.11	1.21	1.34	1.43	1.90	1.81	1.24	1.14
Junction 25	A1168 Chigwell Lane - Langston Rd - Oakwood Hill	0.98	0.94	1.15	1.13	1.15	1.15	1.13	0.98
Junction 26	A1168 Chigwell Lane - The Broadway	0.54	0.71	0.85	0.73	0.97	1.00	0.97	1.00
Junction 27	A1168 Chigwell Lane - Borders Lane	0.49	0.73	0.76	0.97	0.85	1.07	0.85	1.07
Junction 28	A1168 Rectory Lane - Westall Rd Rectory Lane	0.54	0.32	0.69	0.46	0.72	0.48	0.72	0.48
Junction 29	A1168 Rectory Lane Pyrles Lane	0.67	0.59	0.91	0.74	0.83	0.71	0.83	0.71
Junction 30	A1168 Rectory Lane Hillyfields Priority	0.52	0.20	0.82	0.32	1.05	0.45	1.05	0.45
Junction 31	A121 High Rd Traps Hill	0.27	0.37	0.34	0.49	0.42	0.58	0.42	0.58
Junction 32	A121 High Rd - Old Station Rd - Ollards Grove	0.56	0.72	0.71	0.90	0.77	0.87	0.77	0.87
	No mitigation proposed								

Table 10-1 Existing, Do-Minimum & Do-Something Existing Network V Do-Something Mitigated Network Performance (RFC/DOS) – Results Present Worst Performing 'Arm' at each Junction

		Versus Existing		Versus Do-Minimum	
	Scenario	Local Plan 2033 - Mitigation		Local Plan 2033 - Mitigation	
	Junction	AM	PM	AM	PM
1	A121/B1393 Wake Arms PH - Epping Forest			✓	✓
2	A414/B181 Talbot PH - North Weald			✓	✓
3	B194 Crooked Mile - Waltham Abbey				
4	B194 Highbridge St - Waltham Abbey		✓		✓
5	A121/A112 Sewardstone Rd - Waltham Abbey			✓	✓
6	Sewardstone Rd - Sun St - Farm Hill Rd			✓	✓
7	Honey Ln - Farm Hill Rd - Waltham Abbey				✓
8	B1393 Thornwood Rd - Epping			✓	✓
9a	B1393 - Station Rd - Epping				✓
9b	B1393 - St. Johns Rd - Epping			✓	✓
10	B1393 - Theydon Rd - Bell Common	✓		✓	✓
11	B1393 - Bury Ln - Epping		✓	✓	✓
12	A414 Wantz Service Stn - Ongar			✓	✓
13	Coopers Hill - Marden Ash, Ongar				✓
14	A113 Ongar Rd - B172 Abridge Rd				
18a	A121 Church Hill - A1168 Rectory Lane				✓
18b	A121 Goldings Hill - Millsmead - Loughton			✓	
19	B172 - Piercing Hill - Theydon Bois		✓		✓
21	M25 J26 Northern Rbt - Waltham Abbey			✓	✓
22	M25 J26 Southern Rbt - Waltham Abbey	✓	✓	✓	✓
24	A121/B194 Meridian Way Signals - Waltham Abbey		✓	✓	✓
25	A1168 Chigwell Lane - Langston Rd - Oakwood Hill		✓	✓	✓
26	A1168 Chigwell Lane - The Broadway				
27	A1168 Chigwell Lane - Borders Lane				
28	A1168 Rectory Lane - Westall Rd Rectory Lane			✓	✓
29	A1168 Rectory Lane Pyrles Lane			✓	✓
30	A1168 Rectory Lane Hillyfields Priority				
31	A121 High Rd Traps Hill				
32	A121 High Rd - Old Station Rd - Ollards Grove				✓
Total No. Similar to Existing Situation		2	6		
Total No. Similar to Do-Minimum Scenario				16	22

Table 10-2 High Level Performance Comparison of Existing & Do-Minimum Network V Do-Something Mitigated Network (Includes +5% Headroom)

11 Model Results and Analysis – Peak Spreading

11.1 Overview

11.1.1 The previous assessments of each iteration of the LPSV have focused on the AM and PM peak hour impacts as the worst-case. However, it is recognised in the Design Manual for Roads and Bridges (DMRB)[13] and DfT WebTAG[14] that, while not guaranteed to occur, the impact of Peak Spreading also needs to be considered. Where physical network capacity would remain constrained in peak periods leading to drivers seeking available capacity in the periods immediately before or after their typical journey time in the 'peak shoulders'.

11.1.2 This section provides analysis of how Peak Spreading has been applied within the assessment and summarises the impact on the LPSV Do-Something traffic scenario for both the existing and mitigated highway network across the District. The results for a Do-Something Scenario 5 'Peak Spreading-Existing Network' and Do-Something Scenario 6 'Peak-Spreading-Mitigated network' are presented alongside the previous Scenarios 1-4, discussed earlier in this report, for comparison purposes.

11.2 Peak Spreading

11.2.1 The concept of Peak Spreading, while not traditionally considered as a sustainable travel choice leading to a reduction in overall car travel, is generally a desired outcome of development travel plans, or sustainable travel strategies, to make more efficient use of available capacity. Where the network is at capacity at peak times, further demand leads to congestion and, as an organic response, drivers alter their journey times into the shoulders of the peak, potentially reducing traffic in the most congested part of the peak period. Noting that the network would run at or near capacity for a slightly longer duration.

11.2.2 The DMRB Volume 12 Section 2 Part 1: Traffic Appraisal in Urban Areas explains that as congestion increases in urban areas, the impact of peak spreading causes traffic distribution during peak periods to become more uniform as journeys are delayed or re-timed to avoid the worst parts of the peak periods.

11.2.3 The WebTAG guidance 'TAG Unit M2: Variable Demand Modelling' (2014) adopts a more detailed approach, particularly where more sophisticated strategic or micro-simulation models exist. The guidance states that where travel demand and traffic levels vary, different time periods should be modelled, and where modelling predicts overly severe congestion in the peak

[13] DMRB Volume 12 Section 2 Part 1: Traffic Appraisal in Urban

[14] WebTAG guidance 'TAG Unit M2: Variable Demand Modelling'

hour, micro time-period choice modelling to reallocate trips between the peak hour and the shoulders may be used to achieve a more realistic estimate.

11.2.4 An illustrative example of a typical overcapacity junction during the peak hour is shown in Figure 11-1. The impact of Peak Spreading, by reallocating excess peak hour demand to adjacent periods with spare capacity is illustrated as an example in Figure 11-2.

11.2.5 The broad impact of peak spreading as is to remove 'heavy' congestion during parts of the peak hour where vehicular demand cannot be accommodated, and to lengthen the period of time across the peak hour and peak shoulders where 'typical' peak travel conditions are experienced. Peak travel conditions might be expected to represent moderate levels of congestion and delay at junctions. It can be assumed that where there is little spare peak period capacity at a junction, either before or after Peak Spreading, it is likely that 'typical peak travel' conditions will be experienced across a greater proportion of the 3-hour time period.

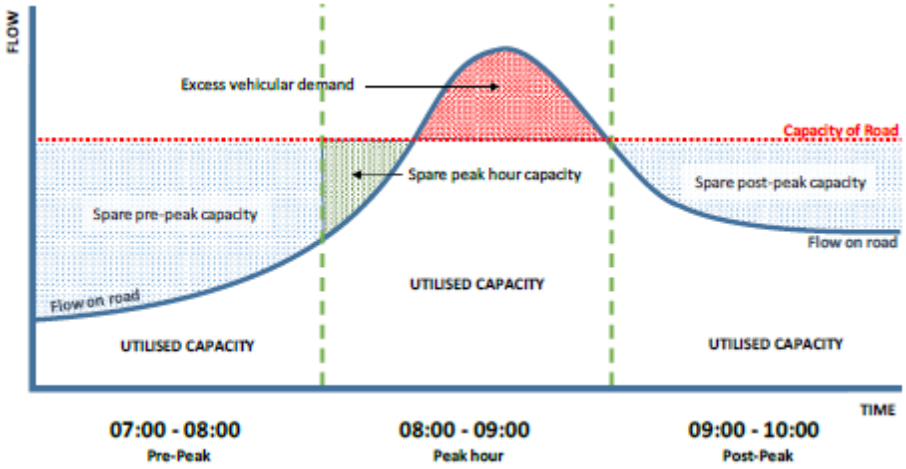


Figure 11-1 Illustrative example of capacity at a congested junction across a 3-hour peak period

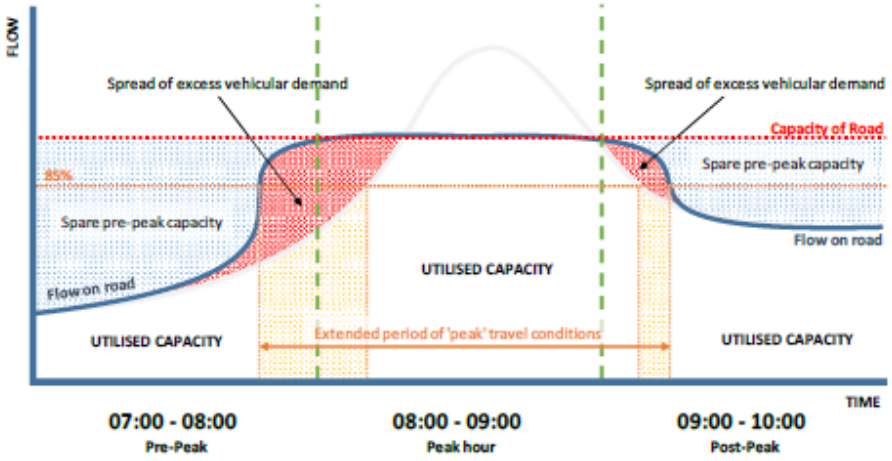


Figure 11-2 Illustrative example of the impact of peak spreading across a 3-hour peak period

11.2.6 The DMRB and WebTAG guidance recognise that a change in driver behaviour occurs, either voluntary, where drivers can deliberately choose to change their time of travel to avoid the most congested times of the day, or as an involuntary result of traffic delays causing increased journey times as congestion grows. Although the extent to which this is likely to take place is difficult to quantify, it is important to capture within the modelling, given it is likely to have an impact on the traffic growth patterns expected in the future in the District.

11.2.7 In response to this guidance, and using the modelling platforms available, the effect of Peak Spreading has been assessed by reallocating peak period trips across the relevant peak shoulders using objective methods based on empirical data. The temporal redistribution of demand to available capacity has therefore been assessed alongside traditional peak hour modelling to achieve a balance of making the most efficient use of the available network capacity prior to the consideration of more comprehensive and costly measures to manage traffic demand levels on the road network.

11.3 Methodology

11.3.1 The EFD Highway Assessment Model is a fixed assignment model, both spatially and temporarily, i.e. there is no allowance for trips to reassign to available capacity on different routes or at different times on the network. The model is not equipped to undertake the full WebTAG Variable Demand Modelling (VDM) approach and a more simplified 'average peak hour' uniform 'average peak hour' approach has been adopted to re-profile peak hour demand and assess available capacity across longer periods in both the AM and PM peaks.

11.3.2 The methodology included a review of historic traffic counts at, or in close proximity to, each of the modelled junctions to identify the change in traffic flow across the extended AM and PM 3-hour peak periods (0700-1000 and 1600-1900 respectively). For most of locations detailed data was available through junction turning counts (JTCs) or where automatic traffic counts (ATCs) and analysis was undertaken on an arm by arm basis for accuracy. Where this junction specific data was not available, the nearest most appropriate data set was used to identify a peak hour to peak period expansion factor for the junction as a whole. Turning proportions were considered uniform across each hour in the peak periods. The re-profiled uniform base 'average peak hour' for the AM and PM was created from the available data.

11.3.3 The future traffic growth was applied using a combination of the TEMPro growth, applied to previous scenarios, and analysis of 3-hour peak periods (0700-1000 and 1600-1900) TRICS development. A re-profiled uniform development traffic 'average peak hour' was created and redistributed using the same methodology set out in Section 6.

11.3.4 The AM / PM 'average peak hour' base turning counts and development traffic were combined with TEMPro growth to create the LPSV Do-Something Peak Spreading scenarios. The flows were then assessed in the junction modelling

software to maintain a consistent approach with the previous assessments of different scenarios and to analyse the availability of capacity.

11.3.5 This is not the standard methodology used to quantify peak spreading. Nevertheless, it is a logical approach to better model driver behaviour, quantify the traffic impact on the hours either side of the peak hour, and provide a better platform for evaluating the impacts of LPSV development and the need for mitigation when considering the capacity of junctions in the 2033 forecast year.

11.4 Changes in Peak Spreading Flows

11.4.1 The application of the Peak Spreading methodology has resulted in a general reduction in the peak hour traffic demand. Table 11-1 provides a summary comparison of the percentage change in traffic flows across the network for the Do-Something Peak Spreading Scenarios 5/6 (i.e. LPSV with reasonable assumptions for changes in driver travel behaviour) with each of the scenarios assessed in this study.

Scenario	% Change from Existing (Scenario 1) Av.	% Change from DM (Scenario 2) Av.	% Change from DS (Scenario 3/4) Av.
1 – Existing			
2 – Do-Minimum	18%		
3/4 – Do-Something	36%	15%	
5/6 – Peak Spread	25%	6%	-8%

Table 11-1 Comparison of Peak Spreading Flow Changes with Peak Hour Scenarios

11.4.2 The Peak Spreading analysis shows that:

- Traffic flows would increase from current levels by approximately 25% compared to 36% in the Do-Something Peak Hour Scenarios 3/4;
- Traffic flows would increase from the Do-Minimum Scenario 2 levels by approximately 6% compared to 15% in the Do-Something Peak Hour Scenarios 3/4; and
- Traffic flows across the network would reduce by 8% on average from the Do-Something Peak Hour Scenarios 3/4 levels.

11.4.3 A summary comparison of the change in AM and PM total junction flows between Scenarios 5/6 Peak Spreading and all previous scenarios assessed is summarised in Table 11-3 at the end of this section.

11.4.4 The analysis demonstrates that the impact of the LPSV would be significantly reduced were Peak Spreading to occur with almost half of the key junctions experiencing a reduction in demand from the Do-Minimum and all, bar some isolated junctions, experiencing a reduction from the Do-Something Peak Hour assessment. The reductions range from a marginal 2%-3% at some locations up to 12%-23% at other locations.

11.5 Peak Spreading Results

11.5.1 The analysis demonstrates there would be sufficient impact from Peak Spreading to reassess the key junctions with the amended flow profiles for comparison with all the previous Do-Something scenarios tested in this study.

11.5.2 The existing and mitigated network scenarios have been assessed alongside each other as Scenario 5 and Scenario 6 to illustrate both the potential impact on the network, such as to demonstrate how the effect of Peak Spreading provides a realistic case for not implementing an actual physical, costlier, intervention, and that the impacts of the overall traffic impact of the LPSV could realistically be less than the Scenario 3 and 4 outputs would indicate.

11.5.3 The results are summarised in Table 11-4 at the end of this section alongside the results of previous assessments. **Appendix H** includes a summary of the modelling assessment results for all junction arms.

11.6 Assessment 4 – Scenario 5 Peak Spreading Non-Mitigated Network

11.6.1 In considering the LPSV, the impact of Peak Spreading on the current, or non-mitigated, network (Scenario 5) demonstrates an improvement over the non-mitigated Do-Something (Scenario 3) with up to 16 junctions operating over theoretical capacity (>1.00 RFC/DOS) in either peak compared to 21 junctions respectively.

11.6.2 Over and above this, up to 6 of these junctions would be operating within the amber (>1.00-1.15 RFC/DOS) threshold – a total of 19 junctions compared to 16 junctions in Scenario 3.

11.6.3 When compared to the mitigated Do-Something (Scenario 4) there is broadly a similar level of performance, with up to 16 junctions operating over theoretical capacity (>1.00 RFC/DOS) in either peak compared to 15 junctions respectively. However, the impact of the mitigation is more notable when considering the amber (>1.00-1.15 RFC/DOS) threshold, with only 19 junctions operating within this in the Peak Spreading scenario and 25 junctions in the mitigated network peak hour scenario.

11.6.4 Overall the impact of Peak Spreading in isolation would not return the network to a similar level of performance as the existing situation. However, it does provide improvements across the network to achieve a similar level of network performance to the Do-Minimum scenario. A high level comparison of the Peak Spreading Do-Something (Scenario 5) against the existing situation and Do-Minimum network is summarised in Table 11-5 at the end of this section (again this includes additional headroom of +5% RFC/DOS allowing for a marginal exceedance of Existing or Do-Minimum performance as a generalised representation).

11.6.5 The wider benefits of the Peak Spreading analysis highlight where the potential need for actual physical mitigation may be offset by organic behavioural change. There would be even further benefits should higher levels

of modal shift be achieved by the end of the Local Plan period. This is potentially relevant to the following 6 junctions where mitigation is proposed in Scenario 4:

Junction	Scenario	3 Do-Something 2033		5 Peak Spreading 2033	
		AM	PM	AM	PM
2	A414/B181 Talbot PH - North Weald	1.31	1.26	1.15	1.06
6	Sewardstone Rd - Sun St - Farm Hill Rd	1.29	1.14	1.09	1.10
12	A414 Wantz Service Stn - Ongar	1.19	1.13	1.09	0.97
18a	A121 Church Hill - A1168 Rectory Lane	0.93	1.10	0.79	0.78
18b	A121 Goldings Hill - Millsmead - Loughton	1.09	0.96	0.88	0.88
25	A1168 Chigwell Lane - Langston Rd - Oakwood Hill	1.15	1.15	1.08	0.98

Table 11-2 Peak Spreading as an alternative to physical mitigation– Results Present Worst Performing 'Arm' at each Junction

11.7 Assessment 5 – Scenario 6 Peak Spreading Mitigated Network

11.7.1 The combination of the impact of Peak Spreading and a package of mitigation, as would be expected, improves network performance significantly. Overall 21 junctions are forecast to operate within theoretical capacity in either peak with a further 4 (25 in total) operating within the amber (>1.00-1.15 RFC/DOS) threshold. This compares favourably with the existing situation, where 24 junctions operate within theoretical capacity in either peak and 25 operate within the amber (>1.00-1.15 RFC/DOS) threshold, broadly demonstrating a similar level of performance between Scenario 1 and 6 across the overall network.

11.7.2 These results are summarised in a high-level comparison of the Peak Spreading Do-Something Mitigated Network (Scenario 6) against the Existing situation and Do-Minimum network in Table 11-5 at the end of this section. **Appendix I** includes a summary of the modelling assessment results for all junction arms.

11.8 Key Residual Impacts

11.8.1 The Peak Spreading assessment shows that a moderate reduction in traffic across the network (average 8%) could result in notable capacity improvements at key junctions, particularly when considered alongside potential highway improvements.

11.8.2 The Wake Arms roundabout (Junction 1) has already been identified as a key constraint even in the existing situation. The potential mitigation for this junction has been designed to minimise the impact on third-party land take in recognition of the adjacent Epping Forest SAC and is shown not to fully mitigate the impacts of the LPSV with residual queuing and delay.

11.8.3 The reduction in Peak Spreading demand plus mitigation would potentially improve on the existing AM peak situation but not improve on the PM peak existing situation. Generally, the results indicate that the forecast peak hour

performance would effectively reverse the level of performance experienced in the existing AM and PM peak hours.

11.8.4 The Thornwood Road signals (Junction 8), while demonstrating an improvement on all forecast scenarios, still demonstrates a worse level of performance in both peaks, marginally exceeding capacity in the AM and increasing on the congestion issues currently experienced in the PM. Again, the mitigation scheme tested at this junction has been designed to minimise the impact on adjacent Epping Forest land. The junction, and any future mitigation, would need to be monitored throughout the Plan period to identify whether a more substantial scheme could be implemented.

11.8.5 The A121 / B194 Meridien Way signals (Junction 24) scheme at Waltham Abbey, similarly to Wake Arms roundabout, would reverse the existing AM and PM peak hour level of performance. The reduction in Peak Spreading demand plus mitigation would potentially improve on the existing PM peak situation but not improve on the AM peak existing situation.

11.8.6 The impact of Peak Spreading demand plus mitigation at A1168 Chigwell Lane / Oakwood Hill signals (Junction 25) would effectively mitigate this key junction back to the existing level of performance with only marginal increases in queuing in the AM peak. Improvements to Microprocessor Optimisation Vehicle Actuation (MOVA) could deliver additional benefits at this junction, which have not been modelled in this study.

11.8.7 The performance of this junction, particularly northbound A1168 queues, also has downstream implications for the M11 Junction 5 off slip 250m to the south. The forecast scenario indicates that the junction would operate at a similar level to the existing situation, which would potentially limit the need for further mitigation at the Junction 5 off slip. This would need to be monitored throughout the plan period.

11.9 Summary

11.9.1 A Peak Spreading assessment has been undertaken to support the evaluation of the impact of the LPSV. While there is no guarantee it will occur, the effect of Peak Spreading is a recognised characteristic of any constrained highway network and, as recommended in DMRB and DfT WebTAG, should be considered as part of any assessment.

11.9.2 The assessments undertaken of different peak hour scenarios, culminating in the effects of mitigation, demonstrate that parts of the forecast network would exceed theoretical capacity for parts of the peak hours. Peak Spreading is therefore a pertinent factor when considering the forecast transport situation associated with the LPSV development.

11.9.3 The assessments show that there is adequate available capacity in the peak shoulders to generate an average 8% reduction in traffic flows within the traditional AM and PM peak hours on the network. The combination of the easing of traffic demand and a package of physical mitigation measures

demonstrates the potential to not only generate an improvement in network performance over the Do-Minimum situation but also return overall performance to a similar level as the existing situation across a lot of the network. Over and above these considerations, more ambitious sustainable modal shift targets could deliver additional improvements to the forecast traffic situation.

11.9.4 A wider benefit of the Peak Spreading analysis has been the identification of locations where physical interventions are proposed but may not be ultimately needed if overall traffic patterns change across the peak periods.

11.9.5 Where there are residual impacts at key junctions, more extensive physical mitigation may be required. As a proportionate approach the impact of traffic growth across the District will need to be monitored over the course of the Plan period to ensure any mitigation proposed is either required or appropriate in scale. This in keeping with the National Planning Policy Framework (NPPF) guidance that:

'Significant adverse impacts…should be avoided and, wherever possible, alternative options which reduce or eliminate such impacts should be pursued. Where adverse impacts are unavoidable, measures to mitigate the impact should be considered. Where adequate mitigation measures are not possible, compensatory measures may be appropriate'.

11.9.6 Consideration should also be given to the overall variables applied to inform the modelling of the LPSV. As is repeated throughout this report, a range of worst-case assumptions have been applied in the interests of providing a robust case, including:

- Total projected housing tested, which includes an additional 1,802 houses across the District (18% increase) to the overall assessed housing requirement;
- No adjustment has been made to existing and background traffic growth to account for improved sustainable transport;
- All LPSV development trips factor have an additional 6% fuel and income growth added as a precautionary approach;
- All LPSV employment and residential trips are included as 'new' trips and do not account for secondary trip assumptions including linked, pass-by, transferred or diverted trips associated with changes in development patterns;
- The TEMPRo v7.2 growth used does not account for the recent downward trend in commuter trips as identified in DfT Road Traffic Forecast (2018) report;
- The modelling methodology uses a static demand matrix and does not account for potential reassignment to other less congested routes in and around the District; and

- Overall growth modelled in the Do-Something (36%) is significantly higher than the corresponding growth taken from TEMPro v7.2 adjusted for EFD LPSV planning assumptions (27.5%).

11.9.7 There is a reasonable argument that this effectively compounds the overall rate of growth to present an overly worst-case. While the Peak Spreading assessment has been specifically designed to assess the temporal redistribution of traffic, as a proxy, it potentially provides a more moderate assessment of the traffic situation in the likely event that the full range of worst-case assumptions are not actually realised.

