A12 Chelmsford to A120 widening scheme

TR010060

7.2 Transport Assessment

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A12 Chelmsford to A120 widening scheme

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7.2 TRANSPORT ASSESSMENT

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1. Introduction

1.1 Introduction

1.1.1 National Highways (the Applicant) has submitted an application under section 37 of the Planning Act 2008 (the "2008 Act") to the Secretary of State for Transport via the Planning Inspectorate (the Inspectorate) for an order to grant development consent for the A12 Chelmsford to A120 widening scheme (the proposed scheme). This Transport Assessment (TA) supports the DCO application for the proposed scheme, drawing on the transport planning, modelling and forecasting work undertaken to date.

1.1.2 The purpose of this TA report is to describe the likely impacts of the proposed scheme on the Strategic Road Network (SRN); Local Road Network (LRN); road safety; walkers, cyclists and horse riders (WCH); and public transport users.

1.2 The proposed scheme

1.2.1 The proposed scheme between junctions 19 (Boreham interchange) and 25 (Marks Tey interchange) is proposed to improve safety, solve strategic traffic problems arising from inadequate and varying route standards, and reduce congestion and delay, which will collectively increase resilience along this key part of the SRN.

1.2.2 The Applicant is seeking powers to widen the existing A12 to three lanes (where it is not already three lanes) between junction 19 and junction 25. The proposed works extend for a total of 15 miles (24km).

1.2.3 The proposed scheme also includes safety-related improvements, including closing off existing private and local direct accesses onto the main carriageway, and alterations and improvements to existing non-vehicular routes along the A12 for WCH.

1.2.4 A detailed description of the proposed scheme can be found in Chapter 2: The proposed scheme, of the ES [TR010060/APP/6.1].

1.2.5 The section of the A12 to be altered is located wholly within the administrative area of Essex County Council (which is the local highway authority for roads not forming part of the SRN in Essex). The proposed scheme is mainly within the administrative areas of Braintree District Council and Colchester Borough Council, with parts also being within the Chelmsford City Council and Maldon District Council administrative areas.

1.2.6 Chelmsford is located to the south-west of the proposed scheme and Colchester to the north-east. The settlements of Boreham, Hatfield Peverel, Witham, Rivenhall End, Kelvedon, Feering and Marks Tey are along the route. The A12 runs parallel and to the south of the GEML railway (which connects London with Colchester, Ipswich and Norwich) for most of its length between junctions 19 and 25.

1.2.7 Major connecting roads include the A130, which joins the A12 at junction 19, and the A120, which joins the A12 at junction 25. The B1137 links Boreham to junction 19 and Hatfield Peverel, and the B1018 and the B1019 link Maldon to Witham and Hatfield Peverel respectively. The B1023 (Inworth Road) links Kelvedon to Tiptree, and Braxted Park Road connects Tiptree to Rivenhall End. These are the main local roads that connect directly to the A12 and therefore will be subject to some associated development to integrate the proposed scheme with the local traffic network.

1.2.8 The proposed scheme will also require the diversion and alteration of utilities, including apparatus for electricity, communications, water and gas. One of the high-pressure gas main diversions has the potential to be an NSIP in its own right under section 20 of the Planning Act 2008.

Proposed scheme's main components

Alteration of the A12 and associated highway development

1.2.9 This includes the following:

- Widening of A12 junction 19 Boreham Interchange Bridge from two to three lanes in each direction and associated roundabouts to increase capacity and to enable the A12 to be widened to three lanes at the junction (to tie in with the current three-lane section between Boreham and Hatfield Peverel (junction 20a)).
- two new three-lane dual carriageway sections, between the existing junctions 22 and 23 and between junctions 24 and 25.

1.2.10 The remaining sections of the existing A12 to be altered will be widened online.

1.2.11 Three new all movement junctions (dumbbell layout) would be provided at junctions 21, 22 and 24, which would replace junctions 20a, 20b and 23. Junctions 21 and 22 will be above ground level with a bridge over the A12 to connect both roundabouts. Junction 24 will be built in cutting, with the A12 at ground level and an underpass to connect both roundabouts.

1.2.12 Junction 25 will be improved with the south roundabout replaced by a signalised junction and a new local road connection (London Road) where the new section of A12 joins the existing mainline.

Utilities

1.2.13 The proposed scheme will have to divert existing utilities which are either located on existing A12 verges or will be affected by the widening works (embankments, retaining walls and associated works). The diversion will include water mains; wastewater; low, medium and high voltage cables, gas main (low and high pressure) and telecommunications.

1.2.14 To enable construction of the proposed scheme, several existing utilities will need to be temporarily diverted. This will safeguard the existing supplies during construction while the permanent diversion routes are being constructed. The quantity and length of temporary diversions will be minimised where practicable and will include all of the affected utilities mentioned above.

Biodiversity, ecology and open spaces

1.2.15 The proposed scheme will maximise biodiversity value with several proposed green areas where habitats, hedgerows and native species of trees and hedges are intended to improve and connect wildlife corridors. Landscape screening is proposed, including retaining existing vegetation where practicable

1.2.16 The proposed green areas are to be located adjacent to the A12 and comprise flood and drainage mitigation areas, together with a new network of ditches, pipes and drainage systems.

1.2.17 As the proposed scheme will impact on some open space and an LNR, National Highways will provide new open space of an equivalent area.

Mitigation of operational effects

1.2.18 The proposed scheme includes design and mitigation measures to avoid or reduce its operational and construction effects. The following are examples of measures that are embedded into the proposed scheme design:

- Mitigation planting to screen views of the proposed scheme, including planting of woodland, individual trees, hedgerows, shrubs, and grassland
- Noise bunds and use of low noise road surfacing to reduce noise impacts from vehicles using the proposed scheme
- Provision of sustainable drainage systems and attenuation to reduce flood risk and mitigate water quality impacts

1.2.19 Additional mitigation measures have also been developed to mitigate likely significant adverse effects during construction and operation, including the following:

- Habitat creation and enhancements to replace habitat lost to the proposed scheme
- Use of noise barriers and surfacing with better noise reducing properties than a conventional low noise surface to mitigate significant noise impacts
- Flood storage areas to mitigate increased flood risk
- Use of bank protection measures, baffles and pool-riffle sequences to mitigate impacts on hydromorphology

Compounds, haul roads and borrow pits

1.2.20 The proposed scheme includes two main compounds, one located north of junction 21 and another north of junction 22, adjacent to Eastways Industrial

1.2.21 The main compounds will have offices, welfare facilities, parking, training rooms, materials storage, asphalt and concrete batching plants.

1.2.22 Three small satellites compounds are also proposed adjacent to the other junctions in the proposed scheme. There will also be laydown areas (self-contained small compound) throughout the proposed scheme.

1.2.23 There will be a prefabrication site compound west of Hatfield Peverel which will allow offline construction of some bridge elements.

1.2.24 Throughout the proposed scheme will be soil storage areas to store topsoil during construction and haul routes parallel to the A12 to connect borrow pits, site compounds and construction areas, reducing construction traffic on the LRN and SRN.

1.2.25 There are four proposed borrow pits in total, which would be located as follows:

- North of the proposed junction 21
- South of the A12 to the east of junction 21
- East of Rivenhall End between the A12 and GEML railway
- South of the A12 to the west of the proposed junction 24

1.2.26 These borrow pits will be used to extract materials from the order land for the construction of the proposed scheme and reduce the import of inert materials from other quarries.

1.2.27 Junction 22 will be built on a currently active quarry (owned by Brice Aggregates), where extraction is being expedited to prevent sterilisation of minerals.

Slow moving traffic and WCH infrastructure

1.2.28 The proposed scheme will improve the quality and capacity of existing WCH infrastructure, seek opportunities for new routes and address historic severance. This includes controlled and uncontrolled crossings at junctions and adjacent local roads.

1.2.29 The proposed scheme will also create new WCH routes to connect north and south of the A12 and connect existing routes along the A12. This includes seven pedestrian and cyclist bridges. There will be four additional new accommodation bridges to provide local residents and farmers access to their land.

1.2.30 The speed limit would be reduced on local roads within villages (Boreham and Hatfield Peverel) and standardise speed limits put in place between villages of Boreham to Hatfield, Inworth to Tiptree and de-trunked sections of the A12) to improve safety, especially for home-to-school transport, and other walking and cycling activity on local roads.

1.2.31 WCH, horse-drawn carriages and slow-moving vehicles would be prohibited from using the proposed scheme, all of which will be accommodated on local roads.

1.2.32 Roadside technology will be added between junctions 21 and 25 to smooth traffic flow, reduce speed limits in congestion to improve safety and to close

lanes when vehicles break down or other incidents occur, to reduce the likelihood of collisions. Messages on electronic signs will inform drivers of reasons for lane closures or reduced speed limits.

Works to the local highway network, including those parts of the existing A12 which will no longer from part of the SRN

1.2.33 The proposed scheme also includes the de-trunking of two sections of the A12 which will become local roads managed by Essex County Council. These are at Rivenhall End and between Feering and Marks Tey.

1.2.34 There will be traffic management improvements to Boreham (Main Road), Hatfield Peverel (The Street), Little Braxted Road and Inworth Road.

1.2.35 New alignments with new overbridges over the A12 are proposed for Braxted Road, Easthorpe Road. The proposed scheme will also provide three accommodation overbridges along Kelvedon bypass at Highfields Lane, Ewell Overbridge, Prested and Threshelfords Bridges.

1.3 The Applicant

1.3.1 The Applicant is appointed and licensed as the strategic highways company for England by the Secretary of State for Transport, on whose behalf it is responsible for operating, maintaining and improving the Strategic Road Network. The network is made up of England's motorways and all-purpose trunk roads (the major A-roads), and the existing A12 is part of the trunk road network for which the Applicant is responsible. Following construction of the proposed scheme, parts of the existing A12 will be de-trunked and placed in the responsibility of the local highways authority, and the Applicant will be responsible for operating, maintaining and, under its general statutory powers, improving the new route of the proposed scheme.

1.4 Structure

1.4.1 The structure of the remainder of this report is as follows:

- Chapter 2: Baseline data and model development
- Chapter 3: Current network performance and future network performance without the proposed scheme
- Chapter 4: Future network performance – with the proposed scheme – SRN
- Chapter 5: Future network performance – with the proposed scheme – LRN
- Chapter 6: Future network performance – the proposed scheme under construction
- Chapter 7: Road safety
- Chapter 8: Sustainable transport
- Chapter 9: Summary and conclusions

Appendices provided as separate documents:

- Appendix A: Junction Modelling Results Summary
- Appendix B: Link Flow Diagrams
- Appendix C: Flow diagrams – communities and A12 mainline
- Appendix D: Construction Traffic Diagrams
- Appendix E: Junction Modelling Technical Notes – Overarching Vissim Modelling Methodology
- Appendix F: Junction Modelling Technical Notes – A12 junctions
- Appendix G: Junction Modelling Technical Notes – Local Road Junctions

2. Baseline data and model development

2.1 Overarching methodology

2.1.1 A traffic model has been developed using industry-standard SATURN software to identify the study area and to assess the likely impacts of the proposed scheme. Forecast traffic flows with and without the proposed scheme in place have been used to identify those communities likely to see a significant increase or decrease in traffic, or no significant change. For those communities likely to experience a significant increase in traffic, key junctions have been identified and assessed. In addition, the existing and proposed junctions on the A12 have also been assessed, including those affected by the construction phase. The outputs from the traffic model have been used as inputs into the assessments described within this report.

2.2 Overview of baseline data and model development

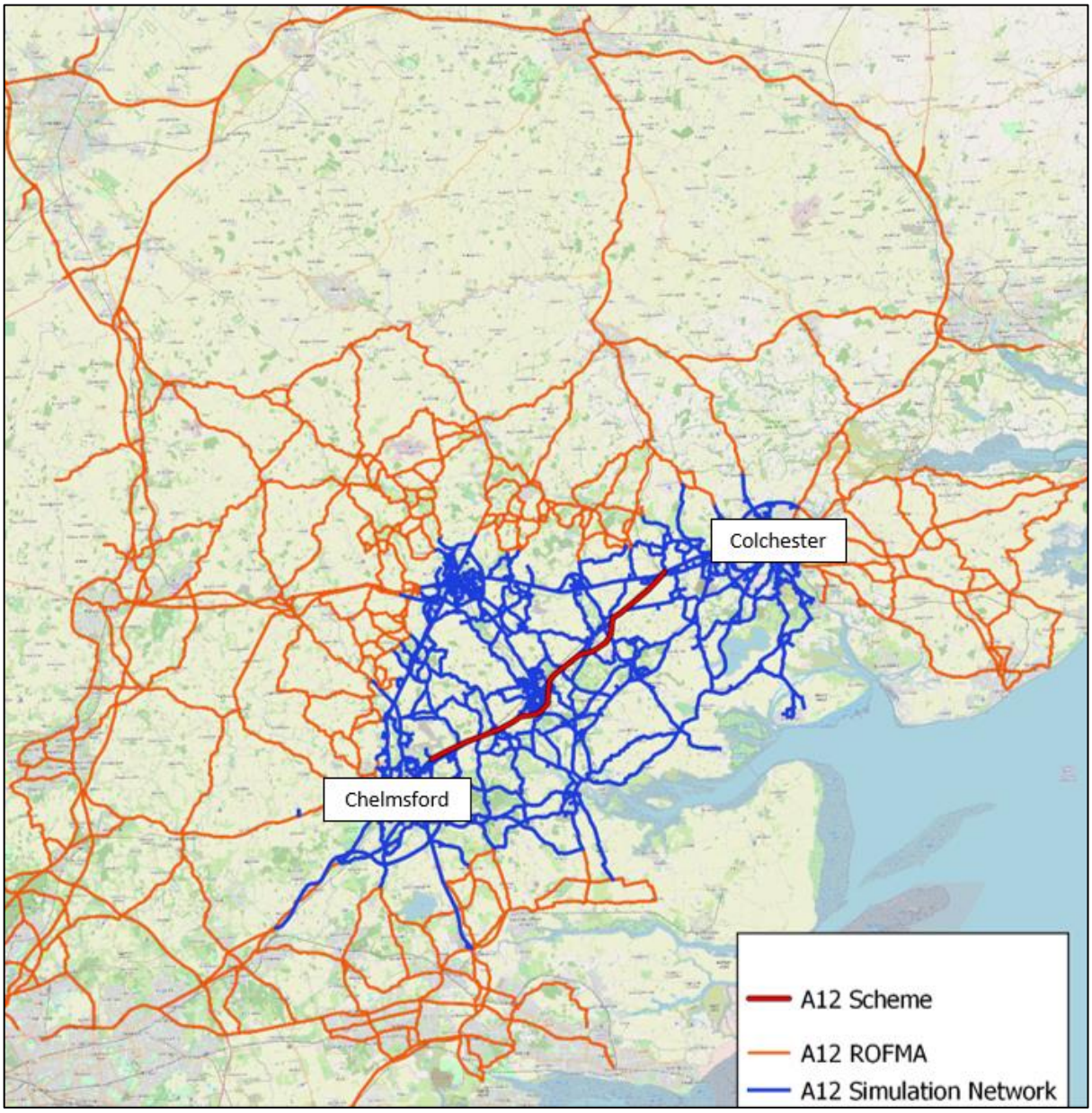
2.2.1 This chapter sets out the details of the baseline data and development of the traffic model used to test the proposed scheme, including:

- the study area
- baseline data collection
- model development process
- junction model development
- forecast years and scenarios

2.3 Study area

2.3.1 The study area for the traffic model, which uses the industry-standard SATURN software, covers the area directly affected by the proposed scheme on both the SRN and on the LRN. Plate 2.1 shows the simulation area (where the greatest impacts will occur) and surrounding buffer area (rest of the fully modelled area (ROFMA)) which links trips to other regions of the UK into the Fully Modelled Area. Further details regarding the study area can be found in the Combined Modelling and Appraisal Report [TR010060/APP/7.3].

Plate 2.1 Model network – buffer and simulation area



2.4 Baseline data collection

2.4.1 To ensure a traffic model is suitable for forecasting it needs to be calibrated and validated using a series of traffic count and journey time data. Therefore, the A12 base model was calibrated and validated using the data sources described below.

Traffic count data

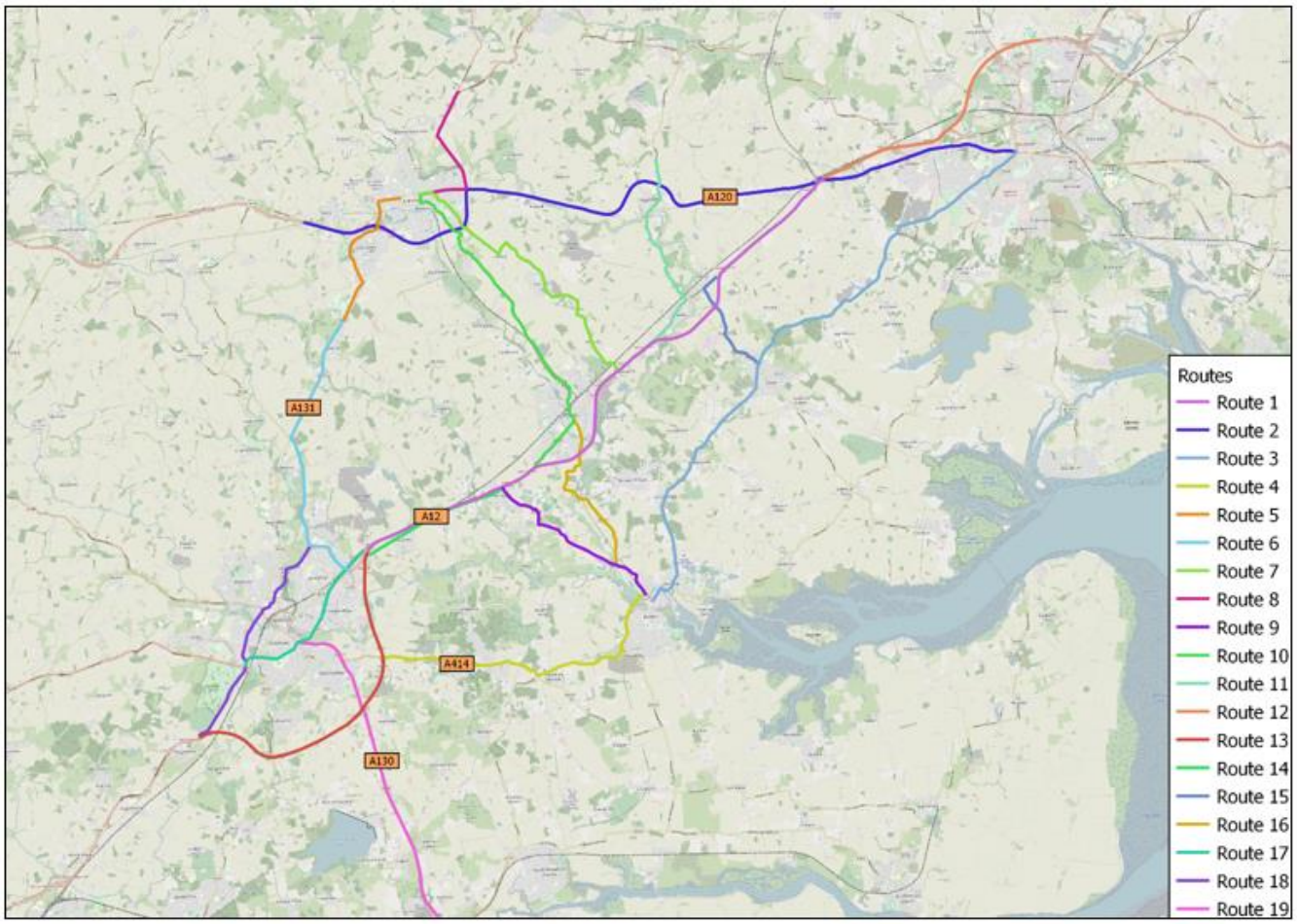
2.4.2 To inform the proposed scheme model updates, existing traffic count data was used from several sources, including data from Essex County Council.

2.4.3 The full list of count locations and summaries of key traffic information by direction is presented in the Combined Modelling and Appraisal Report [TR010060/APP/7.3].

Journey time data

2.4.4 A series of 19 key routes were identified, as shown in Plate 2.2Plate 2.2. The observed journey time data for these routes was compared with modelled data to ensure that model times closely resembled those experienced on the ground. The routes cover main roads through the proposed scheme area of detailed modelling.

Plate 2.2 Journey time routes



2.5 SATURN model development

2.5.1 The starting point for the A12 SATURN base model was the A120 traffic model, which built upon National Highways' South East Regional Traffic Model (SERTM). The A120 traffic model has been extended to provide an area of detailed modelling appropriate for the proposed scheme.

2.5.2 The A120/SERTM model base year is 2015. However, the A12 base year model represents 2019, so the demand was also adjusted using standard industry practices, further details of which can be found in the Combined Modelling and Appraisal Report [TR010060/APP/7.3].

2.5.3 The base model has been calibrated and validated to a compliant level for its intended use for future year forecasting. Further details of the development and validation can also be found in the Combined Modelling and Appraisal Report [TR010060/APP/7.3].

2.5.4 The model segregates trips by vehicle type and trip purpose, as summarised in Table 2.1.

Table 2.1 Purpose, user and vehicle class classification

Purpose	User class (UC)	Vehicle class (VC)
Car (employer's business)	UC1	VC1
Car (commute)	UC2	
Car (other)	UC3	
Light goods vehicle	UC4	VC2
HGV	UC5	VC3

2.5.5 The A12 base model represents peak hours, the times of which were derived from analysis of traffic count data. The three modelled hours are as follows:

- AM peak hour (07:30–08:30)
- Average weekday IP hour (10:00–16:00)
- PM peak hour (17:00–18:00)

2.5.6 Additionally, in order to demonstrate the long-term impacts of the proposed scheme, three forecast years have been modelled:

- The first forecast year is 2027, the opening year of the proposed scheme.
- The second forecast year is 2042, 15 years after the proposed scheme opening.
- A third forecast year of 2051, the final year for which National Trip End Model (Department for Transport, 2017)traffic growth forecasts are available.

2.5.7 As well as the proposed scheme itself, other transport schemes are likely to be constructed by the time of the A12 model's forecast years. For each forecast year, a list of committed highway schemes was drawn up in conjunction with the relevant local highway authorities. In line with the Transport Analysis Guidance (Department for Transport, 2021), only schemes that have a sufficient certainty of being realised have been included in the forecast networks. A list of potential future transport schemes was collated into an 'Uncertainty Log', categorised by

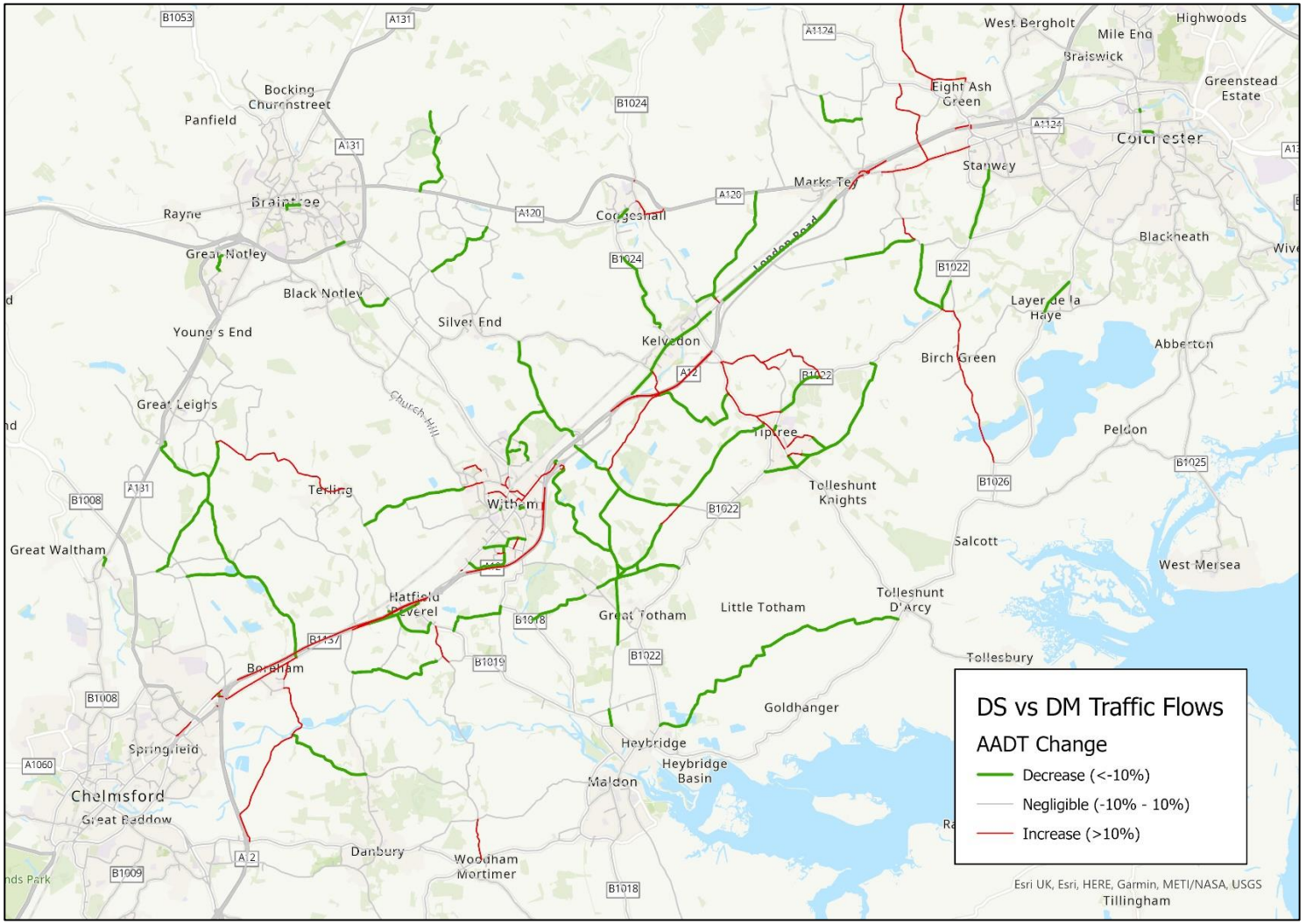
how likely they are to be built. Relevant schemes were then coded into the transport model.