Junction	Scenario	1 Existing 2017 PCU/Hr		2 Do-Minimum 2033 PCU/Hr		3 Do-Something 2033 PCU/Hr		5 Peak Spreading 2033 PCU/Hr		% change from Existing		% change from Do-Minimum		% change from Do-Something Peak Hour	
		AM	PM	AM	PM	AM	PM	AM	PM	AM %	PM %	AM %	PM %	AM %	PM %
1	A121/B1393 Wake Arms PH - Epping Forest	3888	4115	4545	4821	5441	5540	5021	5087	29%	24%	10%	6%	-8%	-8%
2	A414/B181 Talbot PH - North Weald	2246	2163	2624	2532	3611	3423	3172	3082	41%	43%	21%	22%	-12%	-10%
3	B194 Crooked Mile - Waltham Abbey	2542	2993	2959	3478	4109	4488	3536	3892	39%	30%	20%	12%	-14%	-13%
4	B194 Highbridge St - Waltham Abbey	1575	1872	1844	2187	2833	3044	2540	2930	61%	56%	38%	34%	-10%	-4%
5	A121/A112 Sewardstone Rd - Waltham Abbey	2976	3282	3465	3820	3647	3904	3907	4338	31%	32%	13%	14%	7%	11%
6	Sewardstone Rd - Sun St - Farm Hill Rd	2364	2659	2748	3095	3033	3258	2659	3073	12%	16%	-3%	-1%	-12%	-6%
7	Honey Ln - Farm Hill Rd - Waltham Abbey	1234	1409	1435	1645	1517	1710	1390	1510	13%	7%	-3%	-8%	-8%	-12%
8	B1393 Thornwood Rd - Epping	2400	2569	2799	3001	3465	3560	3058	3361	27%	31%	9%	12%	-12%	-6%
9a/b	B1393 - St John's Rd - Station Rd - Epping	2224	2187	2599	2566	3221	3106	2473	3160	11%	44%	-5%	23%	-23%	2%
10	B1393 - Theydon Rd - Bell Common	2265	2102	2645	2465	3413	3101	2783	2881	23%	37%	5%	17%	-18%	-7%
11	B1393 - Bury Ln - Epping	2237	2183	2614	2558	3270	3100	2774	2814	24%	29%	6%	10%	-15%	-9%
12	A414 Wantz Service Stn - Ongar	3126	2987	3682	3529	4203	3945	3837	3538	23%	18%	4%	0%	-9%	-10%
13	Coopers Hill - Marden Ash, Ongar	1617	1651	1915	1959	2156	2135	2021	1888	25%	14%	6%	-4%	-6%	-12%
14	A113 Ongar Rd - B172 Abridge Rd	1880	1824	2243	2188	2348	2251	2196	1996	17%	9%	-2%	-9%	-6%	-11%
18a/b	A121 Church H - A1168 Rectory Ln - Goldings H.	2286	2087	2770	2542	2950	2684	2447	2539	7%	22%	-12%	0%	-17%	-5%
19	B172 - Piercing Hill - Theydon Bois	1630	1486	1900	1739	1898	1732	1813	1658	11%	12%	-5%	-5%	-4%	-4%
21	M25 J26 Northern Rbt - Waltham Abbey	1816	2159	2116	2533	2421	2833	2291	2683	26%	24%	8%	6%	-5%	-5%
22	M25 J26 Southern Rbt - Waltham Abbey	2960	2806	3473	3299	4018	3715	3777	3319	28%	18%	9%	1%	-6%	-11%
24	A121/B194 Meridian Way Signals – Walt. Abbey	2517	2675	2943	3126	3928	3969	3606	3843	43%	44%	23%	23%	-8%	-3%
25	A1168 Chigwell Lane - Langston Rd-Oakwood H	2626	2415	3181	2947	3276	3041	2897	2784	10%	15%	-9%	-6%	-12%	-8%
26	A1168 Chigwell Lane - The Broadway	1515	1845	1862	2263	2014	2372	1941	2225	28%	21%	4%	-2%	-4%	-6%
27	A1168 Chigwell Lane - Borders Lane	1081	1606	1353	1984	1494	2072	1445	1921	34%	20%	7%	-3%	-3%	-7%
28	A1168 Rectory Lane - Westall Rd Rectory Lane	960	1401	1178	1704	1274	1784	1080	1696	13%	21%	-8%	0%	-15%	-5%
29	A1168 Rectory Lane Pyrles Lane	1898	1780	2281	2146	2296	2187	1925	2079	1%	17%	-16%	-3%	-16%	-5%
30	A1168 Rectory Lane Hillyfields Priority	1532	1425	1867	1746	1996	1855	1638	1738	7%	22%	-12%	0%	-18%	-6%
31	A121 High Rd Traps Hill	1276	1254	1538	1517	1677	1599	1385	1551	9%	24%	-10%	2%	-17%	-3%
32	A121 High Rd - Old Station Rd - Ollards Grove	1557	1783	1864	2115	1884	2059	1643	1981	5%	11%	-12%	-6%	-13%	-4%
	Average Change across network									23%	25%	4%	6%	-11%	-6%

Table 11-3 Comparison of Peak Spreading Junction Flow Changes with Peak Hour Scenarios

Scenario		Base 2017		Do Minimum 2033		Local Plan 2033		Local Plan + PS 2033		Local Plan 2033 - Mitigation		Local Plan + PS 2033 - Mitigation	
Junction		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Junction 1	A121/B1393 Wake Arms PH - Epping Forest	1.19	1.13	1.58	1.40	1.86	1.73	1.74	1.65	1.30	1.35	1.12	1.24
Junction 2	A414/B181 Talbot PH - North Weald	0.75	0.64	0.92	0.80	1.31	1.26	1.15	1.06	0.95	0.80	0.84	0.68
Junction 3	B194 Crooked Mile - Waltham Abbey	0.48	0.48	0.60	0.61	1.02	0.95	0.88	0.80	1.02	0.95	0.88	0.80
Junction 4	B194 Highbridge St - Waltham Abbey	0.43	0.79	0.52	0.97	0.78	1.42	0.70	1.37	0.72	0.79	0.63	0.76
Junction 5	A121/A112 Sewardstone Rd - Waltham Abbey	0.47	0.60	0.60	0.74	0.63	0.76	0.53	0.69	0.63	0.76	0.53	0.69
Junction 6	Sewardstone Rd - Sun St - Farm Hill Rd	0.93	0.97	1.10	1.14	1.29	1.14	1.09	1.10	1.07	1.07	0.96	1.02
Junction 7	Honey Ln - Farm Hill Rd - Waltham Abbey	0.75	0.69	0.91	0.84	0.97	0.88	0.87	0.80	0.97	0.88	0.87	0.80
Junction 8	B1393 Thornwood Rd - Epping	0.89	1.18	1.45	1.74	1.29	1.64	1.18	1.56	1.24	1.47	1.08	1.37
Junction 9a	B1393 - Station Rd - Epping	0.78	0.78	0.97	0.97	1.15	1.22	0.86	1.24	1.07	0.86	0.85	0.95
Junction 9b	B1393 - St. Johns Rd - Epping	0.76	0.62	1.05	1.17	1.48	1.35	1.08	1.37	1.06	1.01	0.89	1.03
Junction 10	B1393 - Theydon Rd - Bell Common	0.95	0.82	1.23	1.16	1.73	1.62	1.36	1.43	0.98	1.06	0.90	1.00
Junction 11	B1393 - Bury Ln - Epping	0.94	0.92	1.19	1.14	1.60	1.31	1.47	1.27	1.09	0.82	0.71	0.79
Junction 12	A414 Wantz Service Stn - Ongar	0.78	0.69	1.01	0.91	1.19	1.13	1.09	0.97	0.94	0.89	0.80	0.76
Junction 13	Coopers Hill - Marden Ash, Ongar	0.81	0.67	1.01	0.87	1.15	0.95	1.11	0.81	1.15	0.87	1.11	0.76
Junction 14	A113 Ongar Rd - B172 Abridge Rd	1.04	0.90	X	1.39	X	1.48	X	1.21	X	1.48	X	1.21
Junction 18a	A121 Church Hill - A1168 Rectory Lane	0.65	0.75	0.82	0.99	0.93	1.10	0.79	0.78	1.22	1.03	0.97	0.95
Junction 18b	A121 Goldings Hill - Millsmead - Loughton	0.87	0.75	1.06	0.91	1.09	0.96	0.88	0.88	0.95	0.98	0.77	0.94
Junction 19	B172 - Piercing Hill - Theydon Bois	X	1.16	X	1.60	X	1.55	X	1.49	0.99	0.68	0.97	0.69
Junction 21	M25 J26 Northern Rbt - Waltham Abbey	0.36	0.48	0.43	0.58	0.47	0.60	0.45	0.57	0.47	0.60	0.45	0.57
Junction 22	M25 J26 Southern Rbt - Waltham Abbey	1.14	1.05	1.37	1.27	1.86	1.48	1.66	1.31	0.96	0.67	0.91	0.61
Junction 24	A121/B194 Meridian Way Signals - Waltham Abbey	1.11	1.21	1.34	1.43	1.90	1.81	1.72	1.74	1.24	1.14	1.22	1.11
Junction 25	A1168 Chigwell Lane - Langston Rd - Oakwood Hill	0.98	0.94	1.15	1.13	1.15	1.15	1.08	0.98	1.13	0.98	1.01	0.94
Junction 26	A1168 Chigwell Lane - The Broadway	0.54	0.71	0.85	0.73	0.97	1.00	0.88	0.88	0.97	1.00	0.88	0.88
Junction 27	A1168 Chigwell Lane - Borders Lane	0.49	0.73	0.76	0.97	0.85	1.07	0.65	0.87	0.85	1.07	0.65	0.87
Junction 28	A1168 Rectory Lane - Westall Rd Rectory Lane	0.54	0.32	0.69	0.46	0.72	0.48	0.38	0.40	0.72	0.48	0.38	0.40
Junction 29	A1168 Rectory Lane Pyrles Lane	0.67	0.59	0.91	0.74	0.83	0.71	0.63	0.66	0.83	0.71	0.63	0.66
Junction 30	A1168 Rectory Lane Hillyfields Priority	0.52	0.20	0.82	0.32	1.05	0.45	0.51	0.38	1.05	0.45	0.51	0.38
Junction 31	A121 High Rd Traps Hill	0.27	0.37	0.34	0.49	0.42	0.58	0.31	0.51	0.42	0.58	0.31	0.51
Junction 32	A121 High Rd - Old Station Rd - Ollards Grove	0.56	0.72	0.71	0.90	0.77	0.87	0.65	0.81	0.77	0.87	0.65	0.81
	No mitigation proposed												

Table 11-4 Scenarios 1-4 V Peak Spreading Scenarios 5-6 Network Performance (RFC/DOS) – Results Present Worst Performing 'Arm' at each Junction

		Versus Existing						Versus Do-Minimum					
	Scenario	Local Plan + PS 2033		Local Plan 2033 - Mitigation		Local Plan + PS 2033 - Mitigation		Local Plan + PS 2033		Local Plan 2033 - Mitigation		Local Plan + PS 2033 - Mitigation	
	Junction	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1	A121/B1393 Wake Arms PH - Epping Forest					✓				✓	✓	✓	✓
2	A414/B181 Talbot PH - North Weald						✓			✓	✓	✓	✓
3	B194 Crooked Mile - Waltham Abbey												
4	B194 Highbridge St - Waltham Abbey				✓		✓				✓		✓
5	A121/A112 Sewardstone Rd - Waltham Abbey							✓	✓	✓	✓	✓	✓
6	Sewardstone Rd - Sun St - Farm Hill Rd					✓	✓	✓	✓	✓	✓	✓	✓
7	Honey Ln - Farm Hill Rd - Waltham Abbey							✓	✓		✓	✓	✓
8	B1393 Thornwood Rd - Epping							✓	✓	✓	✓	✓	✓
9a	B1393 - Station Rd - Epping							✓			✓	✓	✓
9b	B1393 - St. Johns Rd - Epping							✓		✓	✓	✓	✓
10	B1393 - Theydon Rd - Bell Common			✓		✓				✓	✓	✓	✓
11	B1393 - Bury Ln - Epping				✓	✓	✓			✓	✓	✓	✓
12	A414 Wantz Service Stn - Ongar					✓				✓	✓	✓	✓
13	Coopers Hill - Marden Ash, Ongar								✓		✓		✓
14	A113 Ongar Rd - B172 Abridge Rd								✓				✓
18a	A121 Church Hill - A1168 Rectory Lane		✓					✓	✓		✓		✓
18b	A121 Goldings Hill - Millsmead - Loughton	✓				✓		✓	✓	✓		✓	✓
19	B172 - Piercing Hill - Theydon Bois				✓		✓		✓		✓		✓
21	M25 J26 Northern Rbt - Waltham Abbey							✓	✓	✓	✓	✓	✓
22	M25 J26 Southern Rbt - Waltham Abbey			✓	✓	✓	✓		✓	✓	✓	✓	✓
24	A121/B194 Meridian Way Signals - Waltham Abbey				✓		✓			✓	✓	✓	✓
25	A1168 Chigwell Lane - Langston Rd - Oakwood Hill		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
26	A1168 Chigwell Lane - The Broadway							✓				✓	
27	A1168 Chigwell Lane - Borders Lane							✓	✓			✓	✓
28	A1168 Rectory Lane - Westall Rd Rectory Lane	✓				✓		✓	✓	✓	✓	✓	✓
29	A1168 Rectory Lane Pyrles Lane	✓				✓		✓	✓	✓	✓	✓	✓
30	A1168 Rectory Lane Hillyfields Priority	✓				✓		✓				✓	
31	A121 High Rd Traps Hill	✓				✓		✓	✓			✓	✓
32	A121 High Rd - Old Station Rd - Ollards Grove							✓	✓		✓	✓	✓
Total No. Similar to Existing Situation		5	2	2	6	12	8						
Total No. Similar to Do-Minimum Scenario								17	17	16	22	23	26

Table 11-5 High Level Performance Comparison of Existing & Do-Minimum Network V Peak Spreading Scenarios (Includes +5% RFC/DOS Headroom)

12 Wider & Cross Boundary Impacts

12.1 Overview

12.1.1 The overall assessment of the EFD Local Plan Submission Version is also subject to a range of interdependent studies including the proximity and potential impacts on the Epping Forest Special Area of Conservation and the strategic sites / Garden Town Communities located in the Wider Harlow area of EFD.

12.1.2 This section provides a summary of the modelling undertaken to date for information purposes only. All results are subject to further testing and potential change.

12.2 Epping Forest Special Area of Conservation (SAC) VISSIM

12.2.1 A VISSIM Microsimulation model has been developed in line with the TfL VISSIM Model Audit Process (VMAP) and in consultation with the Conservators of Epping Forest to assess Air Quality impacts on the Epping Forest SAC.

12.2.2 The primary purpose of the model is to provide traffic modelling outputs, such as predicted daily traffic flows, expected queue lengths, duration of queue, average vehicle speed, and percentage of heavy goods vehicles to EFDC's Habitats Regulation Assessment / air quality consultants AECOM.

12.2.3 The VISSIM model extents are shown in Figure 12-1 and includes the following junctions:

- Junction 1: Wake Arms Roundabout – B1393 Epping Road/ B172/ A121 Golding's Hill/ A104 Epping New Road/ A121 Woodridden Hill
- Junction 33: Woodgreen Road/ A121 Woodridden Hill/ Forest Side/ A121 Honey Lane
- Junction 34: A112 Sewardstone Road/ Avey Lane
- Junction 35: High Beech/ Cross Roads/ High Beech Loughton
- Junction 36: A104 Epping New Road/ Earle's Path/ Cross Roads (Robin Hood Roundabout)

12.2.4 The model has been validated and calibrated against observed Journey Times, Automated Traffic Counts (ATCs) and Automatic Number Plate Recognition (ANPR) surveys to determine the origin and destination of traffic on the network and ensure results were representative of typical traffic patterns in the study area.

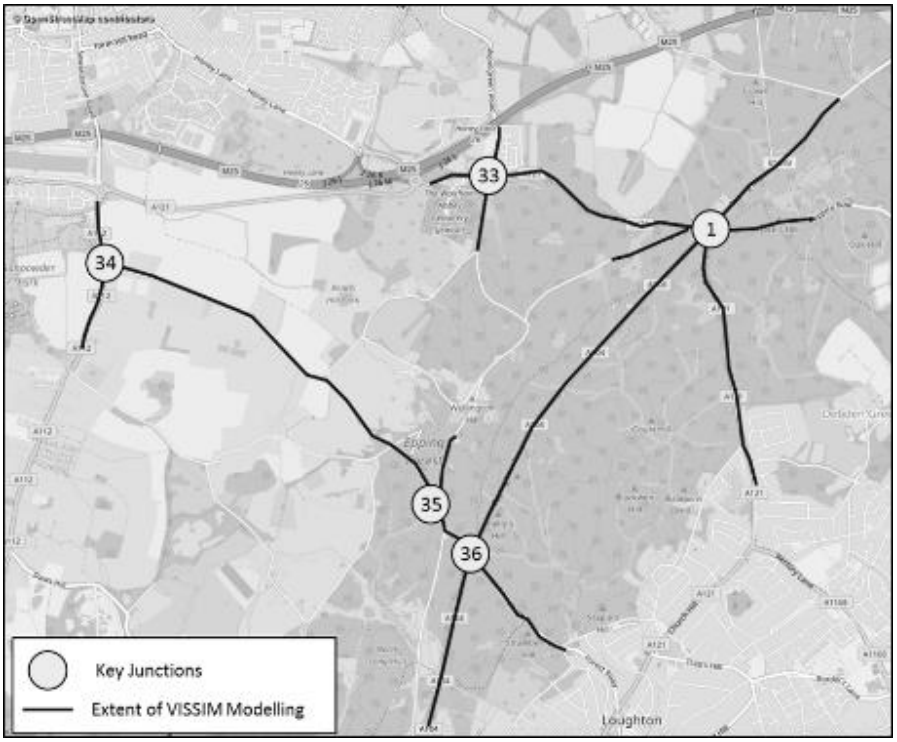


Figure 12-1 VISSIM SAC Model Area

12.2.5 The VISSIM modelling has been undertaken specifically for air quality assessment purposes to test the impact of the LPSV traffic on the SAC and uses a different range of data sets and assessment periods to those modelled in this Transport Assessment. In the first instance, the associated AECOM Habitats Regulation Assessment Report should be referred to for the full range of results and consideration of the implications on air quality. Notwithstanding the overall objectives of the VISSIM modelling, the results do provide additional information on overall network performance, demonstrating that unmitigated LPSV traffic growth is likely to have a significant impact on the road network within the SAC, particularly at Wake Arms roundabout. The assessment of the mitigation proposals demonstrate that the peak hour impact can be reduced in part but, as with the Assessment 3 discussed in Section 10, either a more substantial highway scheme or significant changes in travel behaviour would be required to fully mitigate the overall impact.

12.2.6 As previously stated, the benefits of any mitigation scheme would need to be considered against the overall impact on air quality as well as overall operational interaction with other key parts of the highway requiring mitigation, including the M25 at Junction 26; Bell Common; Epping High Street; and A121 towards Loughton.

12.3 Wider Harlow Strategic Modelling

12.3.1 A separate combined VISUM strategic modelling exercise is being undertaken to assess the impact of development proposed in the West Essex/East Hertfordshire (WEEH) Districts in and around Harlow, including Epping Forest,

Harlow, Uttlesford and East Herts as well as wider TEMPro growth. The model has been used to identify and test major infrastructure requirements around and within the town of Harlow leading to the M11. This section provides an overview of the key implications for EFD arising from the modelling of Local Plan scenarios in the Wider Harlow area.

12.3.2 A series of modelling Technical Notes (TNs 1-6) have reported on model development and identified the highway impact of emerging Local Plan growth. These notes identified locations where the network would be under stress in wider Harlow. The notes also explored the impacts of options to improve capacity around larger development sites including Gilston, East Harlow, Latton Priory and the Water Lane area (incorporating the West Katherine's and West Sumners sites).

12.3.3 The model has a base year of 2014 and used the latest development scenarios as provided across the four Districts of Epping Forest, Harlow, Uttlesford and East Hertfordshire including the EFD LPSV development scenario.

12.3.4 While the model extends beyond the WEEH Districts, the principal focus is to forecast strategic impacts in the Wider Harlow area. It should be noted that, given the nature of separate modelling platforms, base years and study areas, some traffic growth assumptions may differ, including background traffic and development trip rates, to those modelled in the EFD Highway Assessment Model.

12.3.5 Further work has been undertaken to explore the likely effects of attaining lower levels of car use ('Intermediate and Ambitious Sustainable Mode Share') by the end of the 2033 Plan period, with correspondingly higher levels of sustainable travel, than is currently achieved in Harlow. In addition, the aim of reducing the need to out-commute is represented by an estimated increase in more local, shorter trips by a range of modes. Overall sustainable travel would be supported and encouraged through a network of 'Sustainable Travel Corridors (STCs as illustrated on Figure 7-1) providing bus, cycle and walking links to the key strategic sites, town centre, employment areas and railway station.

12.3.6 Mode share change assumptions are applied to developments in the wider Harlow area, depending on their proximity to the STCs and with good potential for modal shift. The following assumptions have been applied to new development and background mode share for car, public transport (PT) and walking / cycling (active):

Location	Modal Share Assumption	Trip Type	Car	PT	Active
All Zones	Standard	All Trips	76%	2%	23%
On Sustainable Travel Corridor (Good Potential)	Intermediate	Development	60%	25%	15%
		Background	65%	10%	25%
	Ambitious	Development	40%	35%	25%
		Background	45%	20%	35%

Table 12-1 WEEH Strategic Model Mode Share Scenarios

12.3.7 As previously discussed, a comprehensive package of transport improvements has been tested and would also be required to deliver anticipated growth in the Wider Harlow area. The key schemes include:

- Provision of new M11 Junction 7a and associated improvements to include:
  - widening of Gilden Way from the London Road roundabout to Marsh Lane
  - new road to link the improved Gilden Way to the M11 via a new Sheering Road roundabout
  - new road link to reconnect to Sheering Road just south of Pincey Brook
  - new roundabouts on either side of the M11 and connected by a new bridge over the M11
  - slip roads on and off the M11 for both north-bound and south-bound traffic
- New second Stort Crossing to the east of the existing crossing: Additional road crossing of the River Stort in Harlow, comprising a dual carriageway linking the A414 at Eastwick with a new 3-arm roundabout north of the River Stort, and a further single carriageway link to River Way towards the eastern end of A414 Edinburgh Way; and
- Sustainable Travel Corridors (STCs) including bus priority and high-quality walking and cycling routes.

12.3.8 It should be noted that potential interim and long-term improvements to Junction 7 on the M11, including provision of a through route at the interchange roundabout from Harlow A414 southbound to the B1393 to Epping Southbound, and minor widening works on the western side of the roundabout, are currently been considered by ECC and Highways England. However, these schemes have not been included in the latest modelling used to inform this report.

12.3.9 The following sections provide a summary of the network performance statistics with a focusing on the impacts of EFD LPSV traffic growth at the M11 Junction 7 and proposed M11 J7a.

12.4 Impacts on M11 Junction 7 & Junction 7a

Traffic Growth

12.4.1 The 2014 Base and 2033 forecast traffic flows for M11 Junction 7 and Junction 7a have been analysed. Additional select link analysis has been undertaken to isolate the forecast traffic growth specifically associated with EFD LPSV developments. Table 12-2 summarises the total flows and changes in flows for all traffic on the M11 Junction 7 and Junction 7a approaches, between 2014 and 2033, as well as the number of trips with an origin or destination specifically in EFD.

Junction Name	Road Name	Total Junction Flows								Epping Forest District (SLA) Flows							
		2014		2033 Standard		2033 Intermediate		2033 Ambitious		2014		2033 Standard		2033 Intermediate		2033 Ambitious	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
M11 J7	M11 SB Off Slip	798	809	732	962	626	961	674	885	356	458	635	865	564	865	576	797
	Hastingwood Rd WB	107	98	0	10	31	8	0	14	59	50	0	10	31	8	0	14
	A414 Canes Ln WB	969	709	1098	1135	1065	1142	1132	1145	690	500	892	930	850	933	890	930
	M11 NB Off Slip	1174	1686	1190	1331	1183	1319	1222	1316	273	427	338	356	328	328	385	329
	London Rd NB	659	866	951	844	943	839	890	787	659	836	955	888	950	879	895	867
	A414 SB	1813	2037	2005	1860	1801	1839	1834	1795	702	514	1045	825	908	799	902	775
M11 J7a	M11 SB Off Slip	0	0	1088	1248	1133	1293	1214	1273	0	0	51	108	65	103	79	125
	M11 NB Off Slip	0	0	312	457	318	422	293	371	0	0	145	262	147	257	139	216
	Gilden Way EB	0	0	1490	1389	1447	1366	1424	1477	0	0	342	223	327	229	325	232
Total	**Junction 7**	**5520**	**6205**	**5977**	**6142**	**5649**	**6109**	**5753**	**5942**	**2739**	**2785**	**3865**	**3875**	**3631**	**3812**	**3647**	**3713**
	Junction 7a	**0**	**0**	**2890**	**3095**	**2898**	**3081**	**2931**	**3122**	**0**	**0**	**537**	**593**	**539**	**589**	**544**	**574**
Flow Change		**Total Junction Flow Change**								**Epping Forest District (SLA) Flow Change**							
M11 J7	M11 SB Off Slip			-66	153	-172	152	-124	75			279	408	208	407	219	340
	Hastingwood Rd WB			-107	-88	-76	-89	-107	-84			-59	-39	-28	-41	-59	-36
	A414 Canes Ln WB			129	426	95	433	163	436			202	430	160	433	200	430
	M11 NB Off Slip			16	-355	9	-367	48	-370			66	-71	55	-99	112	-97
	London Rd NB			292	-22	284	-27	231	-79			297	52	292	42	236	31
	A414 SB			192	-177	-11	-198	21	-242			342	311	205	284	200	261
M11 J7a	M11 SB Off Slip			1088	1248	1133	1293	1214	1273			51	108	65	103	79	125
	M11 NB Off Slip			312	457	318	422	293	371			145	262	147	257	139	216
	Gilden Way EB			1490	1389	1447	1366	1424	1477			342	223	327	229	325	232
Total	**Junction 7**			**457**	**-63**	**129**	**-96**	**233**	**-263**			**1126**	**1090**	**892**	**1027**	**908**	**928**
	Junction 7a			**2890**	**3095**	**2898**	**3081**	**2931**	**3122**			**537**	**593**	**539**	**589**	**544**	**574**

Table 12-2 M11 Junction 7 & Junction 7a 2014-2033 Total / EFD LPSV Flow Changes

12.4.2 The analysis shows that there are currently 5,520-AM and 6,205-PM vehicle movements at Junction 7 with the heaviest flows on the southbound A414 from Harlow and the northbound M11 off slip from London. Junction 7a is not currently implemented.

12.4.3 The introduction of 2033 Standard modal share growth at Junction 7 will increase AM flows by approximately 8%. The increase reduces to 2% and 4% in the respective Intermediate and Ambitious mode share scenarios. In the PM peak total junction flows are expected to reduce. The low level of growth, and potential reduction, in flows is principally associated with the displacement of existing and future traffic flows to the new M11 Junction 7a approximately 4.5 km to the north, where approximately 3,000 new vehicle movements are forecast for each peak.

12.4.4 The additional select link analysis shows that currently 50% of AM traffic and 45% of PM traffic using Junction 7 has an origin or destination specifically in EFD. The LPSV will add approximately 1,100 vehicle trips to the junction in each peak with the 2033 Standard modal share scenario. This increase is partially offset in the AM and completely offset in the PM by the displacement of existing and future traffic to the new Junction 7a. Approximately 19% (500-600) of trips using the new Junction 7a are forecast to have either an origin or destination specifically in EFD.

12.4.5 The modelling indicates that expected growth at the junction will be significantly lower than the overall rate of growth predicted across the WEEH Districts. This is largely due to the introduction of the new Junction 7a to the north as a second all movement M11 junction serving the wider Harlow area.

12.4.6 Notwithstanding the analysis, and given existing congestion at the junction, a combination of an interim and long-term improvement scheme, to complement the new Junction 7a, would improve overall performance and network resilience on the strategic road network.

Journey Times

12.4.7 Journey time analysis was undertaken on a northbound and southbound route, shown in Figure 12-2, to provide an indication of overall network performance through M11 Junction 7 and along the principal A414 leading into Harlow. The overall journey time (mins) for each route and the difference between the 2014 Base and three sustainability scenarios are summarised in Table 12-3.