2.5.8 Full details of the development of the Uncertainty Log and the coding of transport schemes into the model, as well as the creation of the forecast demand, can be found in the Combined Modelling and Appraisal Report [TR010060/APP/7.3].

2.6 Modelled traffic flow changes

2.6.1 Forecast flows with and without the proposed scheme in place have been compared to identify where there are likely to be significant changes in flows with the introduction of the proposed scheme. Plate 2.3 below shows the percentage difference in the 2027 Annual Average Daily Traffic (AADT) flows with and without the proposed scheme in place, with similar graphics presented for 2042 and the AM and PM peak hours in Appendix B, as well as more detailed graphics presenting the traffic levels on both the A12 and some local roads in Appendix C.

Plate 2.3 Change in AADT traffic flows (with proposed scheme (DS) vs without proposed scheme (DM))



2.6.2 The following communities are likely to experience a decrease in traffic with the proposed scheme in place:

- Kelvedon
- Hatfield Peverel
- Rivenhall End
- Easthorpe
- Wickham Bishops
- Smythe's Green
- Little Braxted
- Russell Green

2.6.3 The following communities are likely to experience no significant increase or decrease in traffic:

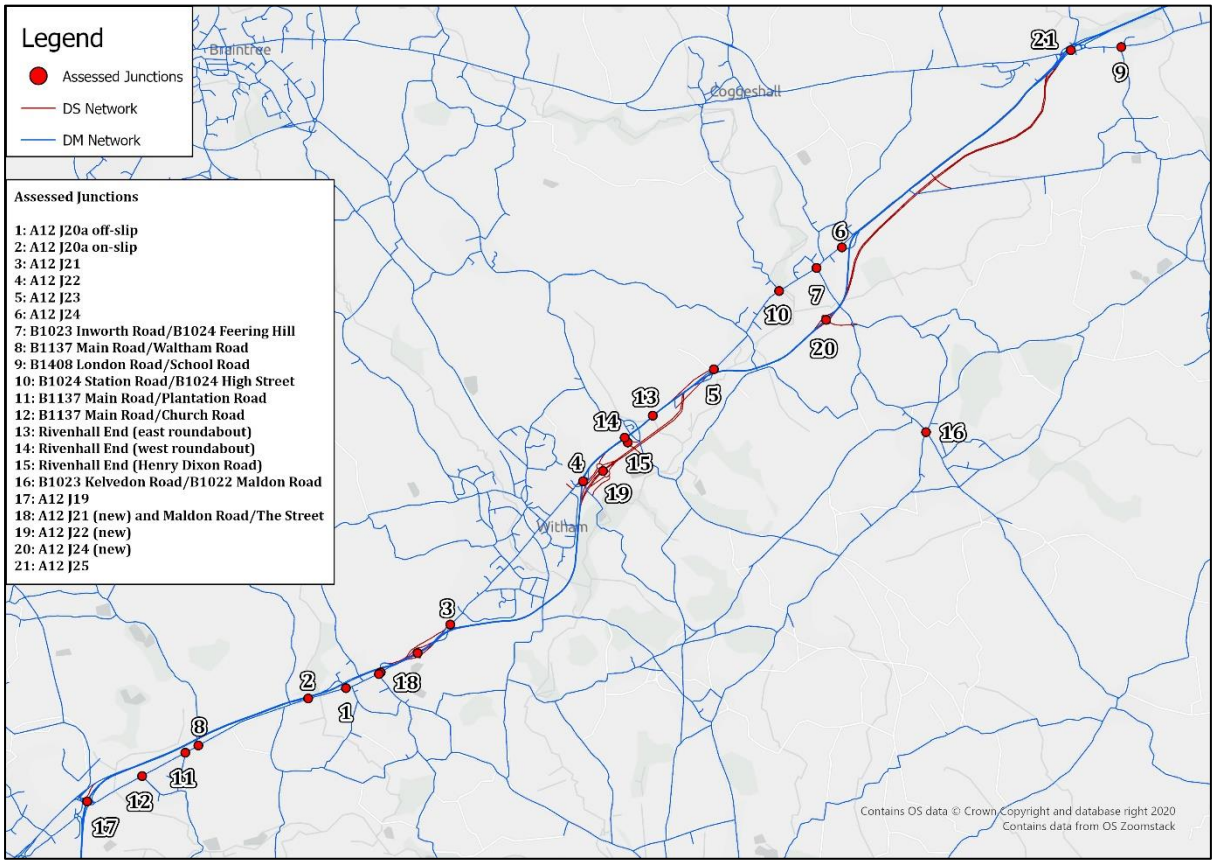
- Braintree
- Witham
- Chelmsford
- Colchester
- Marks Tey
- Coggeshall
- Great Totham
- Great Braxted
- Maldon
- Danbury

2.6.4 The following communities are likely to experience an increase in traffic:

- Boreham
- Copford
- Messing
- Tiptree
- Inworth

2.6.5 The junctions which have been assessed are shown in Plate 2.4. They are located either on the A12 or on the LRN.

Plate 2.4 Junction modelling assessment locations



2.7 Junction model development

2.7.1 To assess key junctions in the study area for their current performance and future performance for this TA, rather than solely using the outputs from the SATURN traffic model described above, local junction modelling has been undertaken. Depending on each individual junction type, the modelling has been developed in the following industry-standard software packages:

- Junctions 9 (ARCADY & PICADY)
- LinSig
- Vissim

2.7.2 The junction modelling assessments have used traffic flow outputs from the SATURN traffic models as their basis. Where relevant, traffic flows from observed junction turning counts have also been utilised for further robustness.

2.7.3 Each junction assessment is presented in a Technical Note outlining its full methodology and results, which can be found in Appendices F and G. There is also a Technical Note which details the approach to Vissim junction modelling which can be found in Appendix E.

2.7.4 The results of the junction modelling are also summarised in the chapters of this TA which follow.

2.8 Summary

2.8.1 A traffic model has been developed, using industry-standard SATURN software, to identify the study area and to assess the likely impacts of the proposed scheme. Forecast traffic flows with and without the proposed scheme in place have been used to identify those communities likely to see a significant increase or decrease in traffic, or no significant change. For those communities likely to experience a significant increase in traffic, key junctions have been identified and assessed. In addition, the existing and proposed junctions on the A12 have also been assessed, including those affected by the construction phase. The outputs from the traffic model have been used as inputs into the assessments described within this report.

2.8.2 The starting point for the A12 SATURN base model was the National Highways' SERTM. The A12 traffic model has an area of detailed modelling appropriate for the proposed scheme.

2.8.3 In order to demonstrate the long-term impacts of the proposed scheme, three forecast years have been modelled, namely 2027 (current programmed opening year), 2042 (15 years after opening) and 2051 (final year for which traffic growth forecasts are available).

2.8.4 Communities expected to experience a decrease in traffic include Kelvedon, Hatfield Peverel and Rivenhall End; those likely to experience no significant increase or decrease include Braintree, Witham, Chelmsford, Colchester, Marks Tey, Maldon and Danbury; while those expected to experience an increase in traffic include Boreham, Copford, Messing and Tiptree.

2.8.5 For the purposes of this TA, junction models have also been developed using industry-standard software to assess key junctions in the study area for their current and future performance, including junctions on the A12 and on the LRN. The junction modelling assessments have used traffic flow outputs from the SATURN traffic models as their basis. Where relevant, traffic flows from observed junction turning counts have also been utilised for further robustness.

3 Current network performance and future network performance without the proposed scheme

3.1 Overview

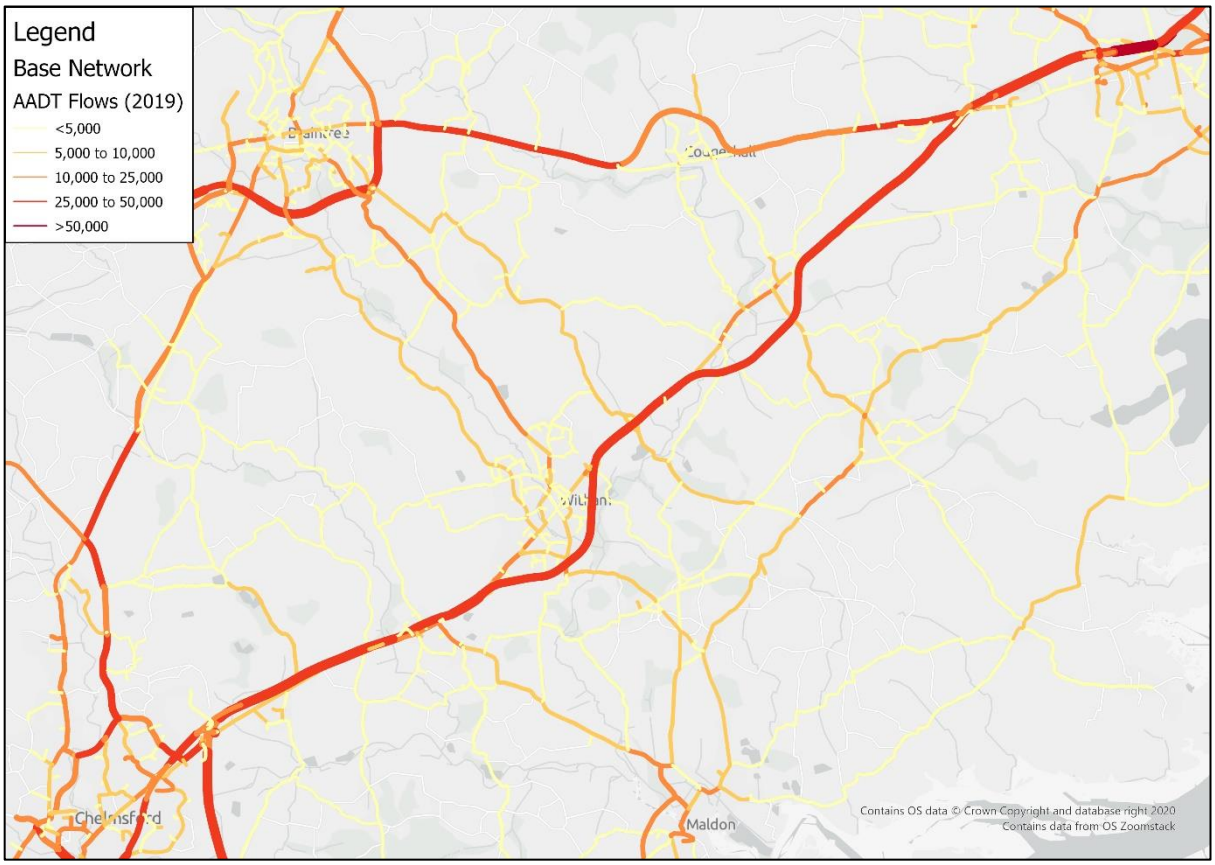
3.1.1 This chapter sets out an overview of the current network performance and future network performance without the proposed scheme, both on the existing A12 (junction 19 to junction 25) and the LRN in the study area. The traffic flows on both the SRN and LRN are presented, along with the results of the junction modelling.

3.2 Current operational performance – traffic flows and conditions

Current traffic flows

3.2.1 Plate 3.1 shows the current AADT flows as of 2019. The traffic flows have been taken from the SATURN traffic models and are presented in vehicles. Similar graphics which show the AM and PM peak hour flows are included in Appendix B

Plate 3.1 Current traffic flows – 2019 AADT



3.2.2 There are high levels of flow along the A12 between junction 19 and junction 25, particularly in between junction 20b and junction 21. The highest levels of flow on the LRN close to the A12 include the A130, A131 and A120, as well as within the communities of Hatfield Peverel and Kelvedon.

Current conditions

3.2.3 To put the above traffic flows into context, Plate 3.2 and Plate 3.3 show the levels of congestion for the AM and PM peak hours (2019). This current level of traffic is extremely high for a two-lane dual carriageway. If a new road was being built today, the current level of traffic is either close to or exceeds the maximum recommended limit for what a two-lane road can support.

3.2.4 The plates show how close the current morning and evening rush hour traffic is to the theoretical capacity of the road. Much of the road is either close to or beyond this capacity in either the morning or evening rush hour. As the road has gotten closer to its capacity, queues and delays have become more regular and severe, and are expected to continue to increase in the future. Road users experience increased journey times, as well as journey times which are difficult to predict from day to day.

Plate 3.2 Congestion on the A12 (2019 AM peak hour)

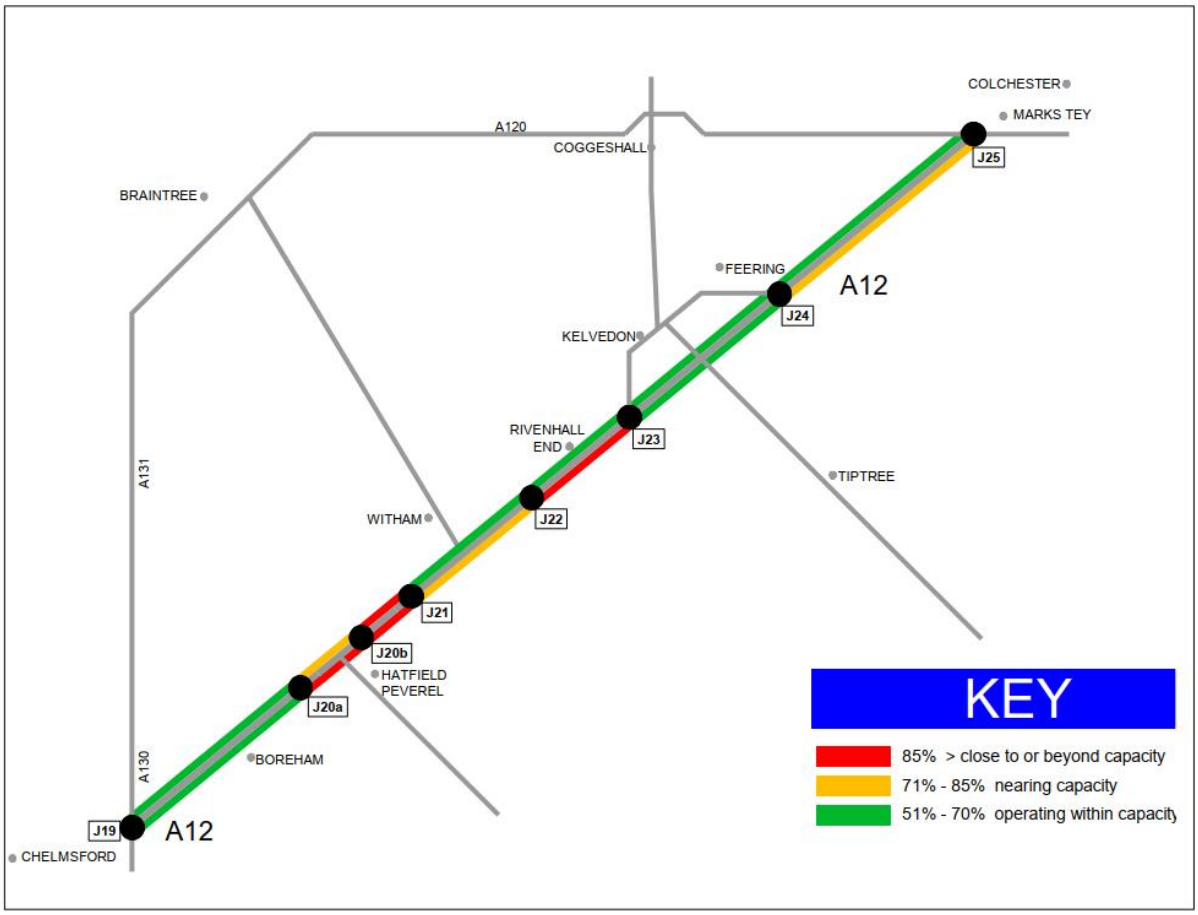
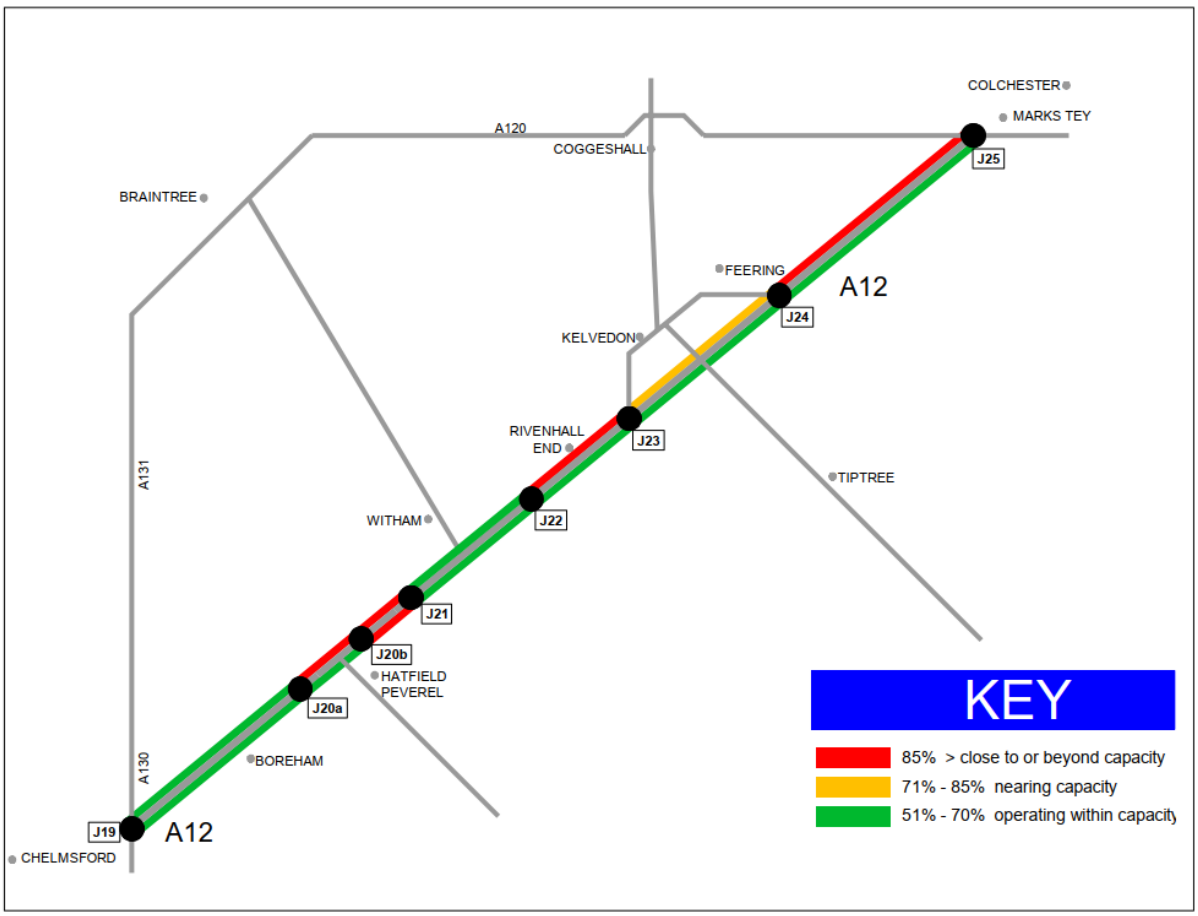


Plate 3.3 Congestion on the A12 (2019 PM peak hour)

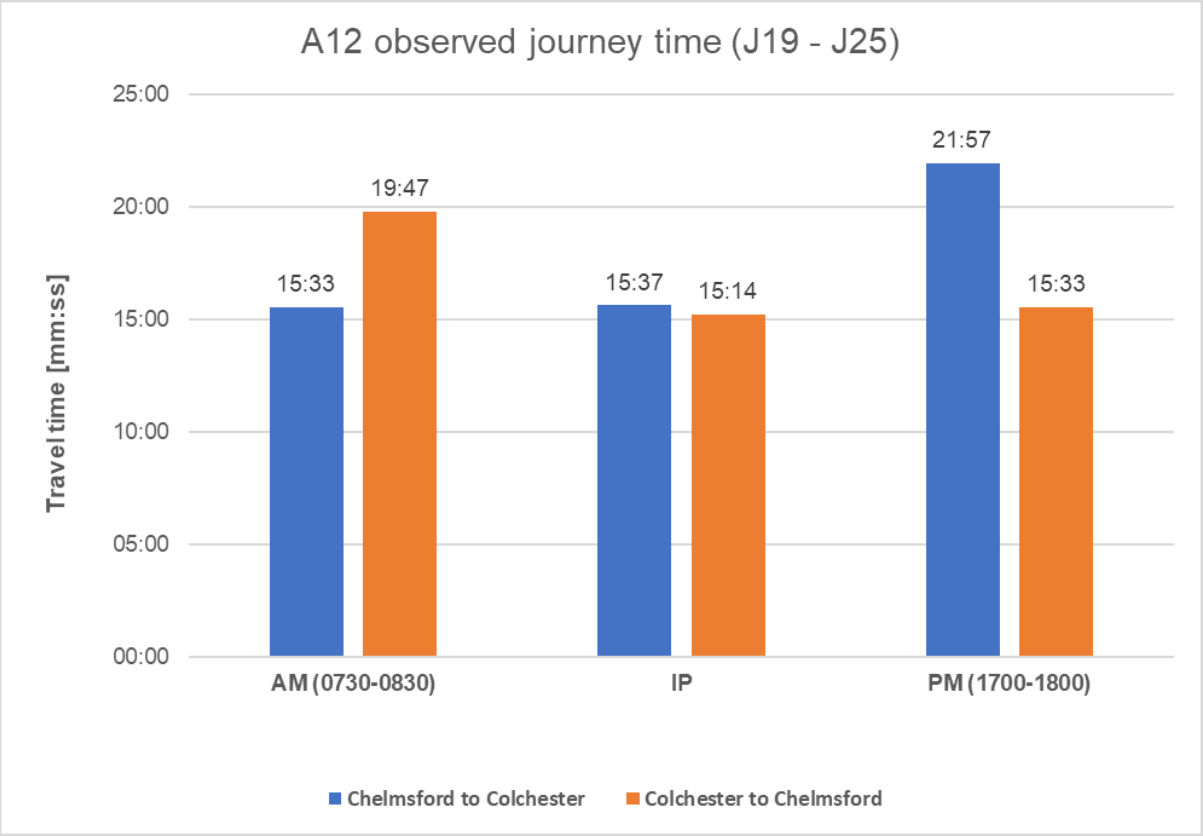


Current journey times and reliability

3.2.5 Due to the high level of traffic for a two-lane dual carriageway, all sections of the A12 between junction 19 and junction 25 are in the worst performing 10% of links on National Highways' network in the East of England (Highways Agency, 2014) in terms of Vehicle Hours Delay.

3.2.6 Based on observed 2019 journey time data, average journey times towards Chelmsford in the morning peak were almost four minutes slower than in the middle of the day. Journey times towards Colchester in the evening peak were over five minutes slower. Plate 3.4 shows these journey times visually.

Plate 3.4 Route journey time by time period



3.2.7 Further information on how the Applicant has dealt with the expected impact of COVID-19 on future traffic is provided in the Combined Modelling and Appraisal Report [TR010060/APP/7.3].

3.3 Current operational performance – existing A12 junctions

3.3.1 The existing A12 junctions have been assessed to establish their current levels of performance. Each of the junctions has been assessed using the relevant software listed in paragraph 2.7.1, depending on the junction type.

3.3.2 For the current operational performance, not all A12 junctions in the study area have been assessed, for the following reasons:

- There are some A12 junctions, such as junction 21 and junction 23, where only a small amount of traffic is making the conflicting movement at those junctions, and therefore detailed junction modelling of the current operation is not required.
- The current junction layout is different to that planned in the future. Junction 19 is currently being improved as part of separate development proposals and so the layout as of 2019 will be different to the future layout.

3.3.3 The results of the junction assessments are summarised in Appendix A (Junction Modelling Results Summary) and provided in full detail in Appendix F (Junction Modelling Technical Notes).

3.3.4 The results of the junction assessments for 2019 are summarised below, together with a brief description of the junctions themselves.

- A12 junction 20a on-slip: The junction assessed is a priority junction located on the B1137 to the west of Hatfield Peverel, for traffic turning right onto the A12 southbound on-slip. It is currently slightly under-capacity during the weekday AM peak hour and is significantly under-capacity in the PM peak hour. The queue of right-turning vehicles is able to be accommodated within the storage space available.
- A12 junction 20a off-slip: The junction assessed is a priority junction located on the B1137 in the centre of Hatfield Peverel, where traffic leaving the A12 meets the B1137 from Bury Lane. It is currently significantly under-capacity during the weekday AM peak hour and slightly under-capacity in the PM peak hour. The queues on the Bury Lane arm in question are small and the delays are less than one minute.
- A12 junction 20b off-slip: The junction assessed is a priority junction located on the B1137 at the eastern end of Hatfield Peverel, where traffic leaving the A12 southbound onto The Street gives way to traffic joining Wellington Bridge. This junction operates satisfactorily in both the weekday AM and PM peak periods, with delays of up to 20 seconds.
- A12 junction 25: This junction is located to the east of Marks Tey and has a dumbbell roundabout layout, with a large distance between the two roundabouts, and is unsignalised. It is currently operating satisfactorily in the weekday AM and PM peak hours. The western roundabout experiences delays of up to half a minute, while the eastern roundabout is less congested with delays of less than 20 seconds.

3.4 Current operational performance – LRN junctions

3.4.1 Similar to the junctions on the A12, key LRN junctions in the study area have also been assessed for their current performance. Only those junctions which could be significantly impacted by the proposed scheme have been assessed for their current operational performance.

3.4.2 Each of the junctions has been assessed using the relevant software listed in paragraph 2.7.1, depending on the junction type.