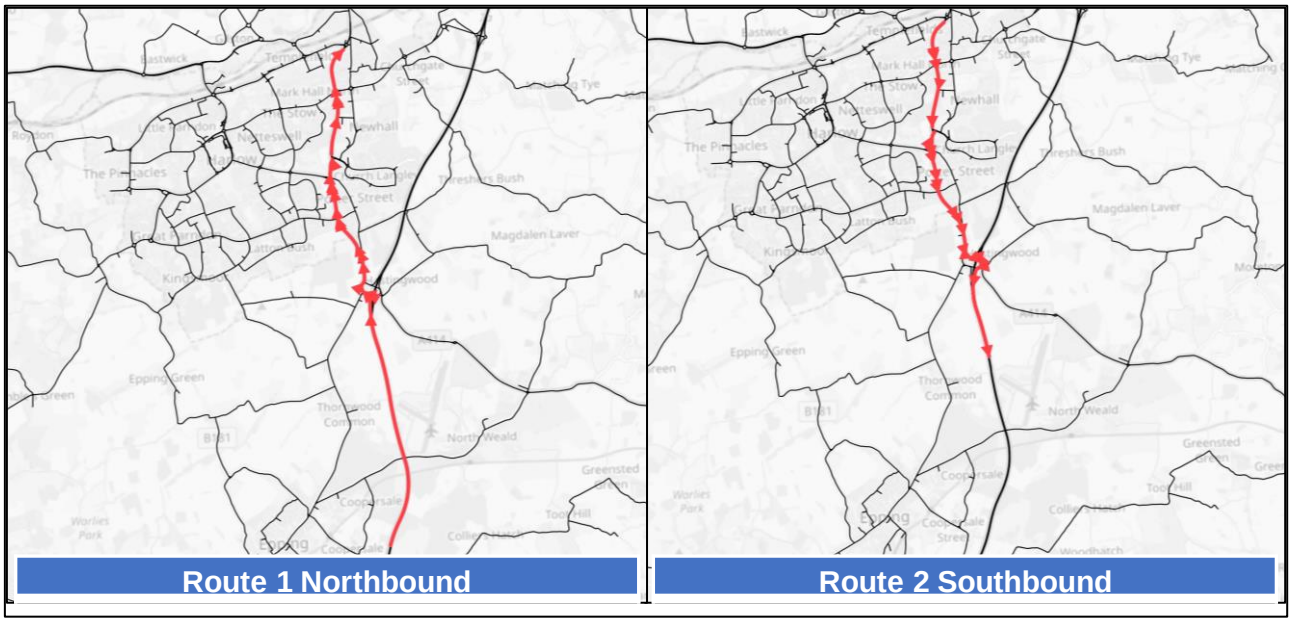


Figure 12-2 M11 Junction 7 Journey Time Routes

Journey Time Route	Journey Time (Min)				Difference to 2014 Base (Min)		
	2014	Standard	Intermediate	Ambitious	Standard	Intermediate	Ambitious
AM							
Route 1 M11 J7 to Edinburgh Way via A414	32.57	34.51	33.83	33.10	1.93	1.26	0.53
Route 2 Edinburgh Way to M11 J7 via A414	18.79	21.52	21.27	20.97	2.73	2.48	2.18
PM							
Route 1 M11 J7 to Edinburgh Way via A414	36.27	35.60	36.31	34.87	-0.67	0.04	-1.40
Route 2 Edinburgh Way to M11 J7 via A414	19.04	20.75	20.49	20.50	1.71	1.45	1.46

Table 12-3 2014-2033 Journey Time Analysis (mins)

12.4.8 The analysis shows that the northbound route in the AM would increase by 1.93 mins in the Standard Sustainability scenario, reducing to 1.26 mins in the Intermediate and only 0.53 mins in the High scenario. The analysis generally shows a marginal improvement on the northbound route in the PM potentially reflecting the reduction of flows in this period and the impact of providing the new Junction 7a to the north as an alternative route into Harlow.

12.4.9 The southbound route shows journey time increases of up to 2.73 mins in the AM and 1.71 mins in the PM peaks. These reduce to 2.18 mins and 1.46 mins respectively in the High Sustainability scenario. The results indicate that the

relatively low flow increases predicted at Junction 7 in the AM, and to a lesser extent in the PM, could have impacts on the A414 approach from Harlow. Further consideration of the interim and long-term improvement scheme, to complement the new Junction 7a, could improve overall performance and network resilience on this part of the SRN.

12.5 Cross Boundary Impacts

12.5.1 The purpose of this analysis is to quantify the cross-boundary transport effects between the authorities neighbouring EFD within the extent of the models. The key highway connections included in this analysis include:

1 A414 north of J7 Harlow (Harlow District Council)
2 Water Lane west of Katherine's Way Harlow (Harlow District Council)
3 A121 at Waltham Cross (Broxbourne Borough Council)
4 A414 at Norton Heath (Chelmsford City Council)
5 B183 Hatfield Heath (Uttlesford)

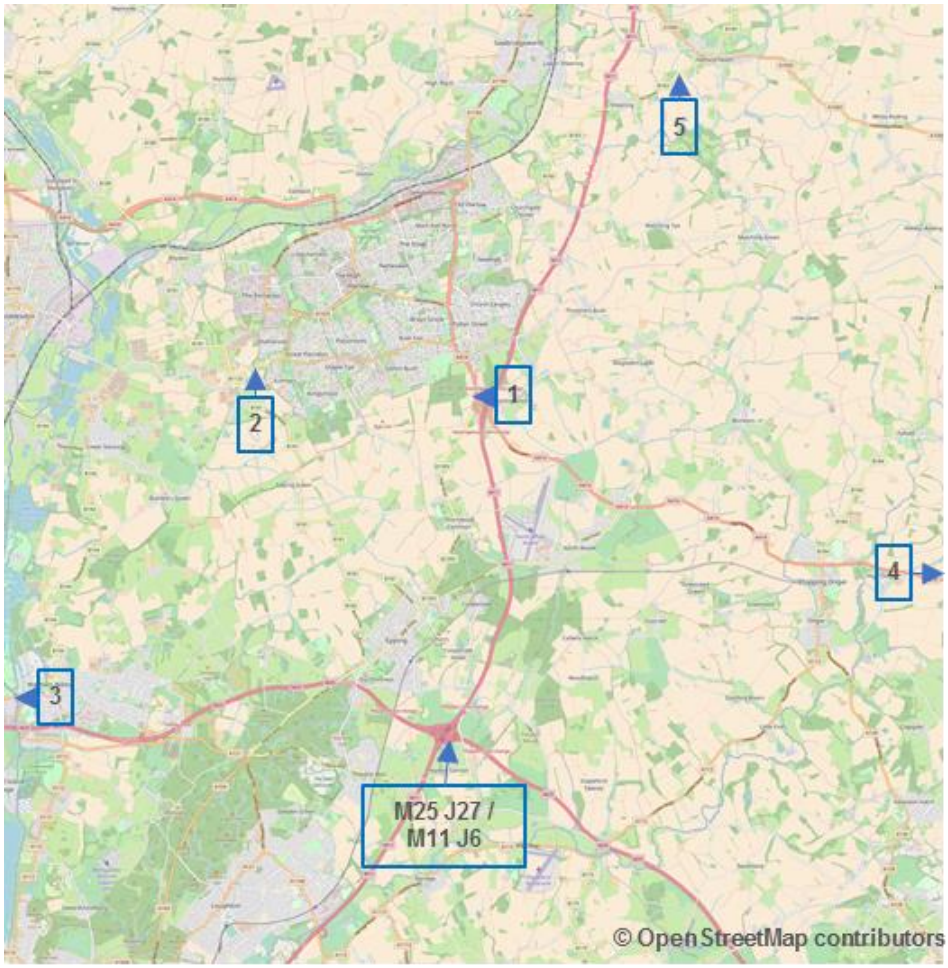


Figure 12-3 Cross Boundary Flow Locations

12.5.2 The cross-boundary traffic flows entering and leaving EFD for the respective links have been identified by using a combination of the WEEH VISUM model and EFD Highway Assessment Model where appropriate and are shown Table 12-4.

District Boundary Location	Base				2033				% Increase from Base			
	AM		PM		AM		PM		AM		PM	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
A414 north of J7 Harlow	1813	1916	2037	2236	2006	1589	1837	1894	10%	-21%	-11%	-18%
Water Lane west of Katherine's Way Harlow	739	1114	1086	944	850	1355	1108	1236	13%	18%	2%	24%
A121 at Waltham Cross	948	1367	1339	997	1456	2323	2178	1493	35%	41%	39%	33%
A414 at Norton Heath	993	647	645	829	1265	828	801	1079	22%	22%	19%	23%
B183 between Sheering and Hatfield Heath	367	610	535	488	497	586	564	521	26%	-4%	5%	6%

Table 12-4 Base and Forecast Cross Boundary Flows

12.5.3 In the absence of a Do-Minimum scenario in the WEEH VISUM model, the analysis shows the level of growth against the base year conditions. While the overall growth includes forecast traffic associated with the EFD LPSV, it also includes a significant proportion of TEMPro background traffic growth (approximately 12.5%) associated with the delivery of Local Plan development in the neighbouring authorities as well as other wider economic factors.

12.5.4 The highest increases are anticipated at the A121 boundary between Waltham Abbey and Waltham Cross in Broxbourne Borough Council where a potential mitigation scheme at the A121 / B194 Meridien Way signals has been identified in this study.

12.5.5 The increase in traffic west of Katherine's Way is largely due to the two strategic sites / Garden Town Communities at Water Lane, West Katherine's and West Sumners, to the west of Harlow, where increased sustainability and links to the wider Harlow sustainable travel corridors is expected to reduce the impact of car travel further.

12.5.6 The WEEH modelling indicates that two-way traffic flows could reduce from existing levels on the A414 to the north of Junction 7.

12.6 M25 Junction 27 / M11 Junction 6

12.6.1 The M25 Junction 27 / M11 Junction 6 interchange is approximately 7km to the south of the M11 Junction 7 (shown in Figure 12-3). The interchange is located within EFD but does not provide direct access to the local road network and serves the strategic M25 / M11 corridors and wider south east and London areas.

12.6.2 The junction was not included in the detailed WEEH VISUM model extent and only limited traffic and forecast information can be extracted to provide an

indication of the level of traffic using the interchange associated with the EFD LPSV growth. The following methodology has been applied to provide a high-level assessment:

- Mainline M25 / M11 interchange peak hour base flows (2014) have been extracted from the WEEH Strategic Model;
- 2014-2033 TEMPro v7.2 growth factor of 24.8% for Essex Rural Motorway has been applied to base flows to understand the likely level of overall growth at the interchange i.e. all local and wider regional growth added; and
- Select link analysis of 2014 and 2033 trips using the interchange specifically with an origin and destination in EFD i.e. growth attributable to EFD (includes Local Plan development growth and background traffic growth).

12.6.3 The analysis is summarised in Table 12-5 and shows that the total flows at the interchange could increase to 16,535-AM and 19,781-PM mainline movements by 2033 when all growth is considered.

12.6.4 The select link analysis shows that the number of additional trips using the interchange, specifically associated with EFD growth, would be 352-AM and 507-PM by 2033. This equates to a 3% increase on the total base flows at the interchange. Again, a significant proportion of this growth includes background growth and is not wholly attributable to the LPSV.

		Total Junction Flows				Epping Forest District (SLA) Flows			
Junction Name	Road Name	2014		2033 Standard		2014		2033 Standard	
		AM	PM	AM	PM	AM	PM	AM	PM
M11 J6 / M25 J27	M11 SB	3468	3239	4328	4041	722	502	888	749
	M25 WB	4375	4620	5459	5765	616	606	622	672
	M11 NB	1747	3316	2180	4137	127	205	124	294
	M25 EB	3661	4678	4568	5837	406	497	590	602
	Totaal Flows	**13251**	**15853**	**16535**	**19781**	**1871**	**1811**	**2223**	**2318**
Flow Change		**Total Junction Flow Change**				**Epping Forest District (SLA) Flow Change**			
M11 J6 / M25 J27	M11 SB			859	803			166	248
	M25 WB			1084	1145			6	66
	M11 NB			433	822			-3	89
	M25 EB			907	1159			184	104
	Total Change			**3284**	**3928**			**352**	**507**

Table 12-5 M25 J27 / M11 J6 Interchange EFD Traffic Growth

12.6.5 The impact assessment at the M25 / M11 interchange is considered as an indication only to provide an order of magnitude of the likely impact of the EFD LPSV growth on the junction. The analysis indicates that a significant level of overall growth (24.8%) is expected at the junction and that EFD related traffic will add approximately 3% to the existing mainline flows.

13 Summary

13.1 Overview

13.1.1 This Transport Assessment builds on the 'toolkit' of evidence prepared over the past 5 years to support earlier iterations of the Epping Forest District Council's (EFDC) Local Plan leading up to the LPSV development scenario. The assessment includes updates to previous modelling methodologies including analysis of rail heading, car-free development, and Peak Spreading. A more detailed assessment of a potential highway mitigation package to accommodate future Local Plan traffic growth has also been included.

13.1.2 The traffic impacts of the LPSV have been assessed using the EFD VISUM assisted Spreadsheet Highway Assessment Model for the forecast year of 2033. The weekday AM and PM worst-case peak hours have been modelled as the most recent representation of the forecast transport situation for the Local Plan at this point.

13.1.3 The Transport Assessment is intended at a strategic scale to inform of the District wide traffic impacts of the Local Plan and provide an indication of any wider cross boundary impacts. The outcomes of the study are principally to identify where the network is sufficiently constrained to the extent that appropriate mitigation may be required. The study does not assess individual development sites but makes recommendations for improvements to specific parts of the network given the overall quantum of Local Plan development. Individual development sites will need to be assessed on their respective merits through the planning process and against the latest traffic conditions, planning information and transport supply at that time.

13.1.4 It is acknowledged that the Transport Assessment makes conservative assumptions regarding the potential for modal shift through reasonable sustainable transport improvements and is based on several worst-case modelling assumptions. It is reasonable to assume that more ambitious modal shift could be realised, with the level of intervention proposed, and potentially bettered, given the Garden Community aspirations at the strategic sites around Harlow.

13.2 Assessment Scenarios

13.2.1 The following scenarios have been assessed sequentially to demonstrate the iterative impacts of Local Plan development traffic, mitigation proposals and changes in driver behaviour, against the Existing situation and Do-Minimum situation. This provides a benchmark for overall acceptability of the Local Plan in transport terms.

- Scenario 1 provides the existing traffic situation and includes an overview of the current level of service for different modes including road safety, public transport and cycling;

- Scenario 2 Do-Minimum (Reference Case) represents a future year in which the Local Plan is not adopted, but accounts for all planned or committed development within the District and full development in the rest of the United Kingdom to 2033;
- Scenario 3 Do-Something adds all development planned in the 2018 Local Plan Submission Version (LPSV) and assesses the traffic impact on the existing highway layout. Reasonable assumptions are made for sustainable transport improvements;
- Scenario 4 Do-Something is a continuation of Scenario 3 and introduces a package of mitigation improvements to the highway network;
- Scenario 5 Peak Spreading Do-Something without Mitigation is a continuation of Scenario 3 and assesses the impact of the redistribution of peak hour traffic into available peak shoulder spare capacity (Peak Spreading) in response to future congestion on the network. This scenario does not include any mitigation of the existing highway network; and
- Scenario 6 Peak Spreading Do-Something with Mitigation is a continuation of Scenario 4 and assesses the impact of the redistribution of peak hour traffic into available peak shoulder spare capacity (Peak Spreading) in response to future congestion on the network. This scenario includes a package of mitigation for the highway network.

13.3 Assessment Results

13.3.1 The analysis shows that currently several junctions and links are either approaching or exceeding capacity. The Do-Minimum growth increases traffic levels by approximately 18% from current levels leading to additional capacity issues across parts of the network.

13.3.2 In Scenario 3, the introduction of reasonable improvements to sustainable transport choices reduces the traffic impact, from unconstrained levels, by approximately 8%. However, the analysis highlights that the LPSV increases traffic levels by up to 36% overall with residual impacts on key junctions and corridors.

13.3.3 A package of highway improvements has been tested in Scenario 4 and shown to either improve on the Do-Minimum or generate a similar level of performance at several key junctions and links. The highway mitigation package remains at the concept design stage and individual schemes have been largely constrained by the highway boundary, costs, environmental issues and observed infrastructure to remain reasonable in scale for viability. Any schemes would be subject to more detailed feasibility, design and potential change as or when they may need to be brought forward for delivery by any parties.

13.3.4 While mitigation is evidently needed, across some parts of the network, and the package delivers significant benefits to highway capacity, there are residual impacts requiring further investigation. Considering DfT guidance on Peak

Spreading, two further assessments have been undertaken of the existing network (Scenario 5) and mitigated network (Scenario 6) to examine the impacts of peak hour traffic redistributing into available peak shoulder spare capacity.

13.3.5 The assessments show that there is potential available capacity in the peak shoulders that could generate a further average 8% reduction in traffic flows within the traditional network AM and PM peak hours. The combination of the easing of traffic, through Peak Spreading, and a package of physical mitigation measures demonstrates the potential to not only generate an improvement in network performance over the Do-Minimum situation but also return overall performance to a similar level as the existing situation across much of the network. A wider benefit of the Peak Spreading analysis has been the identification of locations where physical interventions are proposed but may not be ultimately needed if overall traffic patterns change across the peak periods.

13.3.6 There is also an acknowledgement that sustainable modal shift assumptions are conservative, given the level of improvement proposed and potential for Garden Town Communities at sites around Harlow, and that more ambitious targets would result in additional net traffic reductions. The impact of traffic growth across the District will need to be monitored across the Plan period to ensure any mitigation proposed is either required or appropriate in scale.

13.4 Conclusions

13.4.1 The EFD LPSV sets out the Council's strategy to deliver, amongst other things, new homes, employment floor space, and new pupil places, over the next 15 years.

13.4.2 The Transport Assessment provides a robust concluding study to the suite of previous assessments undertaken over the past 5 years to support the Local Plan process. The study adopts a pragmatic sequential approach to demonstrate the potential impact of the LPSV using a range of scenarios.

13.4.3 The overall 'future housing requirement' for the District has been calculated as the delivery of 10,020 new dwellings between 2017-2033. However, the LPSV makes provision for the 'total projected housing supply available' (11,822 between 2017-2033[15]), which has been tested as a worst-case.

13.4.4 In the first instance, the LPSV has been tested with the existing transport supply. This included 'reasonable' assumptions for improvements to sustainable infrastructure, and modal shift away from the car, but with little or no improvements to highway infrastructure. As would be expected, given the quantum of development proposed, the results indicate that the forecast

[15] Excludes completions, total projected housing supply available is 13,152 dwellings from 2011-2017

development traffic would increase traffic levels significantly across the network and that further mitigation is needed for some parts of that network.

13.4.5 In advance of delivering any physical improvements, which can be costly and could encourage further unconstrained car use, more ambitious sustainable transport and travel demand management interventions should be identified by development. This would need to capitalise and expand on the walking, cycling and bus improvements promoted in this study and demonstrate increased sustainable modal shift. The impact of Peak Spreading would also need to be considered to reflect potential changes in travel behaviour and the availability of network capacity outside of the congested traditional peak hours.

13.4.6 Over and above any further sustainable transport improvements, the assessment demonstrates that a package of physical mitigation schemes will likely be required to mitigate the impact of the LPSV related traffic. The analysis demonstrates that the combination of more ambitious sustainable modal shift, impact of Peak Spreading and a package of physical highway improvements could potentially mitigate the most significant impacts of the Local Plan. In many instances, junction approaches would deliver a similar level of performance over the existing situation, or at the least, improve on the 2033 Do-Minimum scenario, where no Local Plan growth and only transport improvements are delivered.

13.4.7 It is acknowledged that the analysis identifies some localised residual impacts on the network, largely due to the challenges associated with delivering junction improvements in constrained urban or rural areas. The potential mitigation package should be considered as a minimum and the scale of/need for any required scheme will need to be monitored and refined throughout the Local Plan period. Any development coming forward would need to promote and test any mitigation within a Transport Assessment and Travel Plan, as part of any planning application, to ensure mitigation is delivered at an appropriate scale and 'fit for purpose'.

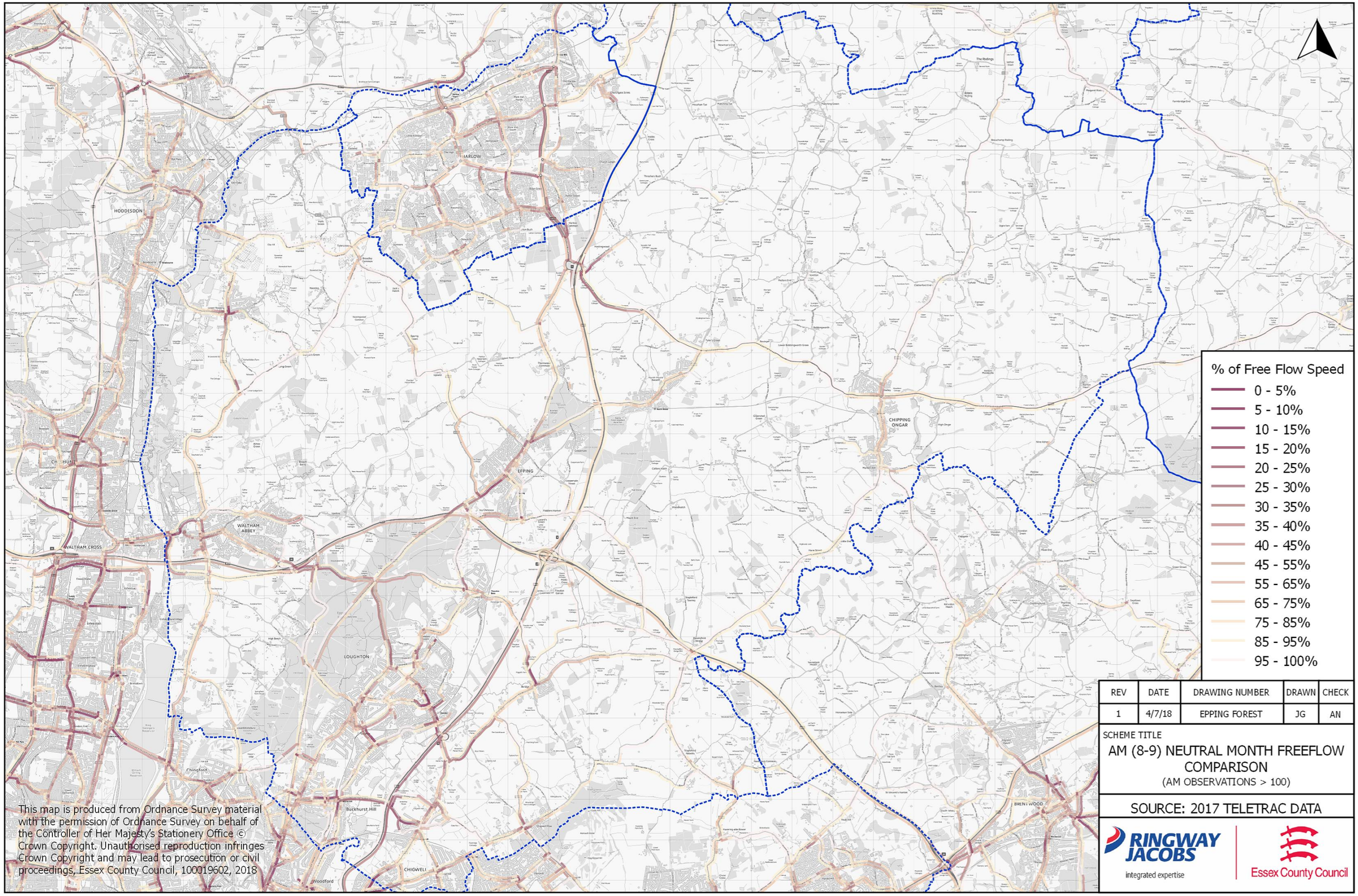
13.4.8 The ongoing assessment work for the West Essex East Herts (WEEH) Districts growth, including the Garden Town Community sites in EFD also identify that significant infrastructure improvements and ambitious sustainable modal shift is required to address significant impact in and around Harlow and the M11.