3.4.3 The results of the junction assessment are summarised in Appendix A (Junction Modelling Results Summary) and provided in full detail in Appendix G (Junction Modelling Technical Notes).

3.4.4 The results of the junction assessments for 2019 are summarised below, together with a brief description of the junctions themselves. Note that these

represent the results of a traffic modelling assessment, rather than being a description of current observed conditions. However, for several junctions observed traffic delay information was used to inform the development of the junction model.

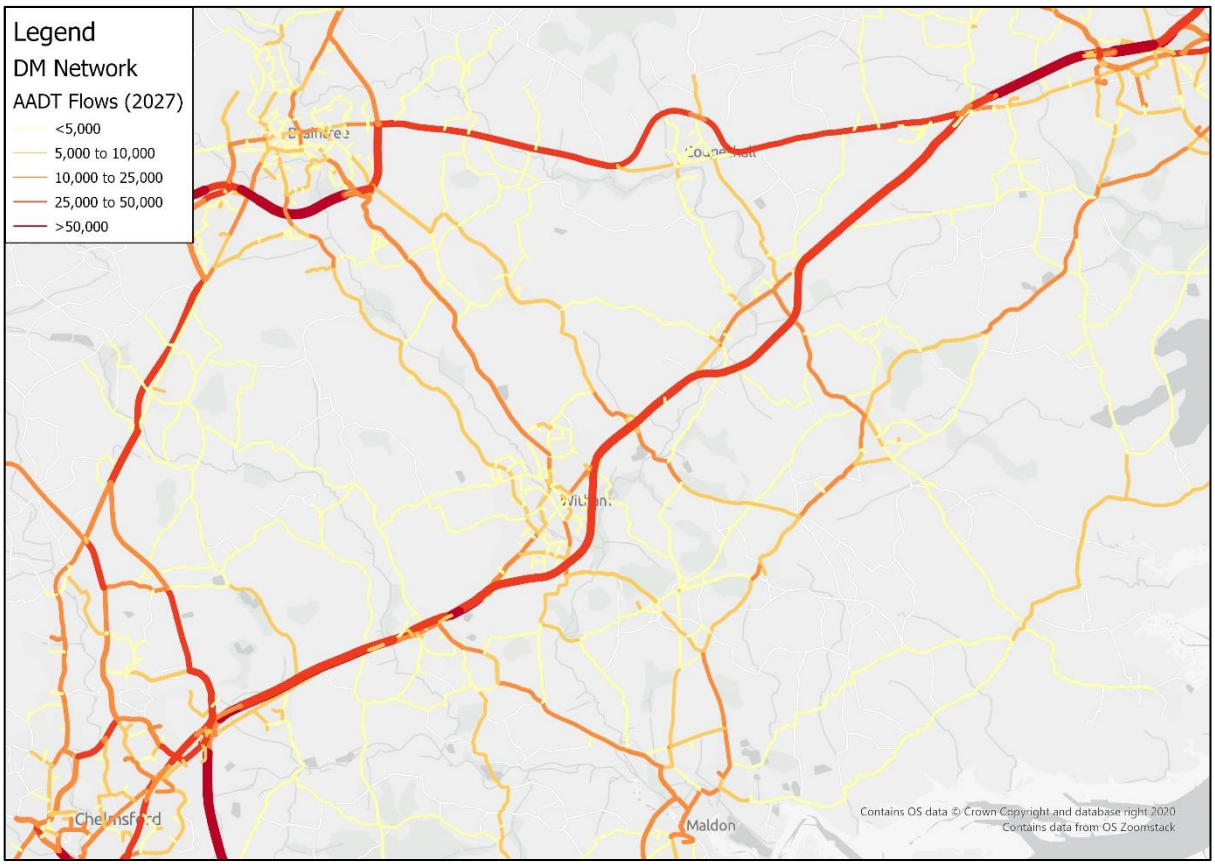
- B1023 Inworth Rd / B1024 Feering Hill ("Gore Pit"), Feering, near Kelvedon: This junction is a staggered crossroads and it is currently over-capacity on the Inworth Road arm in the weekday AM peak hour, and very close to capacity in the PM peak hour, with queues of up to 27 vehicles and delays of approximately five minutes. All other movements operate satisfactorily.
- B1024 Station Rd / B1024 High Street, Kelvedon: This junction is a crossroads without right-turn lanes from the major road into the minor arms, and it currently operates satisfactorily during both the weekday AM and PM peak hours, with minimal queues and delays generally of 20 seconds or less.
- B1408 London Rd / School Road, Copford: This is a priority junction with a right-turn lane from the major road into the minor arm, and it currently operates satisfactorily in both the weekday AM and PM peak hours.
- B1137 Main Road / Church Road, Boreham: This is a priority junction with a right-turn lane from the major road into the minor arm, and it currently operates satisfactorily with no queues and delays of approximately 10 seconds in the weekday AM and PM peak hours.
- B1137 Main Road / Plantation Road, Boreham: This is a priority junction with a narrow right-turn lane from the major road into the minor arm, and it currently operates satisfactorily, with no queues and delays of less than 20 seconds, during both the weekday AM and PM peak hours.
- B1137 Main Road / Waltham Road, Boreham: This is a priority junction without a right-turn lane from the major road into the minor arm, and it is currently over-capacity on the Waltham Road arm in the weekday AM and PM peak hours, with long queues and delays of over 10 minutes in the weekday AM peak hour (lower in the PM peak hour). All other arms operate satisfactorily, with minimal queues and delays.
- B1023 Kelvedon Rd / B1022 Maldon Road, Tiptree: This is a double mini-roundabout and currently operates with small queues and delays of up to 20 seconds.
- B1019 Maldon Rd / B1137 The Street, Hatfield Peverel: This is a mini-roundabout and currently operates satisfactorily in the weekday AM and PM peak hours. Maldon Road northbound experiences approximately half a minute of delay in the weekday AM peak hour and there are similar levels of delay on The Street eastbound in the weekday PM peak hour.
- Eastways, near junction 22: This is a signalised junction located on the B1389 immediately to the north-east of Witham which provides access

to the Eastways Industrial Estate. It is currently slightly under-capacity in the weekday AM peak hour but slightly over-capacity in the PM peak hour, but with queues of less than 20 vehicles and delays of 1 to 1.5 minutes.

3.5 Future traffic forecasts – without the proposed scheme – traffic flows

3.5.1 Plate 3.5 shows the future AADT flows without the proposed scheme in place in 2027. The forecast traffic flows have been taken from the SATURN traffic models and are presented in vehicles. Similar graphics which show the AM and PM peak hour flows, as well as forecast flows for 2042, are included in Appendix B.

Plate 3.5 Future traffic forecasts – 2027 AADT



3.5.2 The main point to note is that the traffic flows are generally forecast to increase across the whole of the area due to growth in levels of travel demand. The only exceptions to this are the following:

- Essex Regiment Way, Chelmsford – traffic forecast to reduce for this road as traffic switches to the proposed Chelmsford North East Bypass.

- B1137 Main Road and Waltham Road, Boreham – reduction due to traffic transfer onto the proposed Chelmsford North East Bypass.
- Baddow, Chelmsford – a reduction due to traffic transfer onto Essex Yeomanry Way approaching the Army and Navy Roundabout.
- Cressing Road, Braintree – a reduction due to traffic transfer onto B1018 due to the Millennium Way slip roads scheme.

3.6 Future year performance without the proposed scheme – existing A12 junctions

3.6.1 The existing A12 junctions have been assessed to establish their performance in the future without the proposed scheme in place for the forecast years 2027 and 2042, for both the weekday AM and PM peak hours. Each of the junctions has been assessed using Vissim junction modelling software.

3.6.2 For the future operational performance, not all A12 junctions in the study area have been assessed. Junctions 20a, 20b and 23 will be removed as part of the proposed scheme, so their future operational performance without the proposed scheme has also not been assessed. Junctions 21 and 24 will be rebuilt in a new location as part of the proposed scheme, so the future performance of the existing layouts without the proposed scheme has not been assessed.

3.6.3 The results of the junction assessment are summarised in Appendix A (Junction Modelling Results Summary) and provided in full detail in Appendix F (Junction Modelling Technical Notes).

3.6.4 The results of the junction assessments for the future year performance in 2027 and 2042 without the proposed scheme are summarised below:

- A12 junction 19: The junction is heavily congested, with delays of up to three minutes on the dumbbell roundabouts and up to 20 minutes at Boreham interchange roundabout (the roundabout to the south of the dumbbells) by 2027.
- A12 junction 25: The junction is operating satisfactorily in the weekday AM peak hour but operates slightly worse in the weekday PM peak hour, with delays of approximately half a minute in the weekday AM peak hour and up to two minutes in the weekday PM peak hour by 2027, and by 2042 these delays have increased to nearly one minute and three minutes respectively.

3.7 Future year performance without the proposed scheme – LRN junctions

3.7.1 Similar to the junctions on the A12, key LRN junctions have also been assessed for their future performance without the proposed scheme in place. Only junctions which are deemed of local significance or are likely to be impacted by the proposed scheme have been assessed in this scenario.

3.7.2 Each of the junctions has been assessed using one of three software types depending on the junction type: Junctions 9, LinSig or Vissim.

3.7.3 The results of the junction assessment are summarised in Appendix A (Junction Modelling Results Summary) and provided in full detail in Appendix G (Junction Modelling Technical Notes).

3.7.4 The results of the junction assessments show the following for the future year performance without the proposed scheme in place:

- B1023 Inworth Rd / B1024 Feering Hill, ("Gore Pit"), Feering, near Kelvedon: The operation of this junction worsens significantly by 2027 in both the weekday AM and PM peak hours, with queues of up to 70 vehicles and delays of up to 14 minutes on the B1024 Inworth Road arm. All other arms continue to operate satisfactorily. By 2042, both side roads are over-capacity, with queues of 120 vehicles and delays of 24 minutes on the B1024 Inworth Road arm.
- B1024 Station Road / B1024 High Street, Kelvedon: Approaching capacity by 2027 during the weekday AM peak hour, but operates satisfactorily in the weekday PM peak hour. By 2042, the junction is over-capacity in the AM peak hour and nearing capacity in the PM peak hour. Queues are generally less than 10 vehicles and delays are less than two minutes.
- B1408 London Road / School Road, Copford: The junction operates satisfactorily in both the AM and PM periods by 2027 and 2042.
- B1137 Main Road / Church Road, Boreham: The junction operates satisfactorily by both 2027 and 2042 in the AM and PM peak hours. There is minimal queueing and approximately 15 seconds of delay.
- B1137 Main Road / Plantation Road, Boreham: The junction operates satisfactorily in both 2027 and 2042 without the proposed scheme in place. There are minimal queues and delays of less than 30 seconds.
- B1137 Main Road / Waltham Road, Boreham: The junction operates satisfactorily in 2027, an improvement on the current situation due to reductions in traffic on Waltham Road due to the proposed Chelmsford North East Bypass being in place by that date. By 2042, however, the junction is significantly over-capacity in both the weekday AM and PM peak hours, with modelled queues of up to 130 vehicles and delays of approximately 27 minutes.
- B1023 Kelvedon Road / B1022 Maldon Road, Tiptree: This junction is under-capacity in the AM peak hour for both 2027 and 2042. However, in the PM peak hour the junction is approaching capacity by 2027 and over-capacity by 2042, with delays of up to two minutes.
- B1019 Maldon Road / B1137 The Street, Hatfield Peverel: This junction operates satisfactorily in the AM and PM peak hours in 2027. There are delays of approximately 40 seconds on Maldon Road northbound in the weekday AM peak hour and similar levels of delay on The Street eastbound in the weekday PM peak hour. By 2042, delays increase by an additional 10 seconds.

- Eastways, near junction 22: The junction is approaching capacity in 2027 during the weekday AM peak hour and is significantly over-capacity in the PM peak hour, with queues of approximately 20 vehicles (AM) and 80 vehicles (PM), and delays of approximately one minute (AM) and 6.5 minutes (PM). By 2042, the queues and delays are similar in the AM, albeit the junction is now slightly over-capacity, and the PM is significantly over-capacity with queues of 110 vehicles and delays of approximately eight minutes.

3.8 Summary

3.8.1 The current level of traffic on the A12 between junction 19 and junction 25 is extremely high for a two-lane dual carriageway and is close to or exceeds the maximum recommended limit for a new road of that type. The high volumes of traffic are such that the A12 is near to or close to capacity on numerous sections between junction 19 and junction 25.

3.8.2 As the A12 has gotten closer to its capacity, queues and delays have become more regular and severe, and are expected to continue to increase in the future. Road users experience increased journey times, as well as journey times which are difficult to predict from day to day. All sections of the A12 between junction 19 and junction 25 are in the worst performing 10% of links on National Highways' network in the East of England in terms of Vehicle Hours Delay (Highways Agency, 2014). Based on the 2019 journey time data, average journey times towards Chelmsford in the morning peak were almost four minutes slower than in the middle of the day. Journey times towards Colchester in the evening peak were over five minutes slower.

The results of the junction assessments for the current operation (2019) and for the future performance without the proposed scheme (2027 and 2042) on the SRN and LRN are summarised in the Table 3.1

3.8.3 .

Table 3.1 Summary of junction operation results – SRN and LRN – current and future performance without the proposed scheme in place

Junction		Software (key statistic used)	Current operation 2019		Future operation, without scheme 2027		Future operation, without scheme 2042	
			Weekday 07:30-08:30	Weekday 17:00-18:00	Weekday 07:30-08:30	Weekday 17:00-18:00	Weekday 07:30-08:30	Weekday 17:00-18:00
A12 J19	Generals Lane Roundabout (West)	Vissim (LOS)	N/A - current layout is changing to developer's layout		E	D	N/A - not assessed	
	Generals Farm Roundabout (East)	Vissim (LOS)			F	E	N/A - not assessed	
	Boreham Interchange (South)	Vissim (LOS)			F	E	N/A - not assessed	
A12 J20a off-slip		PICADY (RFC)	0.49	0.90	N/A - don't need to compare as not assessed in future 'with scheme' scenario			
A12 J20a on-slip		PICADY (RFC)	0.93	0.55	N/A - don't need to compare as not assessed in future 'with scheme' scenario			
A12 J20b off-slip		Vissim (LOS)	C	B	N/A - don't need to compare as not assessed in future 'with scheme' scenario			
A12 J21 (existing layout)		PICADY (RFC)	N/A - don't need to compare as not assessed in future 'with scheme' scenario					
A12 J21 (new layout)		Vissim (LOS)	N/A - new junction which doesn't exist yet					
A12 J22 (new layout)		Vissim (LOS)	N/A - new junction which doesn't exist yet					
A12 J23 (existing layout)		PICADY (RFC)	N/A - don't need to compare as not assessed in future 'with scheme' scenario					
A12 J24 (existing layout)		PICADY (RFC)	N/A - don't need to compare as not assessed in future 'with scheme' scenario					
A12 J24 (new layout)		Vissim (LOS)	N/A - new junction which doesn't exist yet					
A12 J25	Western Roundabout	Vissim (LOS)	C	C	C	E	D	F
	Eastern Roundabout	Vissim (LOS)	A	A	B	B	C	B
	London Road Roundabout	Vissim (LOS)	N/A - new junction which doesn't exist yet					
B1019 Maldon Rd / B1137 The Street (Hatfield Peverel)		Vissim (LOS)	C	C	C	D	D	D
B1023 Inworth Rd / B1024 Feering Hill aka "Gore Pit" (near		PICADY (RFC)	1.15	0.96	1.46	1.45	1.74	1.76
B1024 Station Rd / B1024 High St (Kelvedon)		PICADY (RFC)	0.69	0.40	0.91	0.81	1.01	0.93
B1023 Kelvedon Rd / B1022 Maldon Rd (Tiptree)		ARCADY (RFC)	0.70	0.80	0.72	0.94	0.79	1.04
B1408 London Rd / School Rd (Copford)		PICADY (RFC)	0.18	0.21	0.20	0.23	0.35	0.27
B1137 Main Road / Church Road (Boreham)		PICADY (RFC)	0.39	0.31	0.44	0.34	0.50	0.40
B1137 Main Road / Plantation Road (Boreham)		PICADY (RFC)	0.43	0.46	0.47	0.51	0.55	0.60
B1137 Main Road / Waltham Road (Boreham)		PICADY (RFC)	1.47	1.13	0.74	0.48	1.87	1.80
Rivenhall End west roundabout		ARCADY (RFC)	N/A - new junction which doesn't exist yet					
Rivenhall End east roundabout		ARCADY (RFC)	N/A - new junction which doesn't exist yet					
Rivenhall End - Henry Dixon Road		LinSig (PRC)	N/A - new junction which doesn't exist yet					
Eastways, near junction 22		LinSig (PRC)	10.2%	-8.4%	1.7%	-33.5%	-0.6%	-42.9%

Key showing operating condition:

RFC (ARCADY/ PICADY)	
>1	Over capacity
0.85-1	Approaching capacity
<0.85	Under capacity

PRC (LinSig)	
<0%	Over capacity
0%-15%	Approaching capacity
>15%	Under capacity

LOS (Vissim)	
F	Worst operating conditions
E	
D	
C	
B	
A	Best operating conditions

3.8.4 It can be seen that, on the SRN, junction 19 does not operate satisfactorily in the future without the proposed scheme in place. The Eastways junction near to junction 22 also does not operate satisfactorily. On the LRN, the vast majority of the junctions are below capacity in 2027 without the proposed scheme in place, and by 2042 the majority are still below capacity, the exceptions being the B1023 Inworth Road / B1024 Feering Hill ('Gore Pit') near Kelvedon, B1024 Station Road / B1024 High Street at Kelvedon, the B1023 Kelvedon Road / B1022 Maldon Road at Tiptree and the B1137 Main Road / Waltham Road at Boreham.

3.8.5 However, it should be noted that for the B1019 Maldon Road / B1137 The Street junction (Hatfield Peverel) and A12 junction 25, the classification of those junctions as being under capacity is based on the overall junction average. Some arms on those junctions have significant queues.

4 Future network performance – with the proposed scheme – SRN

4.1 Overview

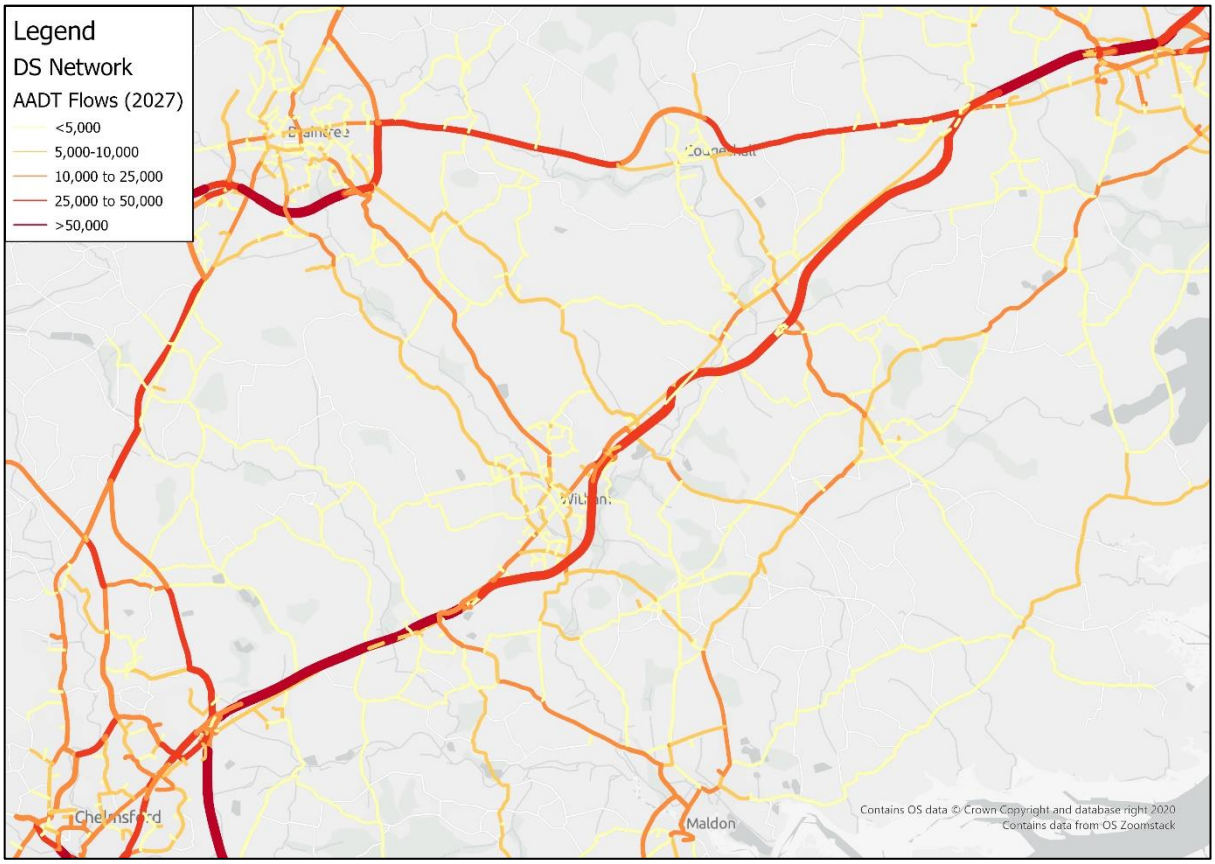
4.1.1 This chapter sets out the future network performance on the SRN with the proposed scheme in place, focusing on the A12 mainline and junctions between junction 19 and junction 25. Forecast traffic flows are presented, along with the results of the junction modelling.

4.1.2 The traffic flows presented in this chapter are derived from the same SATURN traffic models whose outputs have been used as inputs into the junction models.

4.2 Future traffic forecasts – with the proposed scheme – SRN

4.2.1 Plate 4.1 shows the future AADT flows with the proposed scheme in place in 2027. The forecast traffic flows have been taken from the SATURN traffic models and are presented in vehicles. Similar graphics which show the 2027 AM and PM peak hour flows, as well as flows for 2042, are included in Appendix B. Plate 2.3 above also shows the percentage difference in the AADT flows when comparing 2027 with and without the proposed scheme in place, with similar graphics again presented for 2042 and the AM and PM peak hours in Appendix B.

Plate 4.1 Future traffic forecasts – with proposed scheme 2027



4.2.2 Traffic is expected to reduce significantly on the two sections of the existing A12 that will be bypassed as part of the proposed scheme (between junction 22 and junction 23 at Rivenhall End and between junction 24 and junction 25). Traffic levels would increase on the A12 between junction 19 and junction 25 for sections which are not bypassed, as well as on the sections of the A12 on either side of the proposed scheme. This is because traffic would re-route onto the A12 away from other less suitable routes and because the increase in capacity on the proposed A12 would result in a general increase in trips (known as Variable Demand).

4.3 Future operational performance – with the proposed scheme – proposed A12 junctions

4.3.1 The A12 junctions between junction 19 and 25 have been assessed for their performance in the future with the proposed scheme in place for the forecast years of 2027 and 2042, for both the AM and PM peak hours. Each of the junctions has been assessed using Vissim junction modelling software.

4.3.2 As part of the proposed scheme, junctions 20a, 20b and 23 will be removed. These junctions have therefore not been assessed. Junctions 21 and 24 will be rebuilt in new locations, so their new layouts have been assessed instead of their existing layouts.

4.3.3 The results of the junction assessment are summarised in Appendix A (Junction Modelling Results Summary) and provided in full detail in Appendix F (Junction Modelling Technical Notes).

4.3.4 The results of the junction assessments show the following for the future year performance with the proposed scheme in place:

- A12 junction 19: This proposed junction operates satisfactorily overall in both 2027 and 2042. There are queues of up to one minute by both years, but this is an improvement on the situation without the proposed scheme in which the junction is heavily congested.
- A12 junction 21: This proposed junction operates satisfactorily, with delays of up to 20 seconds by 2027 and 40 seconds by 2042.
- A12 junction 22 (proposed layout): This proposed junction operates satisfactorily, with delays of up to 30 seconds in 2027 and 50 seconds by 2042.
- A12 junction 24: This proposed junction operates satisfactorily in both the weekday AM and PM peak hours in 2027 and 2042.
- A12 junction 25: This proposed junction operates satisfactorily overall in both the weekday AM and PM peak hours in both 2027 and 2042. The eastern dumbbell operates better than the western dumbbell, with delays of up to one minute for the latter in 2027 and 2042.

4.4 Summary

4.4.1 The SATURN model has been used to estimate future traffic flows with the proposed scheme in place. Traffic is expected to reduce significantly on the two sections of the existing A12 that will be bypassed as part of the proposed scheme (between junction 22 and junction 23 at Rivenhall End and between junction 24 and junction 25). Traffic levels would increase on the A12 between junction 19 and junction 25 for the sections which are not bypassed, as well as on the sections of the A12 on either side of the proposed scheme. This is because traffic would re-route onto the A12 away from other less suitable routes and because the increase in capacity on the proposed A12 would result in a general increase in trips (known as Variable Demand).