Appendices

EB503

Appendix A Trafficmaster Plots

EB503



REV	DATE	DRAWING NUMBER	DRAWN	CHECK
1	4/7/18	EPPING FOREST	JG	AN

SCHEME TITLE

AM (8-9) NEUTRAL MONTH FREEFLOW COMPARISON

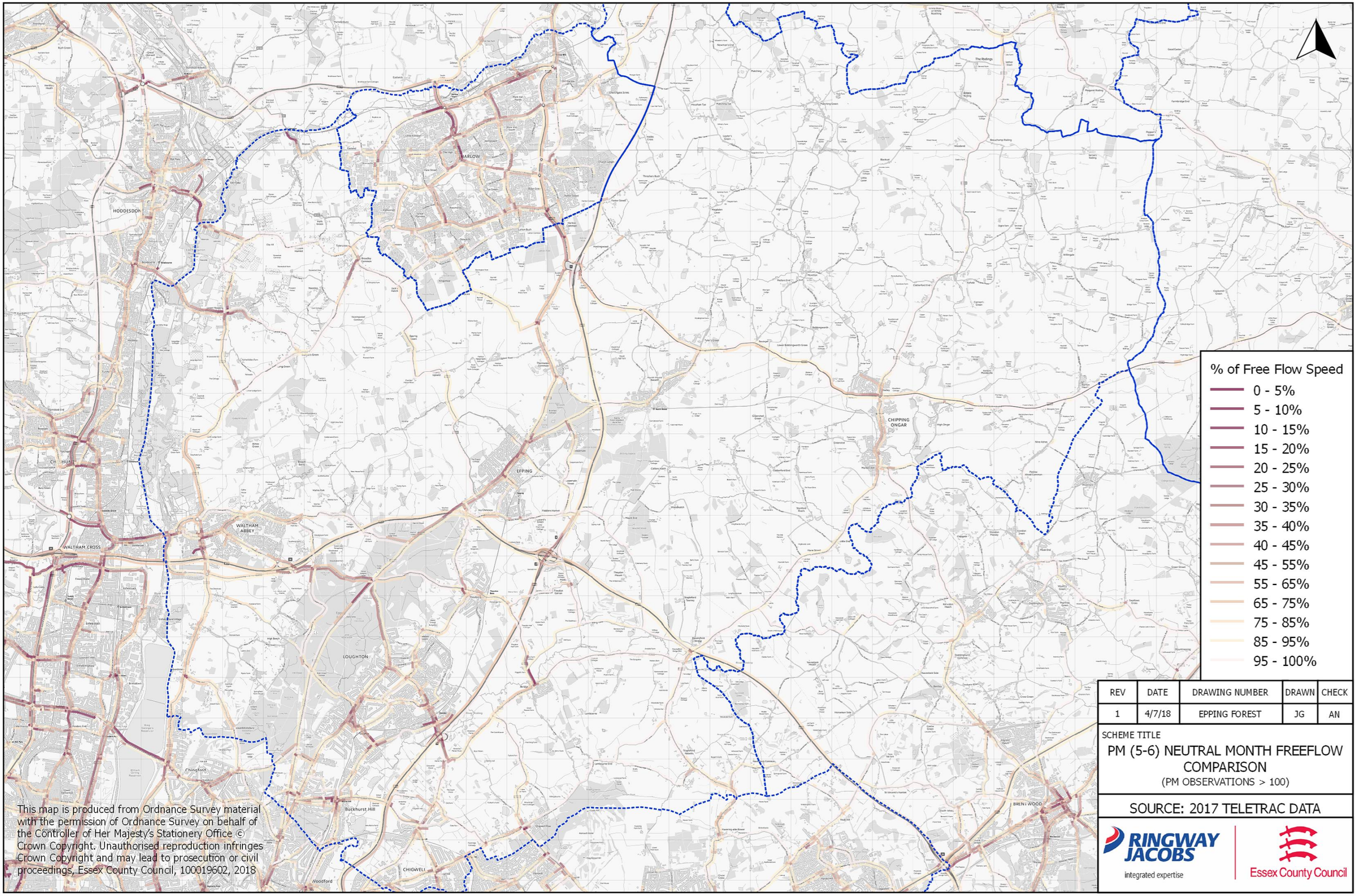
(AM OBSERVATIONS > 100)

SOURCE: 2017 TELETRAC DATA

RINGWAY JACOBS integrated expertise

Essex County Council

EB503



REV	DATE	DRAWING NUMBER	DRAWN	CHECK
1	4/7/18	EPPING FOREST	JG	AN

SCHEME TITLE

PM (5-6) NEUTRAL MONTH FREEFLOW COMPARISON

(PM OBSERVATIONS > 100)

SOURCE: 2017 TELETRAC DATA

RINGWAY JACOBS integrated expertise

Essex County Council

Appendix B Committed Developments

Site/App Ref	Site Name & Location	Settlement:	Site Type	Housing Units (2033)
EPF/3409/16	Sterling House Langston Road Loughton Essex IG10 3TS/Prior approval for proposed change of use of a building fro	Loughton	Residential	129
EPF/0183/15	5 one-bedroom apartments, 11 two-bedroom apartments, 4 three-bedroom apartments	North Weald Bassett	Residential	20
EPF/0228/13	4 one-bedroom apartments and 4 two-bedroom apartments	Waltham Abbey	Residential	8
EPF/0259/16	2 three-bedroom detached houses, 8 four-bedroom detached houses and 10 three-bedroom terraces	Harlow	Residential	18
EPF/0320/10	Two-bedroom apartments	Chigwell	Residential	14
EPF/0402/14	Two-bedroom apartments	Loughton	Residential	11
EPF/0570/15	Four and five bedroom detached houses	Broxbourne	Residential	26
EPF/0604/14	8 five-bedroom houses	Stapleford Abbots	Residential	8
EPF/0645/15	2 one-bedroom apartments and 5 two-bedroom apartments	Loughton	Residential	7
EPF/0663/15	Two-bedroom apartments	Epping	Residential	8
EPF/0739/10	Two-bedroom terraced houses	Harlow	Residential	14
EPF/0853/14	THFC Training Ground, Luxborough Lane	Chigwell	Residential	56
EPF/0864/15	2 three-bedroom detached houses and 12 three-bedroom apartments	Sawbridgeworth	Residential	14
EPF/0928/14	Seven one-bedroom apartments and three 2-bedroom apartments	Waltham Abbey	Residential	10
EPF/0958/15	3 Two-bedroom apartments and 1 one-bedroom apartment	Epping	Residential	4
EPF/0987/14	54 Centre Drive Epping CM16 4JF	Epping	Residential	14
EPF/1007/15	2 two-bedroom houses, 15 three-bedroom houses, 11 one-bedroom flats, 23 two-bedroom flats	Loughton	Residential	51
EPF/1162/15	36 two-bedroom affordable houses, 27 three-bedroom affordable houses, 11 three-bedroom houses and 5 four-bedroo	Waltham Abbey	Residential	78
EPF/1245/16	Two-bedroom apartments	Loughton	Residential	14
EPF/1771/15	10 three-bedroom terraced houses and 2 two-bedroom terraced houses	North Weald Bassett	Residential	12
EPF/1862/15	34 five-bedroom detached houses, 4 five-bedroom semi-detached houses and 5 five-bedroom detached houses	Chigwell	Residential	43
EPF/1978/13	Dwellings of unspecified sizes	Stapleford Abbots	Residential	70
EPF/2001/16 / EPF/1103/15	Retirement apartments of unspecified sizes	Loughton	Residential	38
EPF/2027/14	9 four-bedroom houses and 2 five-bedroom houses	Harlow	Residential	11
EPF/2040/13	5 two-bedroom apartments and 4 one-bedroom apartments	Waltham Abbey	Residential	9
EPF/2126/11	4 one-bedroom apartments and 8 two-bedroom apartments	Epping	Residential	12
EPF/2163/13	61 two-bedroom apartments and 3 one-bedroom apartments	Loughton	Residential	64
EPF/2254/15	18 three-bedroom houses, 12 two-bedroom flats and 6 one-bedroom flats	Loughton	Residential	36
EPF/2370/14	13 three-bedroom terraces, 2 four-bedroom terraces and 1 two-bedroom terrace	Sewardstone	Residential	16
EPF/2378/15	8 one-bedroom apartments and 2 two-bedroom studio apartments	Loughton	Residential	10
EPF/2444/13	Guest bedrooms for letting	Roydon	Residential	14
EPF/2473/16	Woodview / Lambourne Road, Chigwell, Essex, IG7 6HX	Chigwell	Residential	23
EPF/2494/13	Three-bedroom detached cottages	N/A	Residential	6
EPF/2511/13	2-bedroom semi-detached houses	Waltham Abbey	Residential	6
EPF/2516/14	2 three-bedroom semi-detached houses, 5 four bedroom detached houses and 2 five-bedroom detached houses	Harlow	Residential	9
EPF/2535/14 / EPF/0487/16	Five 4-bedroom detached houses, seven 5-bedroom detached houses, 6 two-bedroom terraces and 5 three-bedroom te	Harlow	Residential	23
EPF/2665/13	Four 3-bedroom terraces, seven 2-bedroom terraces and two 4-bedroom terraces	Waltham Abbey	Residential	13
EPF/2696/13	Nine two-bedroom apartments and 2 one-bedroom apartments	Woodford	Residential	11
EPF/2748/14	181-185 High Road Chigwell IG7	Chigwell	Residential	13
EPF/2753/15	One-bedroom apartments	Loughton	Residential	7
EPF/2817/14	Four-bedroom semi-detached houses	N/A	Residential	6
EPF/2899/15	Chigwell County Primary School High Road Chigwell Essex IG7 6DW	Chigwell	Residential	32
EPF/3006/14	Dwellings of unspecified sizes, though at least 42% will have fewer than 4 bedrooms	Ongar	Residential	105
EPF/3019/15	6 one-bedroom apartments, 4 two-bedroom apartments and 2 three-bedroom apartments	Loughton	Residential	12
EPF/3034/16	Norton Heath Riding Centre / Fingrith Hall Lane, High Ongar, Essex, CM4 0JP	High Ongar	Residential	30
EPF/3035/15	6 one-bedroom apartments and 6 two-bedroom apartments	Buckhurst Hill	Residential	12
EPF/3121/15	Two-bedroom apartments	Sawbridgeworth	Residential	12
SR-0526 / EPF/1269/15	Golden Lion public house, Newmans Lane, Loughton	Loughton	Residential	30
N/A	Committed small scale (542 pro rata over 6 prinicpal settlements)	Chigwell	Residential	56
N/A	Committed small scale (542 pro rata over 6 prinicpal settlements)	Epping	Residential	80
N/A	Committed small scale (542 pro rata over 6 prinicpal settlements)	Harlow	Residential	121
N/A	Committed small scale (542 pro rata over 6 prinicpal settlements)	Loughton	Residential	121
N/A	Committed small scale (542 pro rata over 6 prinicpal settlements)	North Weald Bassett	Residential	80
N/A	Committed small scale (542 pro rata over 6 prinicpal settlements)	Waltham Abbey	Residential	84

Appendix C Site Allocations

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ALLOCATION REFERENCE	SITE SELECTION REFERENCE	ALLOCATION SITE NAME	ADDRESS	PARISH	SETTLEMENT	SETTLEMENT LOCAL PLAN	SITE AREA (HA)	PRIMARY LAND USE	DWELLINGS (CAPACITY)	EMPLOYMENT FLOORSPACE (SQM)	PITCHES/YARD	INDICATIVE DEVELOPMENT AREA (HA)	INDICATIVE NET DENSITY	EMPLOYMENT USE CLASE	TYPE
EPP.E1	E-095	Land at Eppingdene	Eppingdene, Ivy Chimneys, CM16 4EL	Epping	Epping	Epping	1.11	Employment	0	0	0	N/A	0		Existing Employment Site
EPP.E2	ELR-0091	Land at Coopersale Hall	Land at Coopersale Hall, Flux's Lane, Coopersale, CM16 7PE	Epping	Epping	Epping	1.8	Employment	0	0	0	N/A	0		Existing Employment Site
EPP.E3	EMP-0011	Falconry Court	Falconry Court, Bakers Lane, Epping, CM16 5BD	Epping	Epping	Epping	0.5	Employment	0	0	0	N/A	0		Existing Employment Site
EPP.E4	EMP-0013	Bower Hill Industrial Estate	Bower Hill Industrial Estate, Epping, CM16 7BN	Epping	Epping	Epping	1.73	Employment	0	0	0	N/A	0		Existing Employment Site
HONG.E1	SR-0394	Nash Hall Industrial Estate	High Ongar, Essex, CM5 9NL	High Ongar	High Ongar	High Ongar	2	Employment	0	0	0	N/A	0		Existing Employment Site
LOU.E1	EMP-0002a	Oakwood Hill Industrial Estate	Oakwood Hill, Loughton, IG10 3DQ	Loughton	Loughton	Loughton	6.1	Employment	0	0	0	N/A	0		Existing Employment Site
LOU.E3	EMP-0003	Buckingham Court	Rectory Lane, Loughton, IG10 2QZ	Loughton	Loughton	Loughton	0.62	Employment	0	0	0	N/A	0		Existing Employment Site
LSHR.E1	EMP-0017	Land at The Maltings	Station Road, Sawbridgeworth, CM21 9JX	Sheering	Lower Sheering	Lower Sheering	2.04	Employment	0	0	0	N/A	0		Existing Employment Site
NAZE.E1	E-112	The Old Waterworks	Green Lane, Nazeing, Essex, EN10 6RS	Nazeing	Lower Nazeing	Nazeing	2.15	Employment	0	0	0	N/A	0		Existing Employment Site
NAZE.E2	ELR-0099	Land West of Sedge Green	Sedge Green, Nazeing, CM19 5JR	Nazeing	Lower Nazeing	Nazeing	0.84	Employment	0	0	0	N/A	0		Existing Employment Site
NAZE.E3	EMP-0007	Bridge Works and Glassworks at Nazeing New Road	Nazeing New Road, Nazeing, Essex, EN10 6SY	Nazeing	Lower Nazeing	Nazeing	2.13	Employment	0	0	0	N/A	0		Existing Employment Site
NAZE.E4	EMP-0009	Hillgrove Business Park	Nazeing Road, Nazeing, EN9 2HB	Nazeing	Lower Nazeing	Nazeing	3.85	Employment	0	0	0	N/A	0		Existing Employment Site
NAZE.E5	SR-0151	Birchwood Industrial Estate	Land at Birchwood Industrial Estate, Hoe Lane, Nazeing, EN9 2RJ	Nazeing	Nazeing	Nazeing	2.88	Employment	0	0	0	N/A	0		Existing Employment Site
NAZE.E6	SR-0863-N	Millbrook Business Park	Millbrook Business Park, Nazeing, Waltham Abbey, EN9 2RJ	Nazeing	Nazeing	Nazeing	0.68	Employment	0	0	0	N/A	0		Existing Employment Site
NAZE.E7	SR-0965	Land at Winston Farm	Land at Winston Farm, Hoe Lane, Nazeing, Waltham Abbey, EN9 2RJ	Nazeing	Nazeing	Nazeing	0.63	Employment	0	0	0	N/A	0		Existing Employment Site
NWB.E1	ELR-0097	New House Farm at Vicarage Lane	New House Farm, Vicarage Lane, North Weald, Epping, CM16 6AP	North Weald Bassett	North Weald Bassett	North Weald Bassett	0.63	Employment	0	0	0	N/A	0		Existing Employment Site
NWB.E2	EMP-0019	Tylers Green Industrial Area	Tylers Green Industrial Area, High Road, North Weald, CM16 6EG	North Weald Bassett	North Weald Bassett	North Weald Bassett	1.1	Employment	0	0	0	N/A	0		Existing Employment Site
NWB.E3	SR-0415	Weald Hall Farm and Commercial Centre	Weald Hall Farm and Commercial Centre, Canes Lane, Epping, CM16 6FJ	North Weald Bassett	North Weald Bassett	North Weald Bassett	3.07	Employment	0	0	0	N/A	0		Existing Employment Site
ONG.E1	E-058	Essex Technology and Innovation Centre	The Gables, CM5 0GA	Ongar	Ongar	Ongar	0.28	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E1	E-049	Bricfield House	Thornwood, CM16 6TH	North Weald Bassett	Thornwood	Rural East	0.37	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E10	E-106	Land at Little Hyde Hall Farm	Hatfield Heath Road, CM21 9HX	Sheering	Lower Sheering	Rural East	0.92	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E11	E-107	Land at Quickbury Farm	Hatfield Heath Road, CM21 9HY	Sheering	Lower Sheering	Rural East	1.52	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E12	E-109	New House Farm	Little Laver Road, CM5 0JE	Moreton, Bobbingworth an	Moreton	Rural East	1.05	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E13	E-115	Warlies Park House	Warlies Park House, Horseshoe Hill, EN9 3SL	Waltham Abbey	Waltham Abbey	Rural West	0.56	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E14	E-119	Matching Airfield North	Anchor Lane, Abbess Roding, CM5 0JR	Abbess Beauchamp and Berners Roding		Rural East	1.34	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E15	ELR-0095	Land at Rolls Farm Barns	Hastingwood Road, Magdalen Laver, Essex, CM5 0EN	Moreton, Bobbingworth an	Magdalen Laver	Rural East	2.91	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E16	ELR-0104a	Taylor's Farm	Taylor's Farm, Gravel Lane, IG7 6DQ	Chigwell	Chigwell	Rural South	0.63	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E17	ELR-0104b	Brookside Garage	Brookside Garage, Gravel Lane, IG7 6DQ	Chigwell	Chigwell	Rural South	0.34	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E18	EMP-0020	Land at Dunmow Road	Dunmow Road, Fyfield, CM5 0NS	Fyfield	Fyfield	Rural East	0.21	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E2	E-068	Land at Kingston's Harm	Downhall Road, Harlow, CM17 0RB	Matching	Matching	Rural East	1.68	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E20	SR-0211	Land at Stewarts Farm	School Road, Stanford Rivers, Ongar, Essex, CM5 9PT	Stanford Rivers	Stanford Rivers	Rural East	0.6	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E22	ELR-0094	Hastingwood Business Centre	1 Willow Place, Hastingwood, Harlow, Essex CM17 9GD	North Weald Bassett	Hastingwood	Rural East	0.29	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E23	E-065	Hobbs Cross Business Centre	Theydon Garnon, CM16 7NY	Theydon Garnon	Theydon Garnon	Rural East	1.76	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E24	E-098	Land at Holts Farm	Holts Court, Holts Farm, CM17 0NS	Moreton, Bobbingworth an	Threshers Bush	Rural East	0.27	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E3	E-070	Matching Airfield South	Anchor Lane, Abbess Roding, CM5 0JR	Abbess Beauchamp and B	Abbess Roding	Rural East	2.81	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E4	E-078	Land at London Road	London Road, Stanford Rivers, CM5 9PJ	Stanford Rivers	Stanford Rivers	Rural East	4.64	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E5	E-096	Land at Hayleys Manor	Hayleys Manor, Upland Road, CM16 6PQ	Epping Upland	Epping Upland	Rural West	2.07	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E6	E-097	Land at Housham Hall Farm	Harlow Road, CM17 0PB	Matching	Matching	Rural East	1.62	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E7	E-101	Land at Searles Farm	Foster Street, CM17 9HP	North Weald Bassett	Harlow	Rural East	1.53	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E8	E-104	Fosters Croft	Foster Street, CM17 9HS	North Weald Bassett	Harlow	Rural East	0.43	Employment	0	0	0	N/A	0		Existing Employment Site
RUR.E9	E-105	Horseshoe Farm at London Road	London Road, CM17 9LH	North Weald Bassett	Harlow	Rural East	0.96	Employment	0	0	0	N/A	0		Existing Employment Site
STAP.E1	ELR-0074	Land at High Willows	Land at High Willows, Murthering Lane, Romford, RM4 1JT	Stapleford Abbotts	Stapleford Abbotts	Stapleford Abbotts	0.6	Employment	0	0	0	N/A	0		Existing Employment Site
THOR.E1	E-092	Camfaud Concrete Pumps	Camfaud Concrete Pumps, High Road, Thornwood, CM16 6LZ	North Weald Bassett	Thornwood	Thornwood	1.35	Employment	0	0	0	N/A	0		Existing Employment Site
THOR.E2	ELR-0092	Land at Esgors Farm	Land at Esgors Farm, Thornwood, CM16 6LY	North Weald Bassett	Thornwood	Thornwood	2	Employment	0	0	0	N/A	0		Existing Employment Site
THOR.E3	ELR-0093	Woodside Industrial Estate	Woodside Industrial Estate, Thornwood, CM16 6LJ	North Weald Bassett	Thornwood	Thornwood	1.99	Employment	0	0	0	N/A	0		Existing Employment Site
THOR.E4	EMP-0014	Weald Hall Lane Industrial Area	Weald Hall Lane Industrial Area, Thornwood, Epping, CM16 6NB	North Weald Bassett	Thornwood	Thornwood	1.09	Employment	0	0	0	N/A	0		Existing Employment Site
WAL.E1	E-066	Howard Business Park	Howard Business Park, Farm Hill Road, Waltham Abbey, EN9 1XA	Waltham Abbey	Waltham Abbey	Waltham Abbey	0.54	Employment	0	0	0	N/A	0		Existing Employment Site
WAL.E2	E-113	Land at Breeches Farm	Breeches Farm, Galley Hill, Waltham Abbey, EN9 2AH	Waltham Abbey	Waltham Abbey	Waltham Abbey	3.27	Employment	0	0	0	N/A	0		Existing Employment Site
WAL.E3	ELR-0088	Land at Woodgreen Road	Land at Woodgreen Road/Southend Land, Waltham Abbey, EN9 3SA	Waltham Abbey	Waltham Abbey	Waltham Abbey	0.62	Employment	0	0	0	N/A	0		Existing Employment Site
WAL.E4	EMP-0005	Cartersfield Road / Brooker Road Industrial Estate	Cartersfield Road/Brooker Road, Waltham Abbey, EN9 1J	Waltham Abbey	Waltham Abbey	Waltham Abbey	8.69	Employment	0	0	0	N/A	0		Existing Employment Site
WAL.E5	EMP-0021	Meridian Business Park and Sainsbury's Distribution Centre	Meridian Business Park & Sainsbury's Distribution Centre, Waltham Abbey, EN9 3BZ	Waltham Abbey	Waltham Abbey	Waltham Abbey	23.65	Employment	0	0	0	N/A	0		Existing Employment Site
WAL.E7	SR-0945	Providence Nursery at Avey Lane	Providence Nursery, Avey Lane, Waltham Abbey, Essex, EN9 3QH	Waltham Abbey	Waltham Abbey	Waltham Abbey	0.5	Employment	0	0	0	N/A	0		Existing Employment Site
LOU.R17	EPF/0055/17	Land to the rear of High Road	268-278 High Road, Loughton, Essex, IG10 4BG	Loughton	Loughton	Loughton	0.11	Residential	12	0	0	N/A	N/A		Residential Commitment
CHIG.R1	EPF/0329/17	Land adjacent to the Paddock	Grove Lane, Chigwell, Essex, IG7 6JF	Chigwell	Chigwell	Chigwell	0.62	Residential	12	0	0	N/A	N/A		Residential Commitment
LOU.R18	EPF/0719/17	Land at High Beech Road	9-11 High Beech Road, Loughton, Essex, IG10 4BN	Loughton	Loughton	Loughton	0.06	Residential	8	0	0	N/A	N/A		Residential Commitment
STAP.R3	EPF/0781/17	Land at The Drive	The Drive, Stapleford Road, Stapleford Abbotts, Essex, RM4 1EJ	Stapleford Abbotts	Stapleford Abbotts	Stapleford Abbotts	0.24	Residential	6	0	0	N/A	N/A		Residential Commitment
CHIG.R2	EPF/2473/16	Woodview	Lambourne Road, Chigwell, Essex, IG7 6HX	Chigwell	Chigwell	Chigwell	1.32	Residential	23	0	0	N/A	N/A		Residential Commitment
WAL.R7	EPF/2881/16	Land at Pine Tree Nursery	Pine Tree Nursery, Avey Lane, Waltham Abbey, Essex, EN9 3QH	Waltham Abbey	Waltham Abbey	Waltham Abbey	0.65	Residential	8	0	0	N/A	N/A		Residential Commitment
RUR.R2	EPF/3034/16	Norton Heath Riding Centre	Fingrith Hall Lane, High Ongar, Essex, CM4 0JP	High Ongar	High Ongar	Rural East	1.95	Residential	30	0	0	N/A	N/A		Residential Commitment
CHIG.R3	EPF/3281/16	Land at Manor Road	126 Manor Road, Chigwell, Essex, IG7 5PR	Chigwell	Chigwell	Chigwell	0.15	Residential	11	0	0	N/A	N/A		Residential Commitment
EPP.R1	EPP.RXXX	Land South of Epping - West	Land South of Epping - West	Epping	Epping	Epping	20.1	Residential	450	0	0	14.84	43		Residential Allocation
EPP.R2	EPP.RXXX	Land South of Epping - East	Land South of Epping - East	Epping	Epping	Epping	23.45	Residential	500	0	0	14.11	45		Residential Allocation
SP 4.1	SP 3.1B	South of Harlow	Land to east of Rye Hill Road, London Road, Harlow, Essex, CM18 7HT	North Weald Bassett	Harlow	Strategic Sites around	102.37	Residential	1050	0	5	75.16	35		Residential Allocation
SP 4.2	SP 3.2	Water Lane Area	West of Harlow	Roydon	Harlow	Strategic Sites around	117.04	Residential	2100	0	5	110.06	30		Residential Allocation
SP 4.3	SP 3.3	East of Harlow	Land East of Harlow, North of Church Langley and South of Sheering Road, Harlow, Essex, CM17 0NG	Sheering	Harlow	Strategic Sites around	128.24	Residential	750	0	5	87.22	20		Residential Allocation
NAZE.R1	SR-0011	Land at Perry Hill	St. Leonards Road, Nazeing, Essex	Nazeing	Lower Nazeing	Nazeing	1.19	Residential	33	0	0	1.07	35		Residential Allocation
LSHR.R1	SR-0032	Land at Lower Sheering	Sheering Lower Road, Lower Sheering, Essex	Sheering	Lower Sheering	Lower Sheering	0.63	Residential	14	0	0	0.63	23		Residential Allocation
SHR.R1	SR-0033	Land at Daubneys Farm	Daubneys Farm, Sheering, Harlow, Essex, CM22 7LU	Sheering	Sheering	Sheering	0.48	Residential	10	0	0	0.41	26		Residential Allocation
NWB.R1	SR-0036	Land at Blumans	Land at Blumans, North Weald (north/south of A414)	North Weald Bassett	North Weald Bassett	North Weald Bassett	7.62	Residential	223	0	0	7.62	36		Residential Allocation
ONG.R1	SR-0067i-N	Land West of Chipping Ongar	Land to the west of Chipping Ongar	Ongar	Ongar	Ongar	2.46	Residential	99	0	0	2.46	45		Residential Allocation
THYB.R1	SR-0070	Land at Forest Drive	Land at Forest Drive, Theydon Bois	Theydon Bois	Theydon Bois	Theydon Bois	0.94	Residential	39	0	0	0.89	44		Residential Allocation
NWB.R2	SR-0072	Land at Tylers Farm	Land at Tylers Farm [271 High Road], North Weald	North Weald Bassett	North Weald Bassett	North Weald Bassett	1.29	Residential	21	0	0	1.29	20		Residential Allocation
SHR.R2	SR-0073	Land East of the M11	Land to the East of the M11, Sheering	Sheering	Sheering	Sheering	3.01	Residential	62		0	2.87	24		Residential Allocation
WAL.R1	SR-0089A	Land West of Galley Hill Road	Land Lying to the west side of Galley Hill Road, Northern Portion	Waltham Abbey	Waltham Abbey	Waltham Abbey	11.28	Residential	295	0	0	11.28	41		Residential Allocation
WAL.R2	SR-0099	Land at Lea Valley Nursery	Lea Valley Nursery, Crooked Mile, Waltham Abbey	Waltham Abbey	Waltham Abbey	Waltham Abbey	16.66	Residential	315	0	0	16.66	29		Residential Allocation
ONG.R3	SR-0102	Land South-West of Fyfield Road	Land at Coles Close, Ongar, CM5 0AY	Ongar	Ongar	Ongar	1	Residential	27	0	0	0.8	34		Residential Allocation
WAL.R3	SR-0104	Land adjoining Parklands	Land adjoining Parklands, Waltham Abbey	Waltham Abbey	Waltham Abbey	Waltham Abbey	4.34	Residential	130	0	0	4.34	34		Residential Allocation
ONG.R2	SR-0120	Land at Bowes Field	Bowes Field, Chipping Ongar	Ongar	Ongar	Ongar	3.42	Residential	135	0	0	3.34	45		Residential Allocation
THOR.R1	SR-0149	Land at Tudor House	Tudor House, High Road, Thornwood, with adjacent land.	North Weald Bassett	Thornwood	Thornwood	4.14	Residential	124	0	0	4.01	35		Residential Allocation
NAZE.R2	SR-0150	The Fencing Centre at Pecks Hill	Pecks Hill, Nazeing, EN9 2NY	Nazeing	Lower Nazeing	Nazeing	0.86	Residential	29	0	0	0.86	35		Residential Allocation
NWB.R3	SR-0158A	Land South of Vicarage Lane	Land at North Weald Bassett, South of Vicarage Lane	North Weald Bassett	North Weald Bassett	North Weald Bassett	34.59	Residential	728	0	0	31.88	35		Residential Allocation
ROYD.R1	SR-0169	The Old Coal Yard	The Old Coal Yard, off 32 High Street, Roydon	Roydon	Roydon	Roydon	0.53	Residential	7	0	0	0.53	15		Residential Allocation
BUCK.R1	SR-0176	Land at Powell Road	St Just, 1 Powell Road, Buckhurst Hill, Essex, IG9 5RD	Buckhurst Hill	Buckhurst Hill	Buckhurst Hill	0.84	Residential	31	0	0	0.84	38		Residential Allocation
HONG.R1	SR-0181	Land at Mill Lane	Mill Lane, High Ongar, CM5 9RQ	High Ongar	High Ongar	High Ongar	0.32	Residential	10	0	0	0.32	31		Residential Allocation
ONG.R4	SR-0184, SR-0185, SR-0186	Land North of Chelmsford Road	Land North of Chemsford Road, Ongar	Ongar	Ongar	Ongar	4.3	Residential	163	0	0	4.28	43		Residential Allocation
ROYD.R2	SR-0197-N	Land at Kingsmead School	Kingsmead School, Epping Road, Roydon, Essex, CM19 5HU	Roydon	Roydon	Roydon	1.36	Residential	21	0	0	1.35	18		Residential Allocation
WAL.R4	SR-0219	Fire Station at Sewardstone Road	Fire Station, Sewardstone Road, Waltham Abbey, Essex, EN9 1PA	Waltham Abbey	Waltham Abbey	Waltham Abbey	0.24	Residential	16	0	0	0.24	68		Residential Allocation
BUCK.R2	SR-0225	Queens Road Car Park	Queens Road, Lower Car Park, Buckhurst Hill, IG9 5	Buckhurst Hill	Buckhurst Hill	Buckhurst Hill	0.43	Residential	41	0	0	0.43	97		Residential Allocation
LOU.R1	SR-0226-N	Loughton London Underground Car Par	Station Road, Loughton, Essex, IG10 4NZ	Loughton	Loughton	Loughton	1.62	Residential	165	0	0	1.62	114		Residential Allocation
LOU.R2	SR-0227	Debden London Underground Car Park	Chigwell Lane, Loughton, Essex IG10 3	Loughton	Loughton	Loughton	1.66	Residential	192	0	0	1.66	129		Residential Allocation
THYB.R2	SR-0228-N	Theydon Bois London Underground Ca	Theydon Bois London Underground Car Park, Station Approach, Theydon Bois, Essex, CM16 7HR	Theydon Bois	Theydon Bois	Theydon Bois	0.3	Residential	12	0	0	0.3	40		Residential Allocation
EPP.R3	SR-0229	Epping London Underground Car Park	Epping Station, Epping, CM16 4HW	Epping	Epping	Epping	1.6	Residential	89	0	0	1.2	83		Residential Allocation
STAP.R1	SR-0242-N	Land at Oaklield Road	Land at Oaklield Road, Stapleford Abbotts, Essex, RM4 1JH	Stapleford Abbotts	Stapleford Abbotts	Stapleford Abbotts	2.16	Residential	33	0	0	2.16	17		Residential Allocation
EPP.R4	SR-0281-N	Land at St Johns Road	St Johns Road, Epping, Essex	Epping	Epping	Epping	1.49	Residential	34	0	0	1.49	27		Residential Allocation
LOU.R3	SR-0289	Land at Vere Road	Vere Road, Loughton, Essex	Loughton	Loughton	Loughton	0.18	Residential	9	0	0	0.09	101		Residential Allocation
NAZE.R3	SR-0300c	Land to the rear of Pound Close	Land to the rear of Pound Close, Nazeing, Essex, EN9	Nazeing	Lower Nazeing	Nazeing	1.27	Residential	39	0	0	1.27	35		Residential Allocation
SHR.R3	SR-0311	Land North of Primley Lane	Sheering, North Area	Sheering	Sheering	Sheering	0.36	Residential	12	0	0	0.36	35		Residential Allocation
CHIG.R4	SR-0317-N	Land between Froghall Lane and Railwa	Land West of Froghall Lane South of Chigwell Cemetery, Chigwell, Essex, IG7	Chigwell	Chigwell	Chigwell	2.33	Residential	105	0	0	2.33	50		Residential Allocation
EPP.R5	SR-0347	Epping Sports Centre	25 Hemnall Street, Epping, Essex, CM16 4LU	Epping	Epping	Epping	0.43	Residential	43	0	0	0.43	101		Residential Allocation
EPP.R6	SR-0348	Cottis Lane Car Park	Cottis Lane Car Park	Epping	Epping	Epping	0.56	Residential	47	0	0	0.45	106		Residential Allocation
EPP.R7	SR-0349	Bakers Lane Car Park	Bakers Lane Car Park	Epping	Epping	Epping	0.42	Residential	31	0	0	0.33	95		Residential Allocation
LOU.R4	SR-0356	Borders Lane Playing Fields	The Field Site, Epping Forest College, Borders Lane, Loughton IG10 3RZ	Loughton	Loughton	Loughton	4.78	Residential	217	0	0	2.39	101		Residential Allocation
LOU.R5	SR-0361	Land at Jessel Green	Coldbrook Lane/Jessel Drive Amenity Open Space	Loughton	Loughton	Loughton	8.03	Residential	154	0	0	4.02	43		Residential Allocation
ONG.R5	SR-0390-N	Land at Greensted Road	Land at Greensted Road, Chipping Ongar, Essex, CM5 9HJ	Ongar	Ongar	Ongar	3.32	Residential	107	0	0	3.32	36		Residential Allocation
ONG.R6	SR-0391	Land between Stanford Rivers Road an	Stanford Rivers Road, Ongar, Essex	Ongar	Ongar	Ongar	1.53	Residential	33	0	0	0.8	23		Residential Allocation
THOR.R2	SR-0410	Land East of High Road	Land East of High Road, Thornwood	North Weald Bassett	Thornwood	Thornwood	1.56	Residential	48	0	0	1.59	35		Residential Allocation
NWB.R4	SR-0455	Land at Chase Farm	Chase Farm Business Centre, Vicarage Lane West, North Weald, Essex, CM16 6AL	North Weald Bassett	North Weald Bassett	North Weald Bassett	0.81	Residential	27	0	0	0.81	35		Residential Allocation

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NAZE.R4	SR-0473	Land at St Leonards Farm	St. Leonards Farm, St. Leonards Road, Waltham Abbey, Nazeing, EN9 2HG	Nazeing	Lower Nazeing	Nazeing	0.82	Residential	21	0	0	0.64	35		Residential Allocation
CHIG.R5	SR-0478B	Land at Chigwell Nurseries	245 High Road, Chigwell, Essex, IG7 5BL	Chigwell	Chigwell	Chigwell	1.7	Residential	65	0	0	1.66	44		Residential Allocation
LOU.R6	SR-0527	Royal Oak Public House	Forest Road, Loughton, IG10 1EG	Loughton	Loughton	Loughton	0.14	Residential	10	0	0	0.14	72		Residential Allocation
WAL.R5	SR-0541	Waltham Abbey Community Centre	Waltham Abbey community Centre, Saxon Way	Waltham Abbey	Waltham Abbey	Waltham Abbey	0.51	Residential	67	0	0	0.41	129		Residential Allocation
EPP.R8	SR-0556	Land and part of Civic Offices	Civic Offices, High Street, Epping, CM16 4BZ	Epping	Epping	Epping	0.66	Residential	44	0	0	0.66	68		Residential Allocation
CHIG.R6	SR-0557	The Limes Estate	The Limes Estate	Chigwell	Chigwell	Chigwell	22.59	Residential	100	0	0	22.57	67		Residential Allocation
LOU.R7	SR-0565-N	Loughton Library	Traps Hill, Loughton, IG10 1HD	Loughton	Loughton	Loughton	0.26	Residential	20	0	0	0.26	81		Residential Allocation
EPP.R9	SR-0587	Land at Bower Vale	17 Bower Vale, Epping , Essex, CM16 7AS	Epping	Epping	Epping	0.4	Residential	50	0	0	0.4	128		Residential Allocation
CHIG.R7	SR-0588	Land at Chigwell Convent	801 and 803 Chigwell Road, Woodford Bridge, IG8 8AU	Chigwell	Chigwell	Chigwell	1.67	Residential	28	0	0	1.64	20		Residential Allocation
BUCK.R3	SR-0813	Stores at Lower Queens Road	2-7 Lower Queens Road, Buckhurst Hill, Essex	Buckhurst Hill	Buckhurst Hill	Buckhurst Hill	0.3	Residential	15	0	0	0.3	130		Residential Allocation
LOU.R8	SR-0834	Land West of High Road	Car Park, west of High Road, Loughton, Essex	Loughton	Loughton	Loughton	0.18	Residential	29	0	0	0.18	162		Residential Allocation
LOU.R9	SR-0835	Land at Former Epping Forest College	Old Epping Forest College Site, Borders Lane, Loughton, Essex	Loughton	Loughton	Loughton	1.02	Residential	111	0	0	1.02	122		Residential Allocation
ONG.R8	SR-0842	The Stag Pub	Brentwood Road, Ongar CM5 9DH	Ongar	Ongar	Ongar	0.28	Residential	9	0	0	#N/A	#N/A		Residential Allocation
STAP.R2	SR-0873	Land to the rear of Mountford & Bishops	Rear of Mountford & Bishops Bron, Oak Hill Road, Stapleford Abbotts, Romford, Essex, RM4 1JL	Stapleford Abbotts	Stapleford Abbotts	Stapleford Abbotts	0.28	Residential	8	0	0	N/A	8		Residential Allocation
LOU.R10	SR-0878	Land at Station Road	46 - 48 Station Road, Loughton, Essex, IG10 4NX	Loughton	Loughton	Loughton	0.14	Residential	12	0	0	0.14	101		Residential Allocation
ROYD.R3	SR-0890	Land at Epping Road	Land at Epping Road, Roydon, Harlow, Essex	Roydon	Roydon	Roydon	0.42	Residential	14	0	0	0.41	39		Residential Allocation
CHIG.R8	SR-0895	Land at Fencepiece Road	105 Manor Road / 281 Fencepiece Road, Chigwell, Essex, IG7 5PN	Chigwell	Chigwell	Chigwell	0.07	Residential	6	0	0	0.07	117		Residential Allocation
CHIG.R9	SR-0898	Land at Grange Court	Grange Court, 72 High Road, Chigwell, Essex, IG7 6PT	Chigwell	Chigwell	Chigwell	0.42	Residential	8	0	0	0.08	117		Residential Allocation
WAL.R6	SR-0903	Land at Roundhills	Waltham Abbey Swimming Pool, Roundhills, EN9 1UP	Waltham Abbey	Waltham Abbey	Waltham Abbey	0.6	Residential	27	0	0	0.6	45		Residential Allocation
CHIG.R10	SR-0916	The Maypole	The Maypole, 171 Lambourne Road, Chigwell, Essex, IG7 6EF	Chigwell	Chigwell Row	Chigwell	0.21	Residential	11	0	0	0.19	62		Residential Allocation
FYF.R1	SR-0935	Land at Gypsy Mead	Ongar Road, Fyfield, Essex, CM5 0RB	Fyfield	Fyfield	Fyfield	0.81	Residential	14	0	0	0.81	17		Residential Allocation
RUR.R1	SR-0937	Avenue Home	Avenue Home, Latton Common, Near Harlow, CM17 9NJ	North Weald Bassett	Harlow	Rural East	0.38	Residential	11	0	0	0.38	32		Residential Allocation
LOU.R11	SR-0974	Land West of Roding Road	Former Electricity Substation, Roding Road, Loughton, Essex, IG10 3ED	Loughton	Loughton	Loughton	0.19	Residential	9	0	0	0.19	51		Residential Allocation
ROYD.R4	SR-0976	Land at Parklands Nursery	Parklands Nursery, Parkfields, Roydon, Harlow, Essex, CM19 5JB	Roydon	Roydon	Roydon	0.98	Residential	20	0	0	0.9	23		Residential Allocation
LOU.R12	SR-0984	Land at 63 Wellfields	63 Wellfields, Loughton, Essex, IG10 1PA	Loughton	Loughton	Loughton	0.26	Residential	10	0	0	0.26	45		Residential Allocation
LOU.R13	SR-0986	Land at 70 Wellfields	70 Wellfields, Loughton, IG10 1NY	Loughton	Loughton	Loughton	0.23	Residential	6	0	0	0.23	34		Residential Allocation
COOP.R1	SR-0987	Land at Parklands	28-31 Parklands and Upper Floors 32-39 Parklands, Coopersale, Epping, Essex, CM16 7RE	Epping	Coopersale	Coopersale	0.16	Residential	6	0	0	0.16	83		Residential Allocation
ONG.R7	SR-0989-Z	Land South of Hunters Chase and West	Hunters Chase, Ongarm Essex, EM5 9DQ	Ongar	Ongar	Ongar	0.8	Residential	17	0	0	0.35	47		Residential Allocation
NWB.R5	SR-0991	Land at The Acorns, Chase Farm	The Acorns, Chase Farm, Vicarage Lane West, North Weald Bassett, Essex, CM16 6AL	North Weald Bassett	North Weald Bassett	North Weald Bassett	1.67	Residential	51	0	0	1.67	35		Residential Allocation
CHIG.R11	SR-1010	Land at Hainault Road	Amar Nivas, 146 Hainault Road, Chigwell, Essex, IG7 5DL	Chigwell	Chigwell	Chigwell	0.17	Residential	7	0	0	0.17	50		Residential Allocation
THYB.R3	SR-1020	Land at Coppice Row	Wain, Coppice Row, Theydon Bois, Epping, Essex, CM16 7ER	Theydon Bois	Theydon Bois	Theydon Bois	0.15	Residential	6	0	0	0.15	59		Residential Allocation
EPP.R10	SR-1021	Land to rear of High Street	287-291 High Street, Epping, Essex, CM16 4DA	Epping	Epping	Epping	0.05	Residential	6	0	0	0.05	135		Residential Allocation
LOU.R14	SR-1026	Land at Alderton Hill	13 Alderton Hill, Loughton, Essex, IG10 3JD	Loughton	Loughton	Loughton	1.28	Residential	33	0	0	1.28	34		Residential Allocation
LOU.R15	SR-1027	Land at Traps Hill	60 Traps Hill, Loughton, Essex, IG10 1TD	Loughton	Loughton	Loughton	0.14	Residential	6	0	0	0.14	59		Residential Allocation
LOU.R16	SR-1032	St Thomas More RC Church	St Thomas More RC Church And Presbytery, 106 Willingale Road, Loughton, Essex, IG10 2DA	Loughton	Loughton	Loughton	0.5	Residential	18	0	0	0.5	36		Residential Allocation
EPP.R11	SR-1035	Epping Library	Epping Library, St John's Road, Epping, CM16 5DN	Epping	Epping	Epping	0.13	Residential	11	0	0	0.13	88		Residential Allocation
MORE.T1	GRT-I_09	Land at Lakeview	Lakeview, Moreton, Essex	Moreton, Bobbingworth and the Lavers	Moreton	Moreton	2.97	Traveller	0	0	1	0	0		Traveller Allocation
NWB.T1	GRT-N_06	Land West of Tylers Green	West of Tylers Green, North Weald Bassett	North Weald Bassett	North Weald Bassett	North Weald Bassett	7.62	Traveller	0	0	5	0	0		Traveller Allocation
RUR.T1	GRT-I_08	Land at Sons Nursery	Sons Nursery, Hamlet Hill	Roydon	Hamlet Hill	Rural West	0.15	Traveller	0	0	2	0	0		Traveller Allocation
RUR.T2	T-E_11	Land at Ashview	Ashview, Hamlet Hill, Roydon, Essex, CM19 5LA	Roydon	Hamlet Hill	Rural West	0.43	Traveller	0	0	1	0	0		Traveller Allocation
RUR.T3	T-I_02	Land at James Mead	James Mead, Waltham Road, Long Green, Nazeing, Essex, EN9 2LU	Roydon	Roydon Hamlet	Rural West	1.17	Traveller	0	0	4	0	0		Traveller Allocation
RUR.T4	T-E_12	Land at Valley View	Curtis Mill Lane, Stapleford Abbotts, Essex, RM4 1HS	Stapleford Abbotts	Stapleford Abbotts	Rural East	0.3	Traveller	0	0	1	0	0		Traveller Allocation
RUR.T5	GRT-E_07	Land at Stoneshot View	Stoneshot View, Nazeing	Nazeing	Nazeing	Rural West	0.5	Traveller	0	0	5	0	0		Traveller Allocation
WAL.T1	GRT-N_07	Land to the rear of Lea Valley Nursery	Yardlcar park at rear Lea Valley Nursery, Crooked Mile, Waltham Abbey	Waltham Abbey	Waltham Abbey	Waltham Abbey	16.66	Traveller	0	0	5	0.5	0		Traveller Allocation
RUR.E19	SR-0006-N	Dorrington Farm	Dorrington Farm, Rye Hill Road, Harlow, Essex, CM18 7JF	North Weald Bassett	Harlow	Rural East	1.85	Employment	0	5640	0	0.94	0	B1a/B1b	New Employment Site
NWB.E4	SR-0940	North Weald Airfield	North Weald Airfield, North Weald, CM16 6HR	North Weald Bassett	North Weald Bassett	North Weald Bassett	40.8	Employment	0	40000	0	10 (10 ha of employment lan	0	B1c/B2/B8	New Employment Site
WAL.E8	SR-1034-Z	Land North of A121	Land adjacent to the north of A121, south of Waltham Abbey, EN9 3AA	Waltham Abbey	Waltham Abbey	Waltham Abbey	27.84	Employment	0	40000	0	10	0	B1c/B2/B8	New Employment Site
LOU.E2	EMP-0002b	Langston Road Industrial Estate	Langston Road Industrial Estate, Lou	Loughton	Loughton	Loughton	29.78	Employment	0	4000	0	1	0	B2	New Employment Site
WAL.E6	SR-0375-N	Galley Hill Road Industrial Estate	Galley Hill Road Industrial Estate, Waltham Abbey, EN9 2AG	Waltham Abbey	Waltham Abbey	Waltham Abbey	3.89	Employment	0	5120	0	1.28	0	B2/B8	New Employment Site
RUR.E21	SR-0953	Land at Paslow Hall Farm	King Street, High Ongar, Ongar, Essex, CM5 9NS	High Ongar	High Ongar	Rural East	1.66	Employment	0	0	0	N/A	0		Existing Employment Site

Appendix D Scenarios 1 & 2 Modelling Summary

EB503

Base 2017

Wake Arms PH - Epping

Junctions 9 — Standard Rbt

Arm Labels	Junction 1	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B1393 Epping Rd	1	7	0.54	2	12	0.68
B	B172	4	17	0.81	7	27	0.87
C	A121 south	271	963	1.19	11	46	0.92
D	A104 Epping New Rd	6	41	0.86	39	183	1.01
E	A121 west	4	24	0.78	133	652	1.13

Talbot PH - North Weald

Junctions 9 — Standard Rbt

	Junction 2	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B181 Weald Bridge Rd	0	5	0.17	0	5	0.15
B	A414 High Rd east	3	10	0.75	1	5	0.49
C	B181 High Rd	1	6	0.39	1	6	0.42
D	A414 High Rd west	1	5	0.41	2	9	0.64

Crooked Mile - Waltham Abbey

Junctions 9 — Standard Rbt

	Junction 3	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B194 Crooked Mile north	1	4	0.48	1	3	0.40
B	Parklands	1	5	0.44	1	4	0.36
C	Crooked Mile south	0	3	0.30	1	3	0.42
D	Car park access	0	4	0.01	0	4	0.02
E	B194 Abbeyview	0	2	0.21	1	4	0.48

Highbridge St - Waltham Abbey

Junctions 9 — Standard Rbt

	Junction 4	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B194 Abbeyview	1	3	0.32	0	3	0.25
B	Highbridge St	1	5	0.30	0	4	0.23
D	B194 west	1	5	0.43	4	15	0.79
E	Powdermill Ln	0	5	0.04	0	6	0.14

Sewardstone Rd - Waltham Abbey

Junctions 9 — Standard Rbt

	Junction 5	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	Sewardstone Rd	1	3	0.33	1	3	0.33
B	A121 Dowding Way	1	4	0.47	1	3	0.34
C	A112 Sewardstone Rd	1	3	0.38	2	5	0.60
D	A121 Meridian Way	1	3	0.31	1	4	0.41

Sewardstone Rd

LINSIG 3 — 5 arm signal

	Junction 6	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	A112 Crooked Mile	18	58	0.93	11	46	0.84
B	Monkswood Ave	6	96	0.83	3	64	0.55
C	Farm Hill Rd	15	40	0.82	17	85	0.96
D	A112 Sewardstone Road	9	27	0.69	21	54	0.97
E	Sun Street	10	94	0.90	11	83	0.90

Honey Ln - Waltham Abbey

Junctions 9 — Mini Rbt

	Junction 7	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	Broomstick Hall Rd	0	6	0.27	0	6	0.27
B	Honey Lane	3	19	0.75	2	15	0.69
C	Farm Hill Rd	1	6	0.39	2	10	0.63

B1393 Thornwood Rd

LINSIG 3 — 3 arm signal

	Junction 8	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	B1393 Thornwood Road	24	56	0.89	78	390	1.16
B	B181 The Plain	23	38	0.79	73	372	1.16
C	B1393 Palmers Hill	21	33	0.89	183	364	1.18

Station Rd - Epping

Junctions 9 — Mini Rbt

	Junction 9a	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B1393 High St north (link)	2	10	0.68	4	15	0.78
B	Station Rd	2	17	0.63	1	15	0.57
C	B1393 High St south	4	15	0.78	3	12	0.74

St. Johns Rd - Epping

Junctions 9 — Mini Rbt

	Junction 9b	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	St Johns Rd	0	10	0.31	1	11	0.44
B	B1393 High St north	2	8	0.60	1	7	0.58
C	B1393 High St south (link)	3	13	0.76	2	8	0.62

Theydon Rd

LINSIG 3 — 3 arm signal

	Junction 10	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	B1393 High Rd east	30	23	0.84	18	16	0.67
B	Theydon Rd	16	101	0.94	12	70	0.82
C	B1393 High Rd west	33	55	0.95	26	25	0.81

Bury Ln - Epping

Junctions 9 — Standard Rbt

	Junction 11	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B182 Bury Ln	2	13	0.61	1	8	0.39
B	B1393 High Rd east	13	63	0.94	11	48	0.92

	C	**B1393 High Rd west**	3	12	0.76	4	14	0.80

Wantz Service Stn - Ongar

Junctions 9
Standard Rbt

Junction 12	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **B184 Fyfield Rd**	2	9	0.61	1	8	0.51
B **A414 Chelmsford Rd east**	4	13	0.78	1	5	0.48
C **B184 High St**	2	9	0.64	2	9	0.68
D **A414 Chelmsford Rd west**	1	5	0.49	2	9	0.69

Coopers Hill - Marden Ash (Ongar)

Junctions 9
Mini Rbt

Junction 13	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **A113 Coopers Hill north**	4	21	0.81	2	11	0.62
B **A128 Brentwood Rd**	1	10	0.57	1	7	0.46
C **A113 Coopers Hill south**	1	6	0.32	2	13	0.67
D **St James' Ave**	0	8	0.03	0	14	0.06

A113 Ongar Rd - B172 Abridge Rd

Junctions 9
T-Junction

Junction 14	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B **B172 Abridge Road (left)**	5	534	1.01	4	167	0.86
B **B172 Abridge Road (right)**	23	351	1.04	7	112	0.90
C **A113 Ongar Road east**	29	122	0.97	1	11	0.43

A121 Church Hill - A1168 Rectory Ln

Junctions 9
Mini Rbt

Junction 18a	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **A121 Goldings Hill (link)**	0	3	0.03	0	3	0.04
B **A1168 Rectory Lane**	2	11	0.65	2	12	0.69
C **A121 Church Hill**	1	9	0.51	3	19	0.75

A121 Goldings Hill - Millsmead Way

Junctions 9
Mini Rbt

Junction 18b	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **A121 Goldings Hill**	7	21	0.87	2	7	0.60
B **A121 Church Hill (link)**	1	6	0.50	3	12	0.75
C **Millsmead Way**	0	8	0.13	0	13	0.12

Piercing Hill - Theydon Bois

Junctions 9
Crossroads

Junction 19	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **Coppice Row east**	0	6	0.01	0	6	0.02
B **The Green**	82	0	X	4	42	0.81
C **Coppice Row west**	0	6	0.08	0	6	0.03
D **Piercing Hill**	423	2948	1.60	117	850	1.16

M25 J26 North - Waltham Abbey

Junctions 9
Standard Rbt

Junction 21	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **Old Shire Lane**	0	4	0.15	0	4	0.12
B **Honey Lane east**	1	3	0.36	1	4	0.48
C **M25 On/Off Slips**	0	2	0.22	1	3	0.37
D **Honey Lane west**	1	5	0.30	0	4	0.18

22 M25 J26 South - Waltham Abbey

Junctions 9
Standard Rbt

Junction 22	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **M25 Off Slip**	61	181	1.10	26	107	1.05
B **Honey Lane east**	83	277	1.14	5	17	0.83
C **Dowding Way**	1	5	0.39	17	88	1.02
D **M25 On Slip**	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only
E **Honey Lane west**	1	4	0.47	21	79	1.02

B184 Highbridge St

LINSIG 3
4 arm signal

Junction 24	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A **Beaulieu Drive**	1	71	0.20	1	71	0.17
B **B194 Highbridge Street**	78	263	1.11	84	394	1.20
C **A121 Meridian Way**	34	144	1.02	14	47	0.89
D **Station Road**	54	180	1.07	166	380	1.21

A1168 Chigwell Ln - Langston Rd - Oakwood Hill

LINSIG 3
4 arm signal

Junction 25	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A **A1168 Chigwell Lane north**	18	79	0.98	18	104	0.94
B **Langston Road**	3	72	0.68	18	74	0.92
C **A1168 Chigwell Lane south**	17	69	0.91	11	54	0.70
D **Oakwood Hill**	14	96	0.91	15	102	0.93

A1168 Chigwell Ln - The Broadway

Junctions 9
Mini Rbt

Junction 26	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **A1168 Chigwell Lane north**	1	9	0.54	2	12	0.71
B **The Broadway**	1	8	0.44	1	10	0.56
C **A1168 Chigwell Lane south**	1	7	0.54	2	10	0.67

A1168 Chigwell Ln - Borders Ln

Junctions 9
Mini Rbt

Junction 27	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **A1168 Rectory Lane north**	0	6	0.26	1	8	0.53
B **A1168 Rectory Lane south**	1	7	0.49	3	12	0.73
C **Borders Lane**	1	8	0.41	1	11	0.53

A1168 Rectory Ln - Westall Rd - Rectory Ln

Junctions 9
Crossroads

Junction 28	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC

A	**A1168 Rectory Lane north**	0	6	0.03	0	4	0.03
B	**Westall Road (left/ahead)**	0	9	0.14	0	6	0.11
B	**Westall Road (right/ahead)**	1	14	0.54	0	12	0.20
C	**A1168 Rectory Lane south**	0	5	0.14	1	6	0.32
D	**Rectory Lane (left/ahead)**	0	6	0.03	0	7	0.07
D	**Rectory Lane (right/ahead)**	0	16	0.01	0	15	0.02