4.4.2 The results of the junction assessments for 2027 and 2042 for the SRN are summarised in Table 4.1.

Table 4.1 Summary of junction operation results – SRN – with proposed scheme in place

Junction		Software (key statistic used)	Future operation, with scheme 2027		Future operation, with scheme 2042	
			Weekday 07:30-08:30	Weekday 17:00-18:00	Weekday 07:30-08:30	Weekday 17:00-18:00
A12 J19	Generals Lane Roundabout (West)	Vissim (LOS)	C	B	C	C
	Generals Farm Roundabout (East)	Vissim (LOS)	C	C	C	C
	Boreham Interchange (South)	Vissim (LOS)	C	B	C	C
A12 J20a off-slip		PICADY (RFC)	Not assessed - J20a removed as part of scheme			
A12 J20a on-slip		PICADY (RFC)	Not assessed - J20a removed as part of scheme			
A12 J20b off-slip		Vissim (LOS)	Not assessed - J20b removed as part of scheme			
A12 J21 (existing layout)		PICADY (RFC)	Not assessed - J21 moved to new location as part of scheme			
A12 J21 (new layout)	Northern Dumbbell	Vissim (LOS)	A	A	B	C
	Southern Dumbbell	Vissim (LOS)	A	A	A	A
A12 J22 (new layout)	Eastern Dumbbell	Vissim (LOS)	A	A	A	A
	Western Dumbbell	Vissim (LOS)	C	C	C	C
A12 J23 (existing layout)		PICADY (RFC)	Not assessed - J23 removed as part of scheme			
A12 J24 (existing layout)		PICADY (RFC)	Not assessed - J24 moved to new location as part of scheme			
A12 J24 (new layout)	Western Dumbbell	Vissim (LOS)	A	A	A	A
	Eastern Dumbbell	Vissim (LOS)	A	A	A	A
	Inworth Road Roundabout	Vissim (LOS)	A	A	A	A
A12 J25	Western Roundabout	Vissim (LOS)	C	D	D	D
	Eastern Roundabout	Vissim (LOS)	A	A	B	B
	London Road Roundabout	Vissim (LOS)	A	A	A	A

Key showing operating condition:

RFC (ARCADY/ PICADY)	
>1	Over capacity
0.85-1	Approaching capacity
<0.85	Under capacity

LOS (Vissim)	
F	Worst operating conditions
E	
D	
C	
B	
A	Best operating conditions

4.4.3 It can be seen that all of the proposed junctions operate satisfactorily in both 2027 and 2042.

5 Future network performance – with the proposed scheme – LRN

5.1 Overview

5.1.1 This chapter sets out the future network performance on the LRN with the proposed scheme in place. Forecast traffic flows are presented, along with the results of the junction modelling.

5.1.2 The traffic flows presented are derived from the same SATURN traffic models whose outputs have been used as inputs into the junction models.

5.1.3 The majority of the LRN in the area surrounding the A12 is unlikely to see a significant increase in traffic with the proposed scheme in place.

5.2 Future traffic forecasts – with the proposed scheme – LRN

5.2.1 As presented earlier in this TA, Plate 4.1 shows the future AADT flows with the proposed scheme in 2027, and Plate 2.3 also shows the percentage difference in the AADT flows when comparing 2027 flows with and without the proposed scheme in place. The traffic flows have been taken from the SATURN traffic models and are presented in vehicles. Similar graphics which show the 2027 AM and PM peak hour flows, as well as flows for 2042 are included in Appendix B.

5.2.2 The figures show that traffic is expected to generally reduce on the LRN, but there is forecast to be some increases in traffic on roads leading towards the A12 junctions, such as the B1023 north of Tiptree, B1137 in Boreham and the B1408 at Copford.

5.2.3 The communities that are likely to have an increase in traffic with the proposed scheme in place were identified in Chapter 2 and include:

- Boreham
- Copford
- Messing
- Tiptree
- Inworth

5.2.4 Further information on the traffic changes due to the proposed scheme in these locations is provided in Appendix C. Although traffic is predicted to increase in these locations, it is considered that each location can safely accommodate the increase in traffic. The impact that this extra traffic would have on noise and air quality in these locations is considered within the Environmental Statement [TR010060/APP/6.1], specifically Chapter 6 (air quality) and Chapter 12 (noise and vibration). The impact on the population and human health is considered within Chapter 13 of the Environmental Statement.

5.2.5 For most of these communities with traffic increases, junction modelling has been undertaken to quantify the traffic impact in terms of queues and delays.

This has been undertaken for the same junctions assessed in section 3.7 above. The results of this assessment are shown in section 5.3.

5.2.6 However, there are two communities mentioned above which are likely to experience an increase in traffic but have no key junctions within them modelled, namely Messing and Inworth. The impact of the proposed scheme on these communities is discussed below:

- Messing is located to the north of Tiptree. Kelvedon Road / Harborough Hall Road passes through Messing and in places is a narrow single-track country lane with passing places. Consequently, existing traffic flows are very low. The proposed new junction 24 will be located close to the western end of Kelvedon Road. The SATURN model predicts that some traffic from the B1022 west of Messing will start to travel through Messing as a short-cut to reach the B1023 Inworth Road and the new junction 24. The model predicts there will be increases in flows on Kelvedon Road through Messing from 38 vehicles per hour without the scheme (two-way flows in 2027) to 133 vehicles per hour with the scheme in the weekday AM peak hour. In the PM peak hour it would increase from 45 to 109 vehicles per hour. In terms of daily traffic, it is predicted to increase from 410 to 1,300 vehicles per day. While the percentage increases are high, the absolute increases in traffic are low (less than an additional two vehicles per minute in peak hours). Traffic flows through Messing will therefore remain low even with the proposed scheme in place.
- Inworth is located on the B1023 between Kelvedon and Tiptree. The proposed junction 24 connects into the B1023 to the north of Inworth, and the SATURN model predicts that there will be increases in flows through Inworth from 784 to 1,111 (two-way) and from 846 to 1,132 (two-way) in 2027 in the weekday AM and PM peak hours respectively, and from 11,180 to 14,820 for daily flows (two-way). The increases in traffic through Inworth are therefore equivalent to approximately an additional five vehicles per minute in peak hours. Localised improvements to this section of Inworth Road would be provided as part of the proposed scheme. This includes widening at existing pinch-points to ensure two vehicles can safely pass each other.

5.2.7 It is also worth noting the predicted increase in traffic at Tiptree, as concerns were raised during consultation that additional traffic could be drawn through Tiptree once the proposed scheme is in place, such as from areas to the east between Tiptree and Colchester and/or from areas to the south-east between Tiptree and Tollesbury. Comparison of future flows with and without the proposed scheme in place as predicted by the SATURN traffic model shows that this is not forecast to happen. However, there are likely to be changes in flows associated with traffic that is to/from Tiptree itself changing route to use junction 24, with the B1023 forecast to get a small increase in traffic in Tiptree, and the B1022 a small decrease. For this reason, the double mini-roundabout

where the B1023 and B1022 meet is one of the junctions that has been assessed in this report.

5.3 Future operational performance – with the proposed scheme – existing local communities and junctions

5.3.1 The junction modelling has been undertaken for the forecast years of 2027 and 2042, and for both the AM and PM peak hours. Each of the junctions has been assessed using the relevant software listed above in paragraph 2.7.1, depending on the junction type.

5.3.2 The results of the junction assessment are summarised in Appendix A (Junction Modelling Results Summary) and provided in full detail in Appendix G (Junction Modelling Technical Notes).

5.3.3 The results of the junction assessments show the following for the future year performance with the proposed scheme in place:

- B1023 Inworth Rd / B1024 Feering Hill ("Gore Pit"), Feering, near Kelvedon: This junction operates satisfactorily in the weekday AM peak hour in 2027, but in the PM peak hour it continues to operate over-capacity. There is an improvement with the proposed scheme in place compared to without the proposed scheme. By 2042, the junction is significantly over-capacity in both peak hours, but with an improvement when compared to the scenario without the proposed scheme in place.
- B1024 Station Road / B1024 High Street, Kelvedon: This junction sees an improvement in its operation with the proposed scheme in place compared to without the proposed scheme. The junction operates satisfactorily with the proposed scheme in place for both the AM and PM peak hours by 2027, with minimal queues and delays of less than 15 seconds and 20 seconds, respectively, by 2042.
- B1408 London Road / School Road, Copford: This junction operates satisfactorily with the proposed scheme in place in both the AM and PM hours in both 2027 and 2042.
- B1137 Main Road / Church Road, Boreham: This junction operates satisfactorily in both 2027 and 2042 in the AM and PM peak hours. There is minimal queueing and approximately 20 seconds of delay.
- B1137 Main Road / Plantation Road, Boreham: This junction operates satisfactorily in 2027 with minimal queues and up to 40 seconds of delay. However, by 2042 the junction is close to capacity with the proposed scheme in place in the AM peak hour, but the queues are only approximately 10 vehicles and delays up to two minutes. In the PM peak hour, the junction operates satisfactorily in 2042.
- B1137 Main Road / Waltham Road, Boreham: This junction operates satisfactorily in 2027 with the proposed scheme in place. By 2042, the

junction is significantly over-capacity in both the weekday AM and PM peak hours, with queues of up to 100 vehicles and delays of over 20 minutes. However, this is an improvement when compared to the scenario without the proposed scheme in place.

- Rivenhall End East roundabout: This proposed junction operates satisfactorily in both 2027 and 2042 in the weekday AM and PM peak hours, with minimal queues and delays of less than five seconds.
- Rivenhall End West roundabout: This proposed junction operates satisfactorily by both 2027 and 2042 in the AM and PM peak hours, with minimal queues and delays of less than 10 seconds.
- Rivenhall End – Henry Dixon Road: This proposed signalised junction operates satisfactorily in 2027 for both the weekday AM and PM peak hours, but by 2042 the junction is nearing capacity.
- B1023 Kelvedon Road / B1022 Maldon Road, Tiptree: This junction operates satisfactorily in the weekday AM peak hour in both 2027 and 2042 with the proposed scheme in place. However, in the PM peak hour it is approaching capacity by 2027 and over-capacity by 2042, with delays of up to two minutes and queues of 30 vehicles. However, its performance does not worsen due to the proposed scheme compared to how it would perform without the scheme.
- B1019 Maldon Road / B1137 The Street, Hatfield Peverel: This junction operates satisfactorily in both the weekday AM and PM peak hours. The weekday PM peak hour sees an overall improvement with the proposed scheme when compared to the 'without scheme' scenario, with delays reducing by up to 15 seconds in 2027 and up to 10 seconds in 2042 on The Street eastbound. However, the queues on the Maldon Road arm get slightly worse compared to the 'without scheme' scenario.
- Eastways, near junction 22: This junction operates under-capacity in the AM peak hour for both 2027 and 2042, but the junction is slightly over-capacity in the PM peak hour, with delays of up to 1.5 minutes by 2027 and 3.5 minutes by 2042.

5.3.4 Although some junctions are expected to be over-capacity with the proposed scheme in place, it should be noted that the assessment undertaken is generally a worst-case scenario, because the majority of the software used synthesises a 'peak within the peak hour'. In reality, flows are likely to be relatively uniform across the weekday AM and PM peak hours, so the queues and delays shown are likely to be over-estimates.

5.4 Summary

5.4.1 Traffic is generally expected to reduce on the LRN, with some increases in traffic on roads leading into the A12 junctions such as the B1023 north of Tiptree and the B1408 at Copford. Some communities such as

Boreham, Copford, Messing, Tiptree and Inworth will also see an increase in traffic.

5.4.2 The results of the junction assessments for 2027 and 2042 for the LRN are summarised in Table 5.1.

Table 5.1 Summary of junction operation results – LRN – with proposed scheme in place

Junction	Software (key statistic used)	Future operation, with scheme 2027		Future operation, with scheme 2042	
		Weekday 07:30-08:30	Weekday 17:00-18:00	Weekday 07:30-08:30	Weekday 17:00-18:00
B1019 Maldon Rd / B1137 The Street (Hatfield Peverel)	Vissim (LOS)	C	C	D	C
B1023 Inworth Rd / B1024 Feering Hill aka "Gore Pit" (near Kelvedon)	PICADY (RFC)	0.83	1.18	1.12	1.44
B1024 Station Rd / B1024 High St (Kelvedon)	PICADY (RFC)	0.58	0.67	0.64	0.74
B1023 Kelvedon Rd / B1022 Maldon Rd (Tiptree)	ARCADY (RFC)	0.66	0.93	0.68	1.03
B1408 London Rd / School Rd (Copford)	PICADY (RFC)	0.32	0.26	0.39	0.29
B1137 Main Road / Church Road (Boreham)	PICADY (RFC)	0.50	0.36	0.41	0.46
B1137 Main Road / Plantation Road (Boreham)	PICADY (RFC)	0.72	0.62	0.98	0.70
B1137 Main Road / Waltham Road (Boreham)	PICADY (RFC)	0.73	0.42	1.70	1.16
Rivenhall End west roundabout	ARCADY (RFC)	0.56	0.46	0.59	0.49
Rivenhall End east roundabout	ARCADY (RFC)	0.30	0.17	0.32	0.18
Rivenhall End - Henry Dixon Road	LinSig (PRC)	30.0%	31.7%	6.0%	10.3%
Eastways, near junction 22	LinSig (PRC)	20.0%	-12.4%	17.5%	-22.4%

Key showing operating condition:

RFC (ARCADY/ PICADY)	
>1	Over capacity
0.85-1	Approaching capacity
<0.85	Under capacity

PRC (LinSig)	
<0%	Over capacity
0%-15%	Approaching capacity
>15%	Under capacity

LOS (Vissim)	
F	Worst operating conditions
E	
D	
C	
B	
A	Best operating conditions

5.4.3 It can be seen that, on the LRN, the vast majority of the junctions are below capacity in 2027 with the proposed scheme in place, and by 2042 the majority are still below capacity, the exceptions being the B1023 Inworth Road / B1024 Feering Hill ('Gore Pit') near Kelvedon, the B1023 Kelvedon Road / B1022 Maldon Road at Tiptree, the B1137 Main Road / Waltham Road at Boreham and the Eastways junction near to junction 22. However, it should be noted that for the first, third and last of those four junctions, the operation improves with the proposed scheme in place compared to the situation without the proposed scheme in place. The operation of the second junction remains similar with and without the proposed scheme in place.