A1168 Rectory Ln - Pyrles Ln

Junctions 9
T-Junction

	Junction 29	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
B	**Pyres Lane (left)**	2	17	0.63	1	9	0.33
B	**Pyres Lane (right)**	0	25	0.29	0	20	0.12
C	**A1168 Rectory Lane south**	2	17	0.67	2	14	0.59

A1168 Rectory Ln - Hillyfields

Junctions 9
T-Junction

	Junction 30	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
B	**Hillyfields Road (left)**	0	12	0.10	0	8	0.07
B	**Hillyfields Road (right)**	1	23	0.52	0	15	0.20
C	**A1168 Rectory Lane east**	0	5	0.10	0	5	0.12

A121 High Rd - Traps Hill

Junctions 9
T-Junction

	Junction 31	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
B	**Traps Hill Road (left)**	0	9	0.27	0	8	0.23
B	**Traps Hill Road (right)**	0	15	0.20	0	15	0.20
C	**A121 High Road south**	1	6	0.24	1	7	0.37

A121 High Rd - Old Station Rd - Ollards Grove

Junctions 9
Mini Rbt

	Junction 32	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
A	**A121 High Road north**	1	9	0.52	1	11	0.59
B	**Old Station Road**	1	10	0.56	3	15	0.72
C	**A121 High Road south**	1	7	0.55	2	9	0.59
D	**Ollards Grove**	0	11	0.22	0	14	0.28

EB503

Do Minimum 2033

Wake Arms PH - Epping

Junctions 9 — Standard Rbt

Arm Labels	Junction 1	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B1393 Epping Rd	2	12	0.70	4	20	0.82
B	B172	78	244	1.03	163	537	1.10
C	A121 south	729	2843	1.58	226	860	1.17
D	A104 Epping New Rd	70	373	1.06	316	1457	1.29
E	A121 west	28	153	0.99	411	1989	1.40

Talbot PH - North Weald

Junctions 9 — Standard Rbt

	Junction 2	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B181 Weald Bridge Rd	0	5	0.23	0	7	0.22
B	A414 High Rd east	12	32	0.92	2	6	0.60
C	B181 High Rd	1	9	0.52	1	8	0.56
D	A414 High Rd west	1	7	0.51	4	17	0.80

Crooked Mile - Waltham Abbey

Junctions 9 — Standard Rbt

	Junction 3	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B194 Crooked Mile north	2	5	0.60	1	4	0.50
B	Parklands	1	7	0.56	1	5	0.45
C	Crooked Mile south	1	3	0.37	1	4	0.52
D	Car park access	0	4	0.02	0	5	0.03
E	B194 Abbeyview	0	3	0.26	2	5	0.61

Highbridge St - Waltham Abbey

Junctions 9 — Standard Rbt

	Junction 4	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B194 Abbeyview	1	3	0.39	0	3	0.30
B	Highbridge St	1	6	0.39	0	5	0.29
D	B194 west	1	6	0.52	22	71	0.97
E	Powdermill Ln	0	5	0.06	0	8	0.19

Sewardstone Rd - Waltham Abbey

Junctions 9 — Standard Rbt

	Junction 5	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	Sewardstone Rd	1	3	0.42	1	4	0.42
B	A121 Dowding Way	2	5	0.60	1	4	0.43
C	A112 Sewardstone Rd	1	4	0.48	3	7	0.74
D	A121 Meridian Way	1	4	0.39	1	5	0.54

Sewardstone Rd

LINSIG 3 — 5 arm signal

	Junction 6	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	A112 Crooked Mile	45	124	1.02	26	99	1.01
B	Monkswood Ave	17	289	1.08	4	72	0.67
C	Farm Hill Rd	53	206	1.07	57	299	1.14
D	A112 Sewardstone Road	14	36	0.84	104	265	1.14
E	Sun Street	27	280	1.10	29	252	1.09

Honey Ln - Waltham Abbey

Junctions 9 — Mini Rbt

	Junction 7	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	Broomstick Hall Rd	1	6	0.35	1	7	0.35
B	Honey Lane	9	50	0.91	5	28	0.84
C	Farm Hill Rd	1	8	0.47	4	17	0.78

B1393 Thornwood Rd

LINSIG 3 — 3 arm signal

	Junction 8	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	B1393 Thornwood Road	153	655	1.43	189	904	1.74
B	B181 The Plain	79	277	1.13	13	29	0.83
C	B1393 Palmers Hill	217	630	1.45	428	882	1.74

Station Rd - Epping

Junctions 9 — Mini Rbt

	Junction 9a	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B1393 High St north (link)	5	21	0.84	24	86	0.97
B	Station Rd	5	43	0.85	4	33	0.78
C	B1393 High St south	22	77	0.97	11	40	0.92

St. Johns Rd - Epping

Junctions 9 — Mini Rbt

	Junction 9b	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	St Johns Rd	10	194	0.96	48	577	1.12
B	B1393 High St north	63	251	1.05	175	810	1.17
C	B1393 High St south (link)	11	38	0.92	3	12	0.75

Theydon Rd

LINSIG 3 — 3 arm signal

	Junction 10	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	B1393 High Rd east	118	276	1.15	91	285	1.16
B	Theydon Rd	42	342	1.18	29	251	1.11
C	B1393 High Rd west	109	374	1.23	97	283	1.16

Bury Ln - Epping

Junctions 9 — Standard Rbt

	Junction 11	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC

A	**B182 Bury Ln**	5	33	0.83	1	12	0.52
B	**B1393 High Rd east**	227	968	1.19	186	708	1.14
C	**B1393 High Rd west**	10	32	0.91	24	74	0.97

Wantz Service Stn - Ongar

Junctions 9
Standard Rbt

Junction 12	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **B184 Fyfield Rd**	5	23	0.83	2	15	0.70
B **A414 Chelmsford Rd east**	53	163	1.01	2	7	0.61
C **B184 High St**	6	24	0.85	7	24	0.88
D **A414 Chelmsford Rd west**	2	8	0.63	10	34	0.91

Coopers Hill - Marden Ash (Ongar)

Junctions 9
Mini Rbt

Junction 13	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **A113 Coopers Hill north**	44	171	1.01	3	18	0.77
B **A128 Brentwood Rd**	3	16	0.72	1	9	0.57
C **A113 Coopers Hill south**	1	8	0.42	6	33	0.87
D **St James' Ave**	0	10	0.05	0	30	0.16

A113 Ongar Rd - B172 Abridge Rd

Junctions 9
T-Junction

Junction 14	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B **B172 Abridge Road (left)**	63	X	X	60	1984	1.38
B **B172 Abridge Road (right)**	329	X	X	122	1960	1.39
C **A113 Ongar Road east**	335	1385	1.27	3	19	0.65

A121 Church Hill - A1168 Rectory Ln

Junctions 9
Mini Rbt

Junction 18a	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **A121 Goldings Hill (link)**	0	3	0.04	0	3	0.05
B **A1168 Rectory Lane**	5	22	0.82	5	24	0.84
C **A121 Church Hill**	2	14	0.66	27	147	0.99

A121 Goldings Hill - Millsmead Way

Junctions 9
Mini Rbt

Junction 18b	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **A121 Goldings Hill**	128	326	1.06	3	10	0.74
B **A121 Church Hill (link)**	2	8	0.62	9	31	0.91
C **Millsmead Way**	0	11	0.20	0	24	0.24

Piercing Hill - Theydon Bois

Junctions 9
Crossroads

Junction 19	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **Coppice Row east**	0	7	0.02	0	6	0.03
B **The Green**	272	X	X	72	660	1.31
C **Coppice Row west**	0	7	0.10	0	6	0.03
D **Piercing Hill**	725	6907	2.64	339	2788	1.60

M25 J26 North - Waltham Abbey

Junctions 9
Standard Rbt

Junction 21	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **Old Shire Lane**	0	5	0.20	0	5	0.16
B **Honey Lane east**	1	4	0.43	2	5	0.58
C **M25 On/Off Slips**	0	2	0.27	1	3	0.46
D **Honey Lane west**	1	5	0.38	0	5	0.24

22 M25 J26 South - Waltham Abbey

Junctions 9
Standard Rbt

Junction 22	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **M25 Off Slip**	386	1532	1.37	242	1213	1.27
B **Honey Lane east**	349	1047	1.23	7	25	0.89
C **Dowding Way**	30	207	1.02	156	856	1.18
D **M25 On Slip**	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only
E **Honey Lane west**	61	238	1.04	195	767	1.16

B184 Highbridge St

LINSIG 3
4 arm signal

Junction 24	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A **Beaulieu Drive**	1	73	0.24	1	72	0.22
B **B194 Highbridge Street**	175	535	1.32	159	656	1.43
C **A121 Meridian Way**	104	475	1.27	23	77	1.06
D **Station Road**	183	526	1.34	311	627	1.42

A1168 Chigwell Ln - Langston Rd - Oakwood Hill

LINSIG 3
4 arm signal

Junction 25	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A **A1168 Chigwell Lane north**	54	248	1.09	48	297	1.13
B **Langston Road**	4	78	0.80	59	293	1.13
C **A1168 Chigwell Lane south**	99	304	1.15	15	67	0.85
D **Oakwood Hill**	35	280	0.11	36	251	1.09

A1168 Chigwell Ln - The Broadway

LINSIG 3
3 arm signal

Junction 26	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A **A1168 Chigwell Lane north**	15	26	0.64	23	24	0.72
B **The Broadway**	11	56	0.85	9	60	0.73
C **A1168 Chigwell Lane south**	12	53	0.83	5	11	0.50

A1168 Chigwell Ln - Borders Ln

LINSIG 3
3 arm signal

Junction 27	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A **A1168 Rectory Lane north**	4	13	0.29	10	13	0.49
B **A1168 Rectory Lane south**	6	10	0.51	5	11	0.50

	C	**Borders Lane**	10	42	0.76	19	106	0.97

A1168 Rectory Ln - Westall Rd - Rectory Ln

Junctions 9
Crossroads

	Junction 28	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**A1168 Rectory Lane north**	0	6	0.05	0	4	0.04
B	**Westall Road (left/ahead)**	0	14	0.24	0	7	0.15
B	**Westall Road (right/ahead)**	2	23	0.69	0	17	0.30
C	**A1168 Rectory Lane south**	0	5	0.18	2	7	0.46
D	**Rectory Lane (left/ahead)**	0	6	0.03	0	7	0.09
D	**Rectory Lane (right/ahead)**	0	17	0.02	0	19	0.03

A1168 Rectory Ln - Pyrles Ln

Junctions 9
T-Junction

	Junction 29	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B	**Pyres Lane (left)**	8	74	0.91	1	11	0.43
B	**Pyres Lane (right)**	3	173	0.80	0	30	0.19
C	**A1168 Rectory Lane south**	7	32	0.84	4	19	0.74

A1168 Rectory Ln - Hillyfields

Junctions 9
T-Junction

	Junction 30	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B	**Hillyfields Road (left)**	1	42	0.32	0	9	0.10
B	**Hillyfields Road (right)**	5	77	0.82	1	22	0.32
C	**A1168 Rectory Lane east**	0	5	0.15	1	5	0.17

A121 High Rd - Traps Hill

Junctions 9
T-Junction

	Junction 31	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B	**Traps Hill Road (left)**	1	11	0.34	0	9	0.29
B	**Traps Hill Road (right)**	0	19	0.28	0	18	0.27
C	**A121 High Road south**	1	7	0.33	2	8	0.49

A121 High Rd - Old Station Rd - Ollards Grove

Junctions 9
Mini Rbt

	Junction 32	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**A121 High Road north**	2	14	0.68	3	18	0.74
B	**Old Station Road**	2	16	0.71	8	43	0.90
C	**A121 High Road south**	2	10	0.67	3	13	0.73
D	**Ollards Grove**	0	15	0.30	1	22	0.42

Appendix E Scenario 3 Modelling Summary

EB503

Local Plan 2033

Wake Arms PH - Epping

Junctions 9 Standard Rbt	Arm Labels	Junction 1	AM			PM		
			Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
	A	B1393 Epping Rd	289	868	1.17	10	36	0.91
	B	B172	370	1390	1.28	241	865	1.17
	C	A121 south	946	4245	1.86	398	1603	1.32
	D	A104 Epping New Rd	50	245	1.03	666	3057	1.62
	E	A121 west	306	1417	1.29	771	3642	1.73

Talbot PH - North Weald

Junctions 9 Standard Rbt	Junction 2	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B181 Weald Bridge Rd	3	18	0.73	1	12	0.54
B	A414 High Rd east	593	1565	1.31	3	11	0.76
C	B181 High Rd	15	71	0.95	366	1309	1.26
D	A414 High Rd west	1	9	0.58	14	63	0.94

Crooked Mile - Waltham Abbey

Junctions 9 Standard Rbt	Junction 3	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B194 Crooked Mile north	84	157	1.02	3	8	0.71
B	Parklands	3	19	0.76	1	7	0.50
C	Crooked Mile south	1	5	0.49	2	6	0.62
D	Car park access	0	6	0.03	0	6	0.03
E	B194 Abbeyview	1	4	0.44	18	40	0.95

Highbridge St - Waltham Abbey

Junctions 9 Standard Rbt	Junction 4	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B194 Abbeyview	3	7	0.72	1	3	0.45
B	Highbridge St	2	13	0.58	1	6	0.34
D	B194 west	4	14	0.78	776	2095	1.42
E	Powdermill Ln	0	6	0.06	0	8	0.19

Sewardstone Rd - Waltham Abbey

Junctions 9 Standard Rbt	Junction 5	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	Sewardstone Rd	1	4	0.49	1	4	0.45
B	A121 Dowding Way	2	6	0.63	1	4	0.45
C	A112 Sewardstone Rd	1	4	0.50	3	8	0.76
D	A121 Meridian Way	1	4	0.39	1	5	0.55

Sewardstone Rd

LINSIG 3 5 arm signal	Junction 6	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	A112 Crooked Mile	140	476	1.29	55	203	1.08
B	Monkswood Ave	28	388	1.19	5	89	0.80
C	Farm Hill Rd	21	48	0.92	50	261	1.12
D	A112 Sewardstone Road	17	34	0.83	112	260	1.14
E	Sun Street	36	438	1.23	33	312	1.14

Honey Ln - Waltham Abbey

Junctions 9 Mini Rbt	Junction 7	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	Broomstick Hall Rd	1	7	0.38	1	8	0.39
B	Honey Lane	20	103	0.97	7	38	0.88
C	Farm Hill Rd	1	8	0.49	4	19	0.79

B1393 Thornwood Rd

LINSIG 3 3 arm signal	Junction 8	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	B1393 Thornwood Road	187	580	1.29	227	924	1.62
B	B181 The Plain	142	400	1.18	196	917	1.62
C	B1393 Palmers Hill	254	534	1.29	609	935	1.64

Station Rd - Epping

Junctions 9 Mini Rbt	Junction 9a	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B1393 High St north (link)	185	541	1.10	101	312	1.05
B	Station Rd	72	532	1.09	8	71	0.90
C	B1393 High St south	243	757	1.15	362	1107	1.22

St. Johns Rd - Epping

Junctions 9 Mini Rbt	Junction 9b	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	St Johns Rd	37	572	1.16	112	1207	1.35
B	B1393 High St north	592	2322	1.48	338	1518	1.33
C	B1393 High St south (link)	236	642	1.13	103	280	1.05

Theydon Rd

LINSIG 3 3 arm signal	Junction 10	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	B1393 High Rd east	442	863	1.71	269	796	1.60
B	Theydon Rd	133	912	1.71	100	807	1.57
C	B1393 High Rd west	319	885	1.73	377	803	1.62

Bury Ln - Epping

Junctions 9 Standard Rbt	Junction 11	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B182 Bury Ln	132	744	1.14	1	14	0.58

B	**B1393 High Rd east**	667	2991	1.60	350	1352	1.27
C	**B1393 High Rd west**	205	535	1.10	578	1523	1.31

Wantz Service Stn - Ongar

Junctions 9
Standard Rbt

	Junction 12	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**B184 Fyfield Rd**	56	230	1.03	4	25	0.81
B	**A414 Chelmsford Rd east**	300	932	1.19	2	9	0.67
C	**B184 High St**	23	87	0.97	26	83	0.98
D	**A414 Chelmsford Rd west**	4	14	0.79	230	635	1.13

Coopers Hill - Marden Ash (Ongar)

Junctions 9
Mini Rbt

	Junction 13	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**A113 Coopers Hill north**	213	771	1.15	6	32	0.87
B	**A128 Brentwood Rd**	4	21	0.80	2	11	0.64
C	**A113 Coopers Hill south**	1	9	0.49	16	78	0.95
D	**St James' Ave**	0	12	0.06	0	56	0.24

A113 Ongar Rd - B172 Abridge Rd

Junctions 9
T-Junction

	Junction 14	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B	**B172 Abridge Road (left)**	102	X	X	82	2434	1.48
B	**B172 Abridge Road (right)**	364	X	X	137	2418	1.48
C	**A113 Ongar Road east**	438	1791	1.36	4	24	0.73

A121 Church Hill - A1168 Rectory Ln

Junctions 9
Mini Rbt

	Junction 18a	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**A121 Goldings Hill (link)**	0	3	0.04	0	3	0.05
B	**A1168 Rectory Lane**	12	51	0.93	12	51	0.93
C	**A121 Church Hill**	3	19	0.75	102	530	1.10

A121 Goldings Hill - Millsmead Way

Junctions 9
Mini Rbt

	Junction 18b	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**A121 Goldings Hill**	187	470	1.09	3	11	0.76
B	**A121 Church Hill (link)**	2	10	0.71	20	64	0.96
C	**Millsmead Way**	0	14	0.23	0	33	0.29

Piercing Hill - Theydon Bois

Junctions 9
Crossroads

	Junction 19	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**Coppice Row east**	0	7	0.05	0	7	0.06
B	**The Green**	253	X	X	51	465	1.23
C	**Coppice Row west**	0	7	0.10	0	6	0.03
D	**Piercing Hill**	692	6497	2.52	319	2597	1.55

M25 J26 North - Waltham Abbey

Junctions 9
Standard Rbt

	Junction 21	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**Old Shire Lane**	0	6	0.21	0	6	0.17
B	**Honey Lane east**	1	4	0.47	2	5	0.60
C	**M25 On/Off Slips**	1	3	0.36	1	4	0.56
D	**Honey Lane west**	1	7	0.47	1	6	0.36

22 M25 J26 South - Waltham Abbey

Junctions 9
Standard Rbt

	Junction 22	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**M25 Off Slip**	799	3907	1.86	411	2118	1.48
B	**Honey Lane east**	507	1446	1.32	20	64	0.96
C	**Dowding Way**	101	627	1.15	262	1531	1.32
D	**M25 On Slip**	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only
E	**Honey Lane west**	278	991	1.21	456	1745	1.36

B184 Highbridge St

LINSIG 3
4 arm signal

	Junction 24	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	**Beaulieu Drive**	1	72	0.24	1	72	0.23
B	**B194 Highbridge Street**	501	993	1.90	217	648	1.43
C	**A121 Meridian Way**	151	730	1.52	44	188	1.06
D	**Station Road**	386	906	1.82	599	932	1.81

A1168 Chigwell Ln - Langston Rd - Oakwood Hill

LINSIG 3
4 arm signal

	Junction 25	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	**A1168 Chigwell Lane north**	76	336	1.15	55	318	1.13
B	**Langston Road**	4	76	0.77	55	282	1.12
C	**A1168 Chigwell Lane south**	61	290	1.13	16	73	0.89
D	**Oakwood Hill**	43	339	1.15	50	326	1.15

A1168 Chigwell Ln - The Broadway

LINSIG 3
3 arm signal

	Junction 26	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	**A1168 Chigwell Lane north**	17	25	0.67	23	22	0.72
B	**The Broadway**	17	100	0.97	10	76	0.84
C	**A1168 Chigwell Lane south**	17	82	0.95	29	117	1.00

A1168 Chigwell Ln - Borders Ln

LINSIG 3
3 arm signal

	Junction 27	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	**A1168 Rectory Lane north**	5	12	0.33	10	12	0.50
B	**A1168 Rectory Lane south**	6	9	0.51	5	12	0.52
C	**Borders Lane**	12	53	0.85	33	212	1.07

A1168 Rectory Ln - Westall Rd - Rectory Ln

Junctions 9

Junction 28	AM	PM

Crossroads

	Junction 28	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**A1168 Rectory Lane north**	0	6	0.05	0	4	0.04
B	**Westall Road (left/ahead)**	0	16	0.28	0	8	0.17
B	**Westall Road (right/ahead)**	3	27	0.72	1	19	0.36
C	**A1168 Rectory Lane south**	1	5	0.21	2	7	0.48
D	**Rectory Lane (left/ahead)**	0	6	0.03	0	8	0.08
D	**Rectory Lane (right/ahead)**	0	18	0.02	0	21	0.04

A1168 Rectory Ln - Pyrles Ln

Junctions 9
T-Junction

	Junction 29	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B	**Pyres Lane (left)**	5	43	0.83	1	11	0.41
B	**Pyres Lane (right)**	2	81	0.60	0	31	0.19
C	**A1168 Rectory Lane south**	6	26	0.80	3	18	0.71

A1168 Rectory Ln - Hillyfields

Junctions 9
T-Junction

	Junction 30	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B	**Hillyfields Road (left)**	6	605	1.04	0	11	0.11
B	**Hillyfields Road (right)**	31	439	1.05	1	28	0.45
C	**A1168 Rectory Lane east**	0	5	0.15	1	4	0.17

A121 High Rd - Traps Hill

Junctions 9
T-Junction

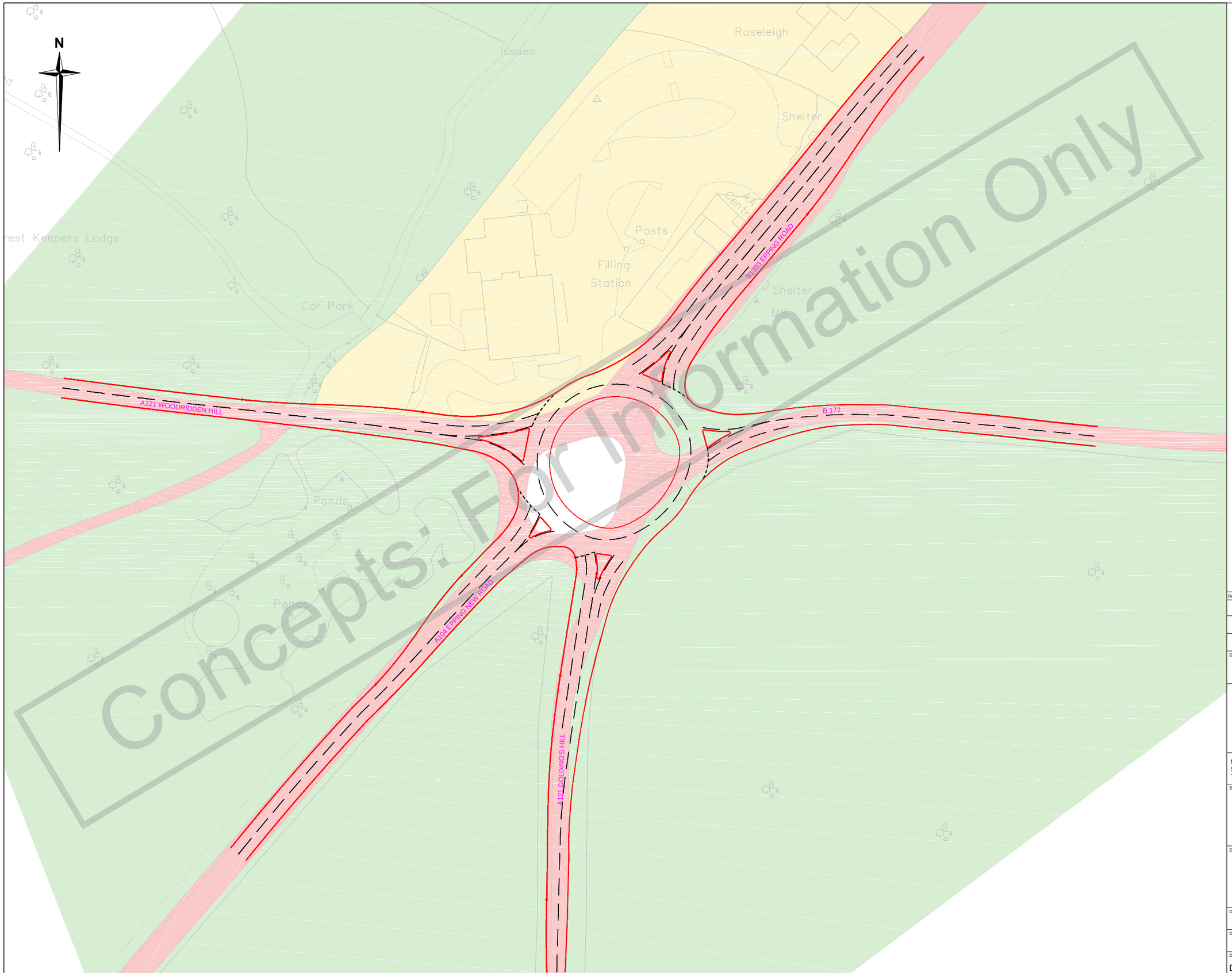
	Junction 31	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B	**Traps Hill Road (left)**	1	13	0.42	1	10	0.32
B	**Traps Hill Road (right)**	1	23	0.34	1	21	0.32
C	**A121 High Road south**	1	7	0.37	3	9	0.58

A121 High Rd - Old Station Rd - Ollards Grove

Junctions 9
Mini Rbt

	Junction 32	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	**A121 High Road north**	3	20	0.77	3	19	0.76
B	**Old Station Road**	3	17	0.72	6	35	0.87
C	**A121 High Road south**	2	9	0.63	2	11	0.69
D	**Ollards Grove**	0	14	0.27	1	19	0.38

Appendix F Mitigation Concept Designs



EB503

Notes

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5. This conceptual design represents one potential option for improvement.
6. The feasibility of this design solution is subject to further work to be conducted during preliminary and detailed design stage.

Key

- Proposed Kerblines
- Land within the highway boundary
- Land within the Special Areas of Conservation (SAC)
- Private land

Rev.	Date	Description of revision	Drawn	Checked	Reviewed	Approved

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE

WAKE ARMS ROUNDABOUT

DRAWING TITLE

OPTION 2 - TWO LANES APPROACH ROUNDABOUT

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:1250

DRAWING No.: **B3553R7A-00-003**

REV.: **0**

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N

WEALD BRIDGE ROAD

A414 (W)

A414 HIGH ROAD

B181 HIGH ROAD

Concepts: For Information Only

Notes

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Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings
- Proposed footpath

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

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Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

TALBOT PUB ROUNDABOUT IMPOVEMENTS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:1000

DRAWING No.: **B3553R7A-00-004**

REV.: **0**

EB503

N

B194 HIGHBRIDGE ST.

LEAVIEW

WINCHESTER CLOSE

MCKEEVER CLOSE

Francis Green House

El Sub Sta

LB

River Lea

18.9m

Information Only

Concepts: For Information Only

Notes

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6. The feasibility of this design solution is subject to further work to be conducted during preliminary and detailed design stage.

Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

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Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

HIGHBRIDGE ST - WALTHAM ABBEY ROUNDABOUT IMPROVEMENT OPTION

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:500

DRAWING No.: **B3553R7A-00-006**

REV.: **0**

EB503

N

A121 Crooked Mile

Monkswood Ave

Sun St

A112 Sewardstone Rd

Farm Hill Rd

A112

Notes

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Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

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SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

A112 SEWARDSTONE_SUN ST_FARM HILL JUNCTION IMPROVEMENTS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:1000

DRAWING No.: **B3553R7A-00-007**

REV.: **0**

EB503

Notes

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4. All road markings and signs are as per the Traffic Signs Regulations and General Directions 2016 (TSRGD).
5. This conceptual design represents one potential option for improvement.
6. The feasibility of this design solution is subject to further work to be conducted during preliminary and detailed design stage.

Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	01/19	ORIGINAL DESIGN	BS	AC	AC	SJ
-	-	-	-	-	-	-
-	-	-	-	-	-	-

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

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SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

B1393 THORNWOOD ROAD EPPING SIGNALIISED JUNCTION OPTION

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:1000

DRAWING No.: **B3553R7A-00-008**

REV.: **0**

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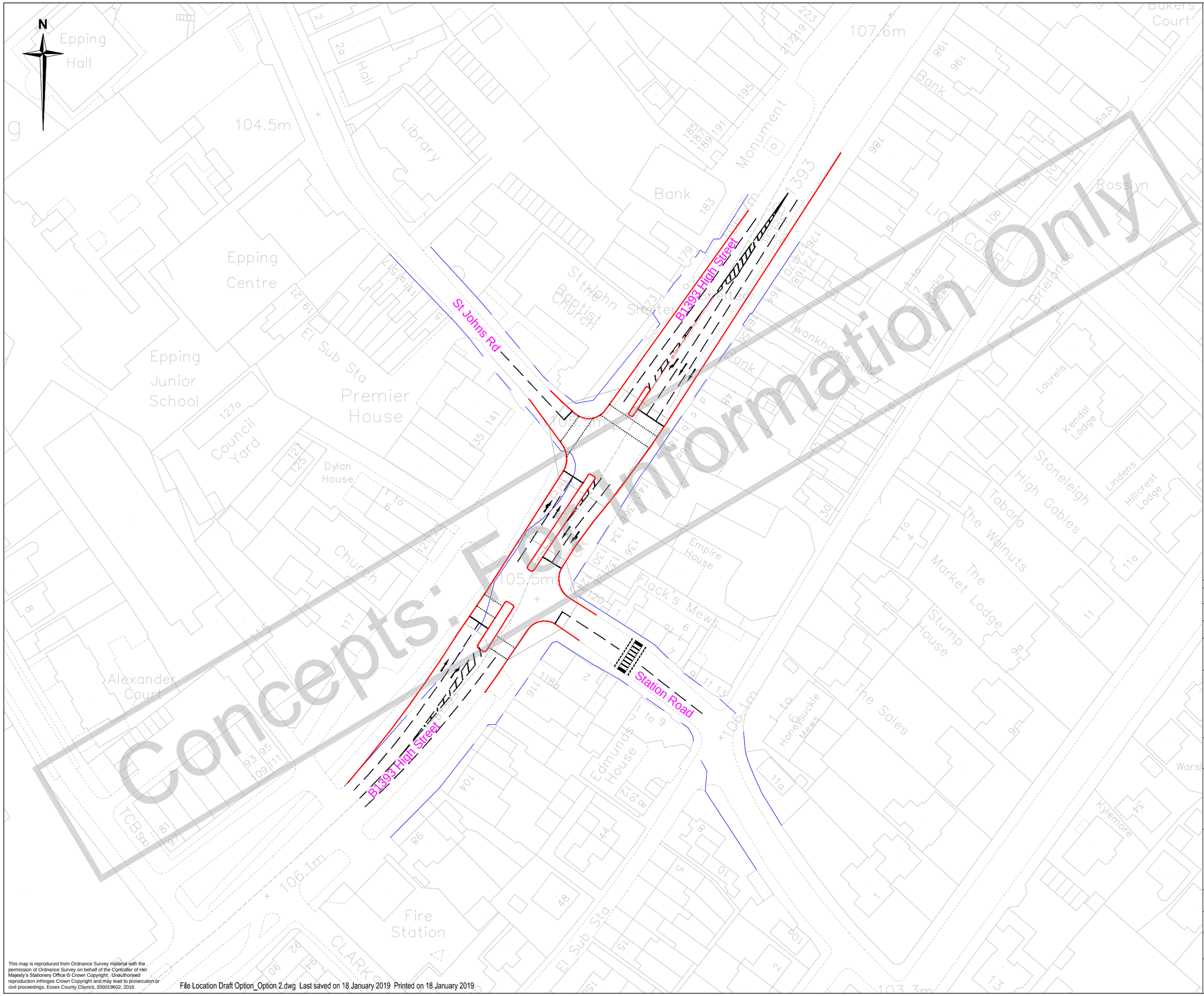

File Location Draft Option_Option 2.dwg Last saved on 18 January 2019 Printed on 18 January 2019

Notes

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5. This conceptual design represents one potential option for improvement.
6. The feasibility of this design solution is subject to further work to be conducted during preliminary and detailed design stage.

Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

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SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

B1393 HIGH ST/ST JOHNS ROAD/STATION ROAD SIGNALIISED JUNCTION - OPTION 2

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:1000

DRAWING No.: **B355369A-00-009**

REV.: **0**

EB503

N

Notes

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5. This conceptual design represents one potential option for improvement.
6. The feasibility of this design solution is subject to further work to be conducted during preliminary and detailed design stage.

Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings

B1393 EPPING ROAD

THEYDON ROAD

Concepts. For Information Only

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

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SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

B1393 EPPING RD/THEYDON ROAD SIGNALIISED JUNCTION OPTION

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

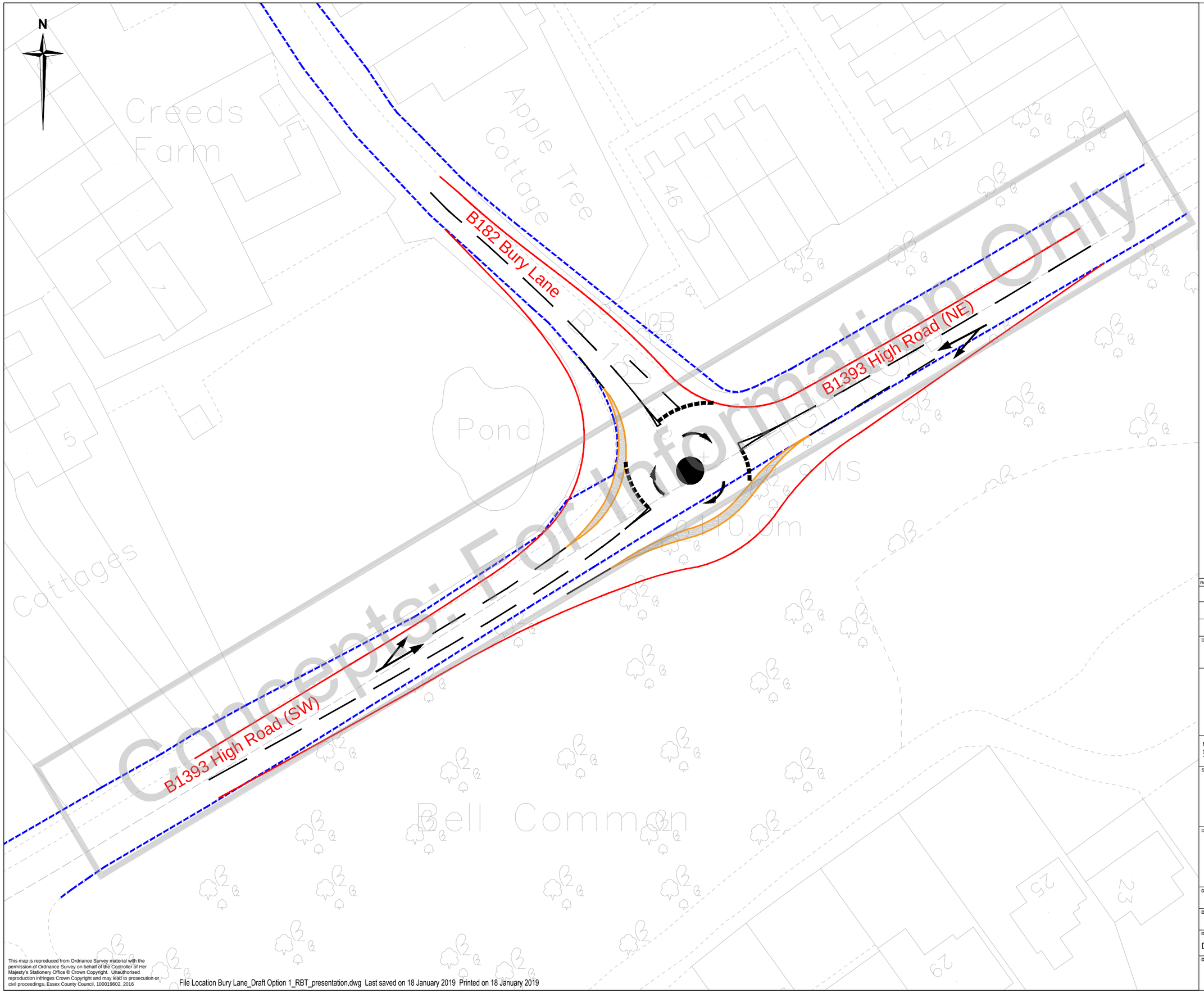
DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:1000

DRAWING No.: **B3553R7A-00-010**

REV.: **0**

EB503



Notes

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2. Proposals shown are based on Ordnance Survey information
3. Existing infrastructure such as drainage, street lighting, traffic signs and signal ducts are subject to alteration as required.
4. All road markings and signs are as per the Traffic Signs Regulations and General Directions 2016 (TSRGD).
5. This conceptual design represents one potential option for improvement.
6. The feasibility of this design solution is subject to further work to be conducted during preliminary and detailed design stage.

Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
	02/18	ORIGINAL DESIGN	BS	AC	AC	SJ
		-	-	-	-	-
		-	-	-	-	-

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise | Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

B1393 HIGH RD/B182 BURY LANE JUNCTION IMPROVEMENTS OPTION 1

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE JAN 19	DATE JAN 19	DATE JAN 19	DATE JAN 19	DATE JAN 19

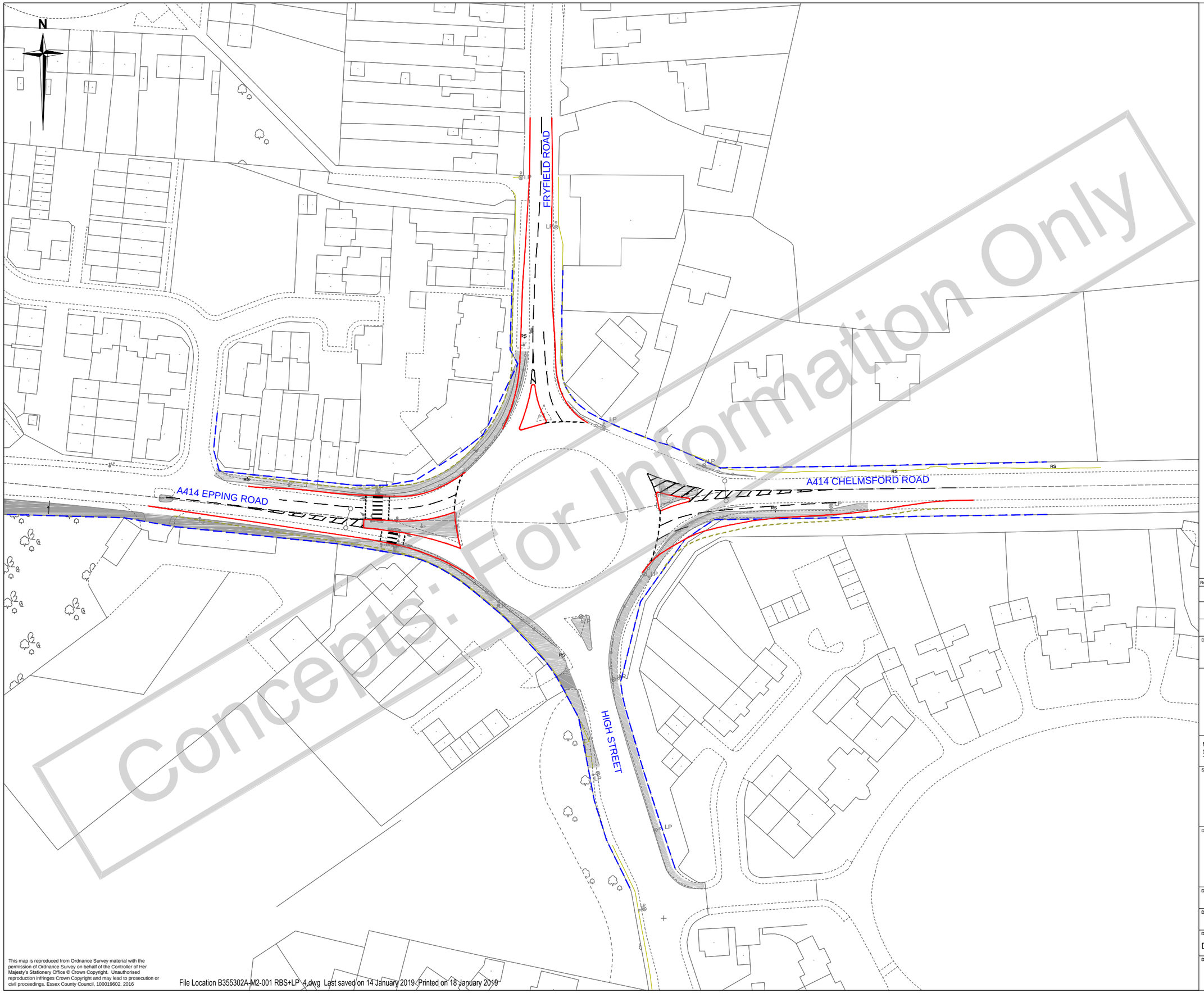
DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:500

DRAWING No.: **B3553R7A-00-011**

REV.: **0**

EB503



Notes

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3. Existing infrastructure such as drainage, street lighting, traffic signs and signal ducts are subject to alteration as required.
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Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings
- Proposed footpath

Rev.	Date	Description of revision	Drawn	Checked	Reviewed	Approved
		ORIGINAL DESIGN	BS	AC	AC	SJ
		-	-	-	-	-
		-	-	-	-	-

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
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Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

FOUR WANTZ ROUNDABOUT IMPROVEMENTS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O. DIMENSIONS IN METRES

SCALE AT A3 (420x297mm) 1:1000

DRAWING No. B3553R7A-00-012

REV. 0

File Location B355302A-M2-001 RBS+LP_4.dwg Last saved on 14 January 2019 Printed on 18 January 2019

EB503

N

COOPERS HILL

ST JAMES' AVENUE

A128 BRENTWOOD ROAD

A113 SANFORD RIVERS ROAD

SANDONPLACE

TCB

Grey End Cottage

Appletree House

Sandon House

Redcot

Concepts. For Information Only

Notes

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3. Existing infrastructure such as drainage, street lighting, traffic signs and signal ducts are subject to alteration as required.
4. All road markings and signs are as per the Traffic Signs Regulations and General Directions 2016 (TSRGD).
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Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	02/18	ORIGINAL DESIGN	BS	AC	AC	SJ
-	-	-	-	-	-	-
-	-	-	-	-	-	-

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

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Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

COOPERS HILL ROUNDABOUT ONGAR

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

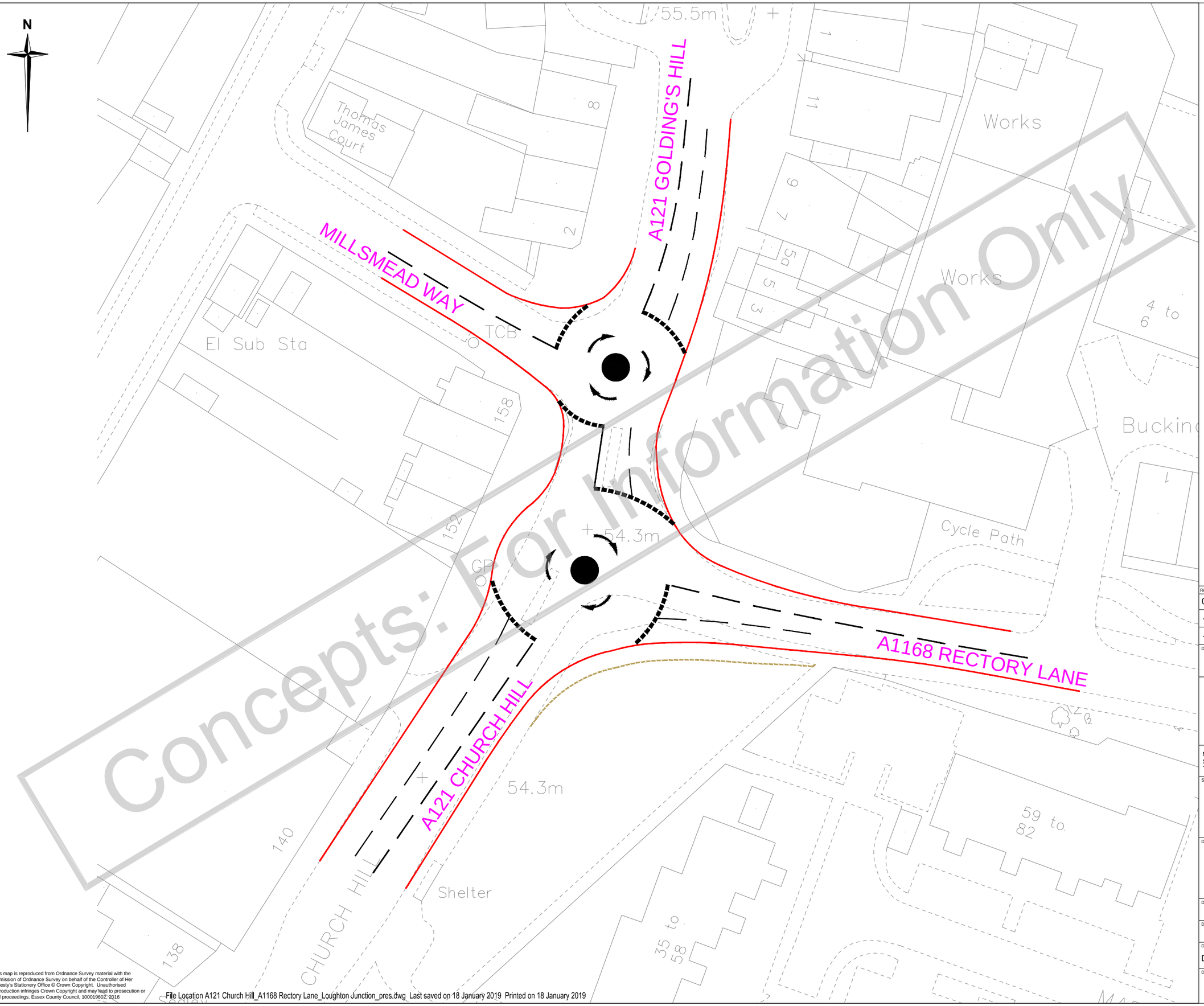
DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:500

DRAWING No.: **B3553R7A-00-013**

REV.: **0**

EB503



Notes

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3. Existing infrastructure such as drainage, street lighting, traffic signs and signal ducts are subject to alteration as required.
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Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings
- Proposed footpath

Rev.	Date	Description of revision	Drawn	Checked	Reviewed	Approved
0	02/18	ORIGINAL DESIGN	BS	AC	AC	SJ
-	-	-	-	-	-	-
-	-	-	-	-	-	-

DRAWING STATUS

FOR INFORMATION

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Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

A121 CHURCH HILL_A1168 RECTORY LANE_MILLSMEAD WAY ROUNDABOUT IMPROVEMENTS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:500

DRAWING No.: **B3553R7A-00-014**

REV.: **0**

File Location A121 Church Hill_A1168 Rectory Lane_Loughton Junction_pres.dwg Last saved on 18 January 2019 Printed on 18 January 2019

EB503

N

Honey Lane (North)

ADDITIONAL FLARE LANE ADDED ALONG THE A121 HONEY LANE (NORTH) APPROACH

M25 Westbound Off Slip

POTENTIAL TO INCREASE THE EXISTING TWO LANE ROAD MARKING IN FUTURE TO IMPROVE EQUAL USAGE OF BOTH APPROACH LANES

M25 Westbound On Slip

A121 Honey Lane

ADDITIONAL FLARE LANE ADDED ALONG THE A121 HONEY LANE

TWO LANE EXIT CAPACITY PROVIDED

A121 Dowding Way

Skillet Hall

Ward Boy

Notes

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3. Existing infrastructure such as drainage, street lighting, traffic signs and signal ducts are subject to alteration as required.
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5. This conceptual design represents one potential option for improvement.
6. The feasibility of this design solution is subject to further work to be conducted during preliminary and detailed design stage.
7. Highway boundary shown is indicative.

Key

- OS Map
- Existing ECC highway boundary
- Proposed kerb
- Proposed road markings

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	02/18	ORIGINAL DESIGN	BS	AC	AC	SJ
1	12/18	TWO LANE EXIT ADDED	BS	AC	AC	SJ
2	16/18	TWO LANE MARKING ADDED ON WESTBOUND OFF SLIP	BS	AC	AC	SJ

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

M25 JUNCTION 26 SOUTHERN ROUNDABOUT IMPROVEMENTS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O.: DIMENSIONS IN MILLIMETRES

SCALE AT A3 (420x297mm): 1:1000

DRAWING No.: **B3553R7A-00-015**

REV.: **2**

EB503

N

BEAULIEU DRIVE.

B194 HIGHBRIDGE ST.

A121 STATION ROAD

A121 MERIDIAN WAY.

AUGUSTINE COURT

LEAVIEW

MCKEEVER CLOSE

GROVE COURT

WINCHESTER

Francis Green House

Swing-Bridge (disused)

Drain

Tow Path

River Lea

+20.7m

+18.9m

8.9m

Concepts. For Information Only

Notes

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Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings
- Proposed Footpath

Rev.	Date	Description of revision	Drawn	Checked	Reviewed	Approved
0	02/18	ORIGINAL DESIGN	BS	AC	AC	SJ
-	-	-	-	-	-	-
-	-	-	-	-	-	-

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

M25 JUNCTION 26 SOUTHERN ROUNDABOUT IMPROVEMENTS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O. DIMENSIONS IN METRES

SCALE AT A3 (420x297mm) 1:1000

DRAWING No. **B3553R7A-00-005**

REV. **0**

File Location Draft Option_v1.dwg Last saved on 18 January 2019 Printed on 18 January 2019

EB503

Notes

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Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	02/18	ORIGINAL DESIGN	BS	AC	AC	SJ
-	-	-	-	-	-	-
-	-	-	-	-	-	-

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

A1168 CHIGWELL LANE/LANGSTON ROAD/OAKWOOD HILL SIGNALISED JUNCTION

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

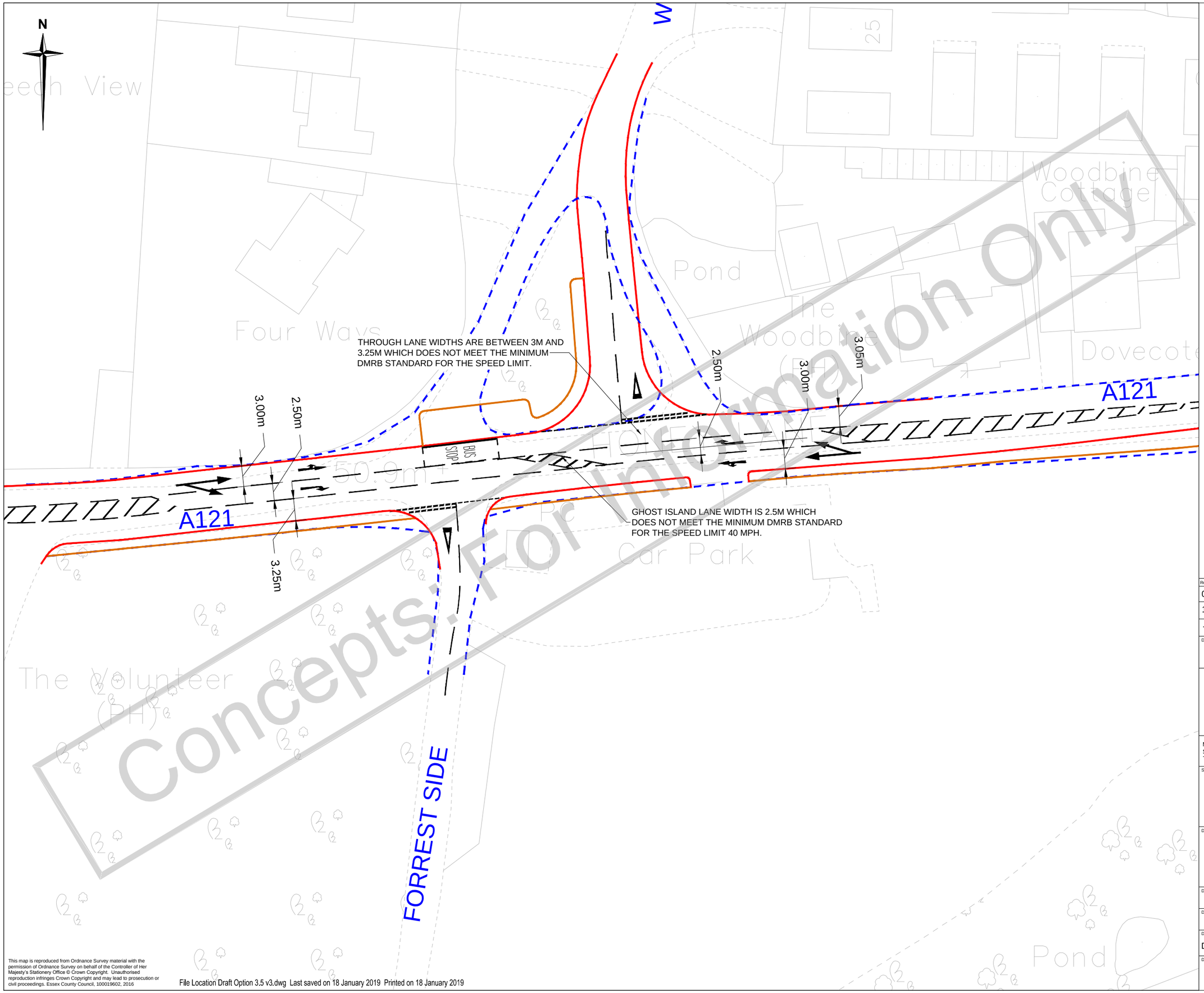
DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:1000

DRAWING No.: **B3553R7A-00-016**

REV.: **0**

File Location A1168 Chigwell Ln_Langston Rd_Draft Option.dwg Last saved on 18 January 2019 Printed on 18 January 2019



File Location Draft Option 3.5 v3.dwg Last saved on 18 January 2019 Printed on 18 January 2019

EB503

Notes

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5. This conceptual design represents one potential option for improvement.
6. The feasibility of this design solution is subject to further work to be conducted during preliminary and detailed design stage.
7. Highway boundary shown is indicative

Key

- OS Map
- Existing highway boundary
- Proposed kerb
- Proposed road markings
- Proposed Footpath

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	02/18	ORIGINAL DESIGN	BS	AC	AC	SJ
1	12/18	SOUTHERN KERB MODIFIED	BS	AC	AC	SJ
-	-	-	-	-	-	-

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

WOODGREEN ROAD JUNCTION IMPROVEMENTS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:500

DRAWING No.: **B3553R7A-00-002**

REV.: **1**

EB503

N

CROSS ROADS

A104 EPPING NEW ROAD

CROSS ROADS

Robin Hood Cottage

Issues

18.8

Pond

The Robin Hood (PH)

Sinks

Iss

Hill Wood

Clearing

A104 EPPING NEW ROAD

EARL'S PATH

ED and Ward Bdy

CR EARL'S PATH

78.9m

Notes

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Key

Proposed Kerblines

Highway Boundary

Rev.	Date	Description of revision	Drawn	Checked	Reviewed	Approved

DRAWING STATUS

FOR INFORMATION

RINGWAY JACOBS Integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE

EPPING FOREST LOCAL PLAN MITIGATION OPTIONS

DRAWING TITLE

ROBIN HOOD JUNCTION IMPROVEMENTS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	AC	AC	SJ
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A3 (420x297mm): 1:1000

DRAWING No.: **B3553R7A-00-001**

REV.: **0**

Appendix G Scenario 4 Modelling Summary

Local Plan 2033 Mitigation

Junctions 9 Standard Rbt — Arm Labels

Wake Arms PH - Epping

Junction 1	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B1393 Epping Rd	7	19	0.87	2	9	0.70
B172	24	81	0.97	6	19	0.85
A121 south	471	1485	1.30	8	26	0.89
A104 Epping New Rd	3	13	0.71	78	241	1.04
A121 west	5	20	0.83	463	1700	1.35

Junctions 9 Standard Rbt

Talbot PH - North Weald

Junction 2	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B181 Weald Bridge Rd	1	7	0.54	1	8	0.42
A414 High Rd east	16	35	0.95	1	4	0.56
B181 High Rd	2	10	0.69	4	12	0.80
A414 High Rd west	1	5	0.42	3	13	0.76

Junctions 9 Standard Rbt

Highbridge St - Waltham Abbey

Junction 4	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B194 Abbeyview	3	7	0.72	0	4	0.46
Highbridge St	2	13	0.58	1	6	0.34
B194 west	1	3	0.44	4	8	0.79
Powdermill Ln	0	6	0.06	0	15	0.30

LINSIG 3 5 arm signal

Sewardstone Rd

Junction 6	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A112 Crooked Mile	28	75	0.95	29	188	1.06
Monkswood Ave	21	255	1.07	5	89	0.80
Farm Hill Rd	40	130	1.02	32	156	1.04
A112 Sewardstone Road	16	32	0.79	76	153	1.06
Sun Street	20	200	1.03	25	216	1.07

LINSIG 3 3 arm signal

B1393 Thornwood Rd

Junction 8	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
B1393 Thornwood Road	160	462	1.23	200	778	1.47
B181 The Plain	175	501	1.24	166	760	1.45
B1393 Palmers Hill	84	308	1.12	291	768	1.46

LINSIG 3 3 arm signal

Station Rd - Epping

Junction 9a	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B1393 High St north (link)	15	29	0.81	17	35	0.86
Station Rd	33	169	1.07	9	49	0.86
B1393 High St south	17	16	0.79	19	19	0.82

LINSIG 3 3 arm signal

St. Johns Rd - Epping

Junction 9b	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
St Johns Rd	6	37	0.58	20	143	1.01
B1393 High St north	19	192	1.06	17	20	0.69
B1393 High St south (link)	18	33	0.84	24	33	0.87

LINSIG 3 3 arm signal

Theydon Rd

Junction 10	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
B1393 High Rd east	25	18	0.81	108	147	1.06
Theydon Rd	18	106	0.97	24	167	1.03
B1393 High Rd west	49	43	0.98	11	13	0.67

Junctions 9 Mini Rbt

Bury Ln - Epping

Junction 11	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B182 Bury Ln	95	515	1.09	2	19	0.67
B1393 High Rd east	0	5	0.06	0	4	0.09
B1393 High Rd west	3	9	0.74	5	13	0.82

Junctions 9 Standard Rbt

Wantz Service Stn - Ongar

Junction 12	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B184 Fyfield Rd	3	13	0.76	2	10	0.63
A414 Chelmsford Rd east	3	9	0.76	1	4	0.44
B184 High St	15	56	0.94	6	20	0.86
A414 Chelmsford Rd west	2	6	0.64	8	21	0.89

Junctions 9 Mini Rbt

Coopers Hill - Marden Ash (Ongar)

Junction 13	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A113 Coopers Hill north	213	771	1.15	6	32	0.87
A128 Brentwood Rd	5	26	0.83	2	11	0.66
A113 Coopers Hill south	1	6	0.41	4	17	0.78
St James' Ave	0	10	0.05	0	33	0.16

Junctions 9 Mini Rbt

A121 Church Hill - A1168 Rectory Ln

Junction 18a	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A121 Goldings Hill (link)	387	1075	1.22	6	19	0.85

	A1168 Rectory Lane	114	491	1.09	57	231	1.03
	A121 Church Hill	1	5	0.43	2	9	0.64

A121 Goldings Hill - Millsmead Way

Junctions 9
Mini Rbt

Junction 18b	**AM**			**PM**		
	Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
A121 Goldings Hill	17	43	0.95	2	7	0.66
A121 Church Hill (link)	2	9	0.69	25	79	0.98
Millsmead Way	0	12	0.21	0	28	0.25

Piercing Hill - Theydon Bois

Junctions 9
Standard Rbt

Junction 19	**AM**			**PM**		
	Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
Coppice Row east	1	6	0.35	1	5	0.32
The Green	1	7	0.37	1	11	0.55
Coppice Row west	1	7	0.45	1	7	0.42
Piercing Hill	31	132	0.99	2	12	0.68

22 M25 J26 South - Waltham Abbey

Junctions 9
Standard Rbt

Junction 22	**AM**			**PM**		
	Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
M25 Off Slip	8	22	0.88	2	8	0.66
Honey Lane east	21	53	0.96	2	6	0.67
Dowding Way	2	10	0.60	2	8	0.63
M25 On Slip	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only
Honey Lane west	2	6	0.62	2	6	0.66

B184 Highbridge St

LINSIG 3
4 arm signal

Junction 24	**AM**			**PM**		
	Queue (PCUs)	**Delay (secs)**	**DoS**	**Queue (PCUs)**	**Delay (secs)**	**DoS**
Beaulieu Drive	1	84	0.23	1	81	0.22
B194 Highbridge Street	128	425	1.24	60	287	1.12
A121 Meridian Way	47	190	1.06	16	47	0.97
Station Road	62	457	1.24	63	306	1.14

A1168 Chigwell Ln - Langston Rd - Oakwood Hill

LINSIG 3
4 arm signal

Junction 25	**AM**			**PM**		
	Queue (PCUs)	**Delay (secs)**	**DoS**	**Queue (PCUs)**	**Delay (secs)**	**DoS**
A1168 Chigwell Lane north	65	278	1.11	24	109	0.98
Langston Road	6	114	0.86	18	91	0.95
A1168 Chigwell Lane south	62	292	1.13	14	60	0.81
Oakwood Hill	35	266	1.10	20	95	0.95

A1168 Chigwell Ln - The Broadway

LINSIG 3
3 arm signal

Junction 26	**AM**			**PM**		
	Queue (PCUs)	**Delay (secs)**	**DoS**	**Queue (PCUs)**	**Delay (secs)**	**DoS**
A1168 Chigwell Lane north	9	17	0.53	10	14	0.68
The Broadway	6	33	0.47	7	46	0.68
A1168 Chigwell Lane south	11	37	0.73	14	40	0.80

A1168 Chigwell Ln - Borders Ln

LINSIG 3
3 arm signal

Junction 27	**AM**			**PM**		
	Queue (PCUs)	**Delay (secs)**	**DoS**	**Queue (PCUs)**	**Delay (secs)**	**DoS**
A1168 Rectory Lane north	5	13	0.35	10	15	0.57
A1168 Rectory Lane south	6	10	0.55	6	12	0.58
Borders Lane	9	37	0.71	11	49	0.83

Appendix H Scenario 5 Modelling Summary

EB503

Local Plan Peak Spreading 2033

Wake Arms PH - Epping

Junctions 9 — Standard Rbt

Arm Labels	Junction 1	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B1393 Epping Rd	76	247	1.03	4	15	0.78
B	B172	146	535	1.10	16	63	0.95
C	A121 south	849	3654	1.74	210	831	1.17
D	A104 Epping New Rd	39	201	1.01	682	3154	1.64
E	A121 west	233	1089	1.22	681	3240	1.65

Talbot PH - North Weald

Junctions 9 — Standard Rbt

	Junction 2	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B181 Weald Bridge Rd	1	8	0.48	1	10	0.47
B	A414 High Rd east	309	761	1.15	2	8	0.67
C	B181 High Rd	5	24	0.82	108	375	1.06
D	A414 High Rd west	1	7	0.48	7	33	0.88

Crooked Mile - Waltham Abbey

Junctions 9 — Standard Rbt

	Junction 3	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B194 Crooked Mile north	7	16	0.88	1	5	0.57
B	Parklands	1	9	0.56	1	5	0.42
C	Crooked Mile south	1	4	0.40	1	4	0.52
D	Car park access	0	5	0.02	0	5	0.02
E	B194 Abbeyview	1	3	0.35	4	10	0.80

Highbridge St - Waltham Abbey

Junctions 9 — Standard Rbt

	Junction 4	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B194 Abbeyview	2	5	0.63	1	3	0.43
B	Highbridge St	1	10	0.50	1	6	0.32
D	B194 west	3	10	0.70	681	1839	1.37
E	Powdermill Ln	0	6	0.06	0	8	0.19

Sewardstone Rd - Waltham Abbey

Junctions 9 — Standard Rbt

	Junction 5	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	Sewardstone Rd	1	3	0.44	1	3	0.41
B	A121 Dowding Way	1	5	0.53	1	3	0.42
C	A112 Sewardstone Rd	1	3	0.39	2	6	0.69
D	A121 Meridian Way	1	3	0.32	1	5	0.49

Sewardstone Rd

LINSIG 3 — 5 arm signal

	Junction 6	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	A112 Crooked Mile	57	196	1.07	36	144	1.04
B	Monkswood Ave	17	278	1.09	5	98	0.83
C	Farm Hill Rd	15	45	0.85	43	227	1.10
D	A112 Sewardstone Road	10	26	0.73	81	185	1.09
E	Sun Street	16	182	1.03	20	173	1.03

Honey Ln - Waltham Abbey

Junctions 9 — Mini Rbt

	Junction 7	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	Broomstick Hall Rd	1	6	0.34	0	7	0.30
B	Honey Lane	7	37	0.87	4	23	0.80
C	Farm Hill Rd	1	7	0.45	2	12	0.68

B1393 Thornwood Rd

LINSIG 3 — 3 arm signal

	Junction 8	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	B1393 Thornwood Road	122	411	1.18	192	847	1.53
B	B181 The Plain	42	84	0.99	172	846	1.54
C	B1393 Palmers Hill	163	363	1.17	539	857	1.56

Station Rd - Epping

Junctions 9 — Mini Rbt

	Junction 9a	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	B1393 High St north (link)	5	19	0.83	148	453	1.08
B	Station Rd	3	26	0.73	10	88	0.93
C	B1393 High St south	6	24	0.86	394	1204	1.24

St. Johns Rd - Epping

Junctions 9 — Mini Rbt

	Junction 9b	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A	St Johns Rd	10	204	0.96	122	1293	1.37
B	B1393 High St north	97	370	1.08	373	1697	1.37
C	B1393 High St south (link)	6	22	0.86	105	284	1.05

Theydon Rd

LINSIG 3 — 3 arm signal

	Junction 10	AM			PM		
		Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A	B1393 High Rd east	227	512	1.36	178	586	1.43
B	Theydon Rd	72	547	1.36	70	586	1.41
C	B1393 High Rd west	22	62	0.99	230	549	1.40

Bury Ln - Epping

Junctions 9 — Standard Rbt

	Junction 11	AM			PM		
		Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC

EB503

A	**B182 Bury Ln**	5	31	0.83	1	11	0.49
B	**B1393 High Rd east**	539	2344	1.47	64	252	1.03
C	**B1393 High Rd west**	6	21	0.87	508	1341	1.27

Wantz Service Stn - Ongar

Junctions 9
Standard Rbt

	Junction 12	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
A	**B184 Fyfield Rd**	6	29	0.87	2	16	0.70
B	**A414 Chelmsford Rd east**	159	472	1.09	2	7	0.59
C	**B184 High St**	7	28	0.87	6	20	0.85
D	**A414 Chelmsford Rd west**	2	9	0.69	21	65	0.97

Coopers Hill - Marden Ash (Ongar)

Junctions 9
Mini Rbt

	Junction 13	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
A	**A113 Coopers Hill north**	162	581	1.11	3	18	0.76
B	**A128 Brentwood Rd**	3	17	0.74	1	8	0.56
C	**A113 Coopers Hill south**	1	8	0.42	4	22	0.81
D	**St James' Ave**	0	10	0.05	0	23	0.11

A113 Ongar Rd - B172 Abridge Rd

Junctions 9
T-Junction

	Junction 14	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
B	**B172 Abridge Road (left)**	72	0	X	43	1114	1.20
B	**B172 Abridge Road (right)**	293	0	X	73	1095	1.21
C	**A113 Ongar Road east**	308	1254	1.25	2	14	0.52

A121 Church Hill - A1168 Rectory Ln

Junctions 9
Mini Rbt

	Junction 18a	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
A	**A121 Goldings Hill (link)**	0	3	0.03	0	3	0.03
B	**A1168 Rectory Lane**	4	19	0.79	4	18	0.78
C	**A121 Church Hill**	2	11	0.59	1	11	0.59

A121 Goldings Hill - Millsmead Way

Junctions 9
Mini Rbt

	Junction 18b	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
A	**A121 Goldings Hill**	7	22	0.88	7	22	0.88
B	**A121 Church Hill (link)**	2	7	0.60	2	7	0.60
C	**Millsmead Way**	0	10	0.14	0	10	0.14

Piercing Hill - Theydon Bois

Junctions 9
Crossroads

	Junction 19	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
A	**Coppice Row east**	0	7	0.03	0	7	0.05
B	**The Green**	222	X	X	24	215	1.10
C	**Coppice Row west**	0	6	0.09	0	6	0.03
D	**Piercing Hill**	638	5446	2.25	315	2401	1.49

M25 J26 North - Waltham Abbey

Junctions 9
Standard Rbt

	Junction 21	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
A	**Old Shire Lane**	0	5	0.20	0	5	0.16
B	**Honey Lane east**	1	4	0.45	2	5	0.57
C	**M25 On/Off Slips**	1	3	0.32	1	4	0.52
D	**Honey Lane west**	1	6	0.44	1	6	0.32

22 M25 J26 South - Waltham Abbey

Junctions 9
Standard Rbt

	Junction 22	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**RFC**	**Queue (PCUs)**	**Delay (secs)**	**RFC**
A	**M25 Off Slip**	626	2838	1.66	276	1387	1.31
B	**Honey Lane east**	465	1361	1.31	8	28	0.90
C	**Dowding Way**	55	366	1.07	127	769	1.15
D	**M25 On Slip**	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only
E	**Honey Lane west**	144	515	1.11	254	962	1.20

B184 Highbridge St

LINSIG 3
4 arm signal

	Junction 24	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**DoS**	**Queue (PCUs)**	**Delay (secs)**	**DoS**
A	**Beaulieu Drive**	1	72	0.24	1	72	0.23
B	**B194 Highbridge Street**	399	884	1.72	196	610	1.39
C	**A121 Meridian Way**	131	644	1.43	36	146	1.03
D	**Station Road**	322	813	1.68	556	889	1.74

A1168 Chigwell Ln - Langston Rd - Oakwood Hill

LINSIG 3
4 arm signal

	Junction 25	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**DoS**	**Queue (PCUs)**	**Delay (secs)**	**DoS**
A	**A1168 Chigwell Lane north**	34	137	1.08	25	121	0.98
B	**Langston Road**	4	76	0.77	19	105	0.97
C	**A1168 Chigwell Lane south**	51	139	1.03	15	64	0.85
D	**Oakwood Hill**	22	160	1.01	20	124	0.98

A1168 Chigwell Ln - The Broadway

LINSIG 3
3 arm signal

	Junction 26	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**DoS**	**Queue (PCUs)**	**Delay (secs)**	**DoS**
A	**A1168 Chigwell Lane north**	16	24	0.69	21	20	0.67
B	**The Broadway**	13	62	0.88	8	61	0.70
C	**A1168 Chigwell Lane south**	12	61	0.86	19	58	0.88

A1168 Chigwell Ln - Borders Ln

LINSIG 3
3 arm signal

	Junction 27	**AM**			**PM**		
		Queue (PCUs)	**Delay (secs)**	**DoS**	**Queue (PCUs)**	**Delay (secs)**	**DoS**
A	**A1168 Rectory Lane north**	6	14	0.39	9	12	0.49
B	**A1168 Rectory Lane south**	5	10	0.50	5	10	0.47

	C	**Borders Lane**	7	37	0.65	12	71	0.87

A1168 Rectory Ln - Westall Rd - Rectory Ln

Junctions 9
Crossroads

Junction 28	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **A1168 Rectory Lane north**	0	5	0.06	0	4	0.04
B **Westall Road (left/ahead)**	0	8	0.09	0	7	0.17
B **Westall Road (right/ahead)**	1	12	0.38	1	17	0.33
C **A1168 Rectory Lane south**	1	5	0.21	1	6	0.40
D **Rectory Lane (left/ahead)**	0	6	0.03	0	7	0.08
D **Rectory Lane (right/ahead)**	0	16	0.02	0	19	0.03

A1168 Rectory Ln - Pyrles Ln

Junctions 9
T-Junction

Junction 29	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B **Pyres Lane (left)**	1	15	0.58	1	11	0.43
B **Pyres Lane (right)**	0	23	0.25	0	27	0.18
C **A1168 Rectory Lane south**	2	16	0.63	2	16	0.66

A1168 Rectory Ln - Hillyfields

Junctions 9
T-Junction

Junction 30	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B **Hillyfields Road (left)**	0	11	0.07	0	10	0.10
B **Hillyfields Road (right)**	1	24	0.51	1	23	0.38
C **A1168 Rectory Lane east**	0	5	0.13	1	4	0.16

A121 High Rd - Traps Hill

Junctions 9
T-Junction

Junction 31	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B **Traps Hill Road (left)**	0	10	0.31	1	10	0.32
B **Traps Hill Road (right)**	0	17	0.23	0	20	0.31
C **A121 High Road south**	1	7	0.27	2	8	0.51

A121 High Rd - Old Station Rd - Ollards Grove

Junctions 9
Mini Rbt

Junction 32	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A **A121 High Road north**	2	13	0.65	3	17	0.72
B **Old Station Road**	2	13	0.65	4	24	0.81
C **A121 High Road south**	1	7	0.50	2	11	0.68
D **Ollards Grove**	0	11	0.19	0	16	0.28

Appendix I Scenario 6 Modelling Summary

EB503

Local Plan Peak Spreading 2033 Mitigation

Junctions 9 Standard Rbt — Arm Labels

Wake Arms PH - Epping

Junction 1	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B1393 Epping Rd	3	11	0.76	2	7	0.61
B172	4	15	0.80	2	9	0.70
A121 south	227	638	1.12	3	11	0.75
A104 Epping New Rd	2	12	0.69	13	43	0.94
A121 west	4	17	0.80	327	1167	1.24

Junctions 9 Standard Rbt

Talbot PH - North Weald

Junction 2	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B181 Weald Bridge Rd	1	5	0.36	1	6	0.34
A414 High Rd east	5	12	0.84	1	4	0.49
B181 High Rd	1	6	0.55	2	7	0.68
A414 High Rd west	1	4	0.35	2	8	0.64

Junctions 9 Standard Rbt

Highbridge St - Waltham Abbey

Junction 4	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B194 Abbeyview	2	5	0.63	1	3	0.44
Highbridge St	1	10	0.50	1	6	0.32
B194 west	1	3	0.39	3	7	0.76
Powdermill Ln	0	6	0.06	0	13	0.28

LINSIG 3 5 arm signal

Sewardstone Rd

Junction 6	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A112 Crooked Mile	29	78	0.96	14	73	0.91
Monkswood Ave	9	110	0.88	5	98	0.83
Farm Hill Rd	15	43	0.82	21	98	0.99
A112 Sewardstone Road	12	29	0.69	40	85	1.02
Sun Street	13	118	0.94	15	112	0.97

LINSIG 3 3 arm signal

B1393 Thornwood Rd

Junction 8	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
B1393 Thornwood Road	76	212	1.07	157	661	1.37
B181 The Plain	82	229	1.08	138	655	1.36
B1393 Palmers Hill	59	211	1.06	244	658	1.37

LINSIG 3 3 arm signal

Station Rd - Epping

Junction 9a	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B1393 High St north (link)	16	30	0.82	24	51	0.95
Station Rd	11	50	0.85	12	68	0.93
B1393 High St south	10	11	0.61	6	44	0.81

LINSIG 3 3 arm signal

St. Johns Rd - Epping

Junction 9b	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	
St Johns Rd	4	33	0.45	24	177	1.03
B1393 High St north	4	33	0.71	10	16	0.51
B1393 High St south (link)	21	38	0.89	28	40	0.92

LINSIG 3 3 arm signal

Theydon Rd

Junction 10	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
B1393 High Rd east	12	13	0.58	61	56	0.99
Theydon Rd	11	68	0.88	21	134	1.00
B1393 High Rd west	24	22	0.90	10	13	0.62

Junctions 9 Mini Rbt

Bury Ln - Epping

Junction 11	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B182 Bury Ln	2	16	0.71	1	13	0.53
B1393 High Rd east	0	5	0.06	0	4	0.08
B1393 High Rd west	1	6	0.59	4	12	0.79

Junctions 9 Standard Rbt

Wantz Service Stn - Ongar

Junction 12	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
B184 Fyfield Rd	2	9	0.65	1	7	0.51
A414 Chelmsford Rd east	2	7	0.70	1	3	0.39
B184 High St	4	17	0.80	3	11	0.75
A414 Chelmsford Rd west	1	5	0.55	3	10	0.76

Junctions 9 Mini Rbt

Coopers Hill - Marden Ash (Ongar)

Junction 13	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A113 Coopers Hill north	162	581	1.11	3	18	0.76
A128 Brentwood Rd	3	20	0.77	1	9	0.57
A113 Coopers Hill south	1	6	0.34	2	11	0.66
St James' Ave	0	9	0.05	0	18	0.09

Junctions 9 Mini Rbt

A121 Church Hill - A1168 Rectory Ln

Junction 18a Opt 2	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A121 Goldings Hill (link)	19	60	0.97	4	14	0.79

	A1168 Rectory Lane	11	55	0.93	14	65	0.95
	A121 Church Hill	1	4	0.35	2	8	0.61

A121 Goldings Hill - Millsmead Way

Junctions 9
Mini Rbt

Junction 18b Opt 2	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
A121 Goldings Hill	3	10	0.77	2	6	0.62
A121 Church Hill (link)	2	8	0.61	14	45	0.94
Millsmead Way	0	10	0.14	0	24	0.22

Piercing Hill - Theydon Bois

Junctions 9
Standard Rbt

Junction 19	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
Coppice Row east	0	6	0.30	0	5	0.29
The Green	1	7	0.35	1	10	0.51
Coppice Row west	1	7	0.43	1	7	0.37
Piercing Hill	20	89	0.97	2	13	0.69

22 M25 J26 South - Waltham Abbey

Junctions 9
Standard Rbt

Junction 22	AM			PM		
	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)	RFC
M25 Off Slip	5	14	0.81	1	6	0.57
Honey Lane east	11	28	0.91	2	5	0.61
Dowding Way	1	8	0.54	1	6	0.52
M25 On Slip	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only	Exit-Only
Honey Lane west	2	5	0.58	1	5	0.58

B184 Highbridge St

LINSIG 3
4 arm signal

Junction 24	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
Beaulieu Drive	1	84	0.23	1	81	0.22
B194 Highbridge Street	110	406	1.22	55	271	1.11
A121 Meridian Way	37	146	1.03	15	45	0.97
Station Road	57	422	1.21	52	239	1.09

A1168 Chigwell Ln - Langston Rd - Oakwood Hill

LINSIG 3
4 arm signal

Junction 25	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A1168 Chigwell Lane north	32	132	1.01	22	83	0.94
Langston Road	10	164	0.96	14	77	0.89
A1168 Chigwell Lane south	31	111	0.99	14	53	0.76
Oakwood Hill	22	160	1.01	16	84	0.90

A1168 Chigwell Ln - The Broadway

LINSIG 3
3 arm signal

Junction 26	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A1168 Chigwell Lane north	9	15	0.51	10	12	0.60
The Broadway	6	35	0.49	6	47	0.64
A1168 Chigwell Lane south	9	32	0.60	12	32	0.70

A1168 Chigwell Ln - Borders Ln

LINSIG 3
3 arm signal

Junction 27	AM			PM		
	Queue (PCUs)	Delay (secs)	DoS	Queue (PCUs)	Delay (secs)	DoS
A1168 Rectory Lane north	6	13	0.39	9	13	0.54
A1168 Rectory Lane south	5	9	0.50	5	11	0.53
Borders Lane	7	36	0.60	8	44	0.73