6 Future network performance – the proposed scheme under construction

6.1 Overview

6.1.1 This chapter sets out how the construction of the proposed scheme will impact traffic conditions on the existing network.

6.1.2 Information is provided below on the likely peak year of construction and the methodology used to estimate the construction traffic, both in terms of HGVs and construction worker traffic, together with the junction modelling results.

6.1.3 For details on the impacts during the construction phase on WCH and public transport, see Chapter 8.

6.2 Introduction to construction phase

6.2.1 A series of steps have been taken to establish the construction traffic likely to travel within the construction phase, as well as shift patterns and compound and borrow pit locations. These steps are as follows:

- Identify the main construction tasks and their durations
- Identify the associated material types, tonnages, etc.
- Identify the peak year of construction
- Estimate the numbers of HGVs in the peak year of construction and their likely origins and access routes
- Estimate the numbers of workers in the peak year of construction and their likely shift patterns, origins, access routes and modes

6.2.2 Mitigation measures identified for the construction phase are as follows:

- Locating compounds adjacent to the A12, so construction HGVs are kept on the A12 and off the LRN, though this would result in HGVs U-turning at some A12 junctions (as covered in the Outline CTMP [TR010060/APP/7.7]).
- Locating borrow pits adjacent to the A12 – this would avoid fill material travelling long distances, but would result in HGV trips along the A12 within the Order Limits and HGVs U-turning at some A12 junctions (as covered in the Outline CTMP [TR010060/APP/7.7]).

6.2.3 Construction workers will travel to and from the surrounding towns and cities, with the majority likely to live in Chelmsford and Colchester due to their proximity to the A12 and the construction sites, together with the availability of accommodation, with other towns such as Braintree, Witham and Maldon expected to have smaller proportions of construction workers. As a realistic worst-case scenario, there is an aim to achieve 20% travel by public transport and then use mini-buses from local rail stations to the construction sites. Of the remaining construction workers, there is an aim to achieve 20% car-share, with none travelling by mini-bus and all the

remaining construction workers driving by car. Detailed diagrams showing the construction traffic movements are shown in Appendix D, and discussed further in the next section.

6.2.4 Full details of the construction phase can be found in the Outline CTMP [TR010060/APP/7.7].

6.3 Future traffic forecasts – peak year of construction

6.3.1 From an assessment of the likely construction programme, the quantities of materials required and their timing within the construction programme, the peak year of construction has been identified as 2025. This has therefore been used for assessing the worst-case impacts of the construction phase.

6.3.2 While the proposed scheme is under construction, traffic flows will increase on a small number of roads within the study area. Construction HGVs are expected to use four key approach routes described below, with their associated proportions. However, it must be noted that it is not known exactly where materials will be sourced from.

- A12 between the M25 and A12 junction 19 (40%).
- A130 between the Port of Tilbury and A12 junction 19 (20%).
- A12 between the A14 and A12 junction 25 (25%).
- A120 between the M11 and A12 junction 25 (15%).

6.3.3 The typical number of external construction HGVs in the peak year of 2025 is expected to be around 560 HGVs in and 560 HGVs out on weekdays, 260 HGVs in and 260 HGVs out on Saturdays, with none on Sundays. The typical number of internal construction HGVs in 2025, shuttling between the compounds and borrow pits and the construction sites, is expected to be 490 HGVs in and 490 HGVs out on weekdays, 330 HGVs in and 330 HGVs out on Saturdays, with none on Sundays.

6.3.4 Using the percentages included in paragraph 6.3.2 and the traffic from paragraph 6.3.3 above, the resultant traffic volumes are presented in Table 6.1.

Table 6.1 Typical external construction HGVs

Approach	Weekday		Saturday	
	In	Out	In	Out
A12 between the M25 and A12 19	224	224	104	104
A130 between the Port of Tilbury and A12 J19	112	112	52	52
A12 between the A14 and A12 J25	140	140	65	65
A120 between the M11 and A12 J25	84	84	39	39

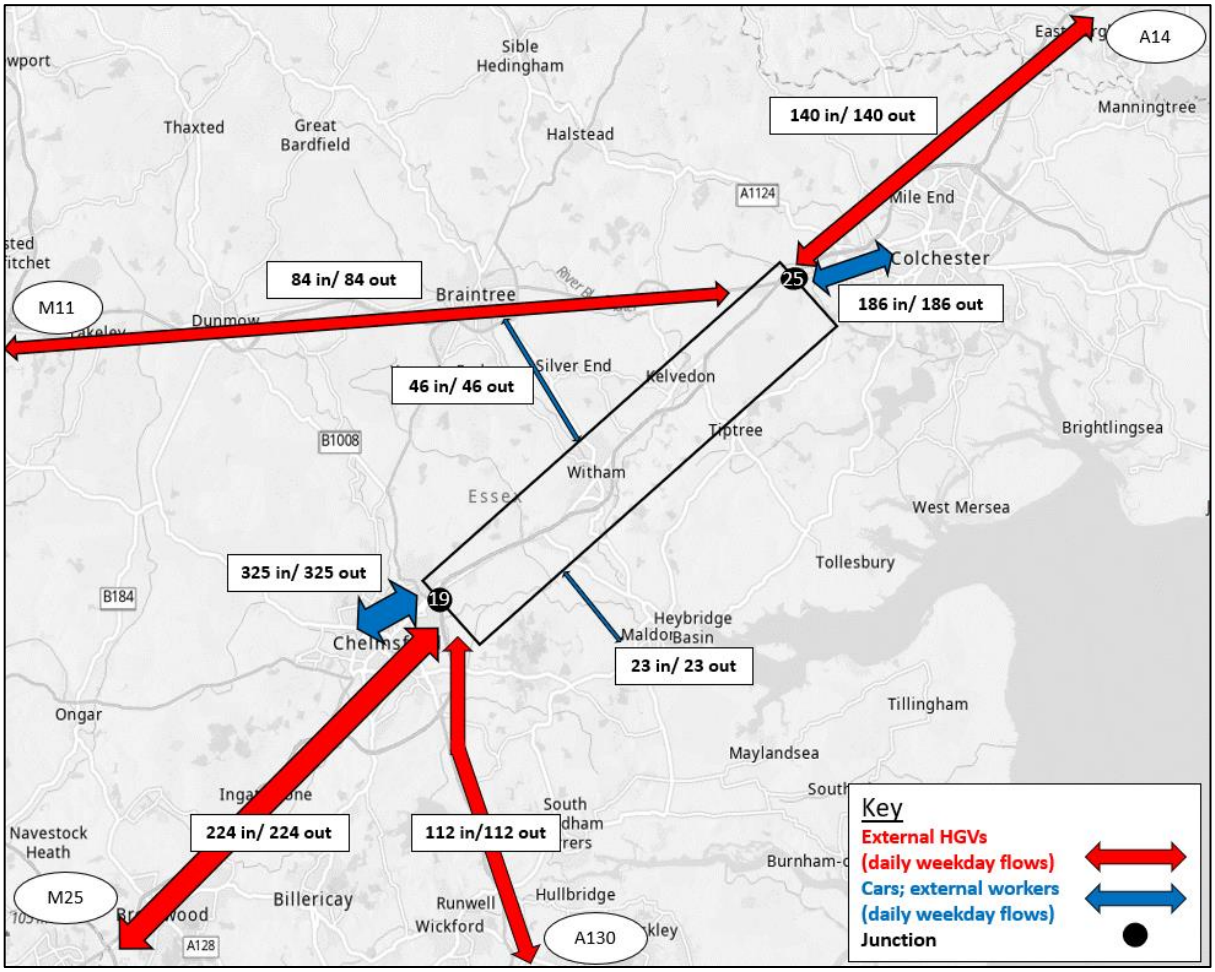
6.3.5 The typical number of construction workers in the peak year of 2025 is expected to be around 1,550 on weekdays (1,050 work sites and 400 site offices / 100 working from home), and on Saturdays work sites would be 65% of those on weekdays and site office staff would be 50% of those on weekdays.

6.3.6 Construction worker vehicles are likely to travel on the A12 and the following LRN routes:

- B1024 for those travelling to and from Braintree
- B1389 for those travelling to and from Witham
- B1019 for those travelling to and from Maldon

6.3.7 Plate 6.1 shows the additional traffic which is forecast to enter the A12 junction 19 to junction 25 area from external areas. Further diagrams, including the breakdown of traffic within the section between junction 19 and junction 25, are shown in Appendix D.

Plate 6.1 External HGV and Car (worker) construction traffic flows



6.3.8 To create the total traffic in the peak year of construction, forecast 2027 flows without the proposed scheme in place were factored back to 2025 using National Trip End Model (Department for Transport, 2017)/Regional Traffic Forecast growth factors. The construction traffic was then added to those 2025 flows and the relevant existing junction layouts were assessed.

6.4 Future operational performance – construction phase – existing SRN junctions

6.4.1 The existing A12 junctions have been assessed to establish their performance while the proposed scheme is under construction, for the weekday AM, IP and PM peak hours in 2025. The IP has been included in the construction assessment as the construction traffic is expected throughout the day. Each of the junctions has been assessed using the relevant software listed above in paragraph 2.6.1, depending on the junction type.

6.4.2 For the assessment of junction operation while the proposed scheme is under construction, not all A12 junctions have been assessed because construction traffic is only expected to pass through a limited number of A12 junctions.

6.4.3 The results of the junction assessment are summarised in Appendix A (Junction Modelling Results Summary) and provided in full detail in Appendix F (Junction Modelling Technical Notes).

6.4.4 The results of the junction assessments for the peak year of construction (2025) show the following:

- A12 junction 19: This junction is heavily congested even before the construction traffic is added, and due to the heavily congested conditions, the delays only increase. By 2025, there are delays at the dumbbell roundabout of up to four minutes, and up to 20 minutes at Boreham interchange.
- A12 junction 21: This junction operates satisfactorily in 2025 with construction traffic during the weekday AM, IP and PM peak hours, with minimal queues and delays.
- A12 junction 23: This junction operates satisfactorily with construction traffic in the weekday AM, IP and PM peak hours, with minimal queues and delays.
- A12 junction 24: This junction operates satisfactorily with construction traffic during the weekday AM, IP and PM peak hours, with minimal queues and delays.
- A12 junction 25: This junction operates satisfactorily in the weekday AM peak hour and in the IP, with delays of up to 25 and 40 seconds respectively. However, in the weekday PM peak hour the junction is approaching capacity, with delays of up to 1.5 minutes.

6.4.5 Although some junctions are expected to be over-capacity during the construction phase, it should be noted that the assessment undertaken is considered to be a worst-case scenario for the following reasons:

- The peak year of construction (2025) has been assessed. The significant impacts therefore occur for a short duration, both in terms of a single year and in terms of a limited number of hours per day, i.e. weekday AM and PM peak hours only. Construction flows will

therefore be lower in other hours of the day and will also be lower in all the years either side of 2025.

- There is the potential to increase the use of mini-buses and public transport to transport the construction workers. This would reduce construction traffic overall.
- If congestion occurs in the weekday AM peak hour, construction workers may need to retime their journeys to ensure they start their shift on time. If this were to occur, this would reduce construction traffic at that time of day.
- In summer and winter months, shift start and finish times may be outside the weekday AM and PM peak hours for some of the construction workers. If this were to occur, this would reduce construction traffic in the weekday AM and PM peak hours.
- There is also the potential to maximise the delivery of materials directly to work sites via temporary accesses and egresses from the A12 and haul roads. This would reduce the number of internal HGVs travelling from compounds to the work sites, i.e. maximising the use of single round trips by external HGVs instead of two round trips by one external and one internal HGVs.

6.5 Future operational performance – construction phase – existing LRN junctions

6.5.1 As described above, mitigation measures such as the locations of compounds and borrow pits will be used to keep HGVs on the A12. The only construction traffic that is therefore likely to use the LRN is the construction workers travelling to and from the surrounding towns, as described above. This section therefore focuses on the key LRN junctions which may be impacted by workers travelling to access the construction sites.

6.5.2 As the majority of construction workers are expected to travel to and from Chelmsford or Colchester and hence travel via the A12, it is unlikely that there will be significant volumes of construction worker vehicles on the LRN.

6.5.3 With the exception of the B1019 Maldon Road / B1137 The Street junction in Hatfield Peverel and the Eastways junction near A12 junction 22, there are no local junctions expected to be impacted by construction worker traffic, and therefore detailed junction assessments have not been undertaken for any other local junctions.

6.5.4 The results of the junction assessment are summarised in Appendix A (Junction Modelling Results Summary) and provided in full detail in Appendix G (Junction Modelling Technical Notes).

6.5.5 The results of the junction assessments for the peak year of construction (2025) show the following:

- B1019 Maldon Rd / B1137 The Street, Hatfield Peverel: This junction operates satisfactorily with construction traffic (2025) in the weekday AM and PM peak hours with delays of up to 45 seconds on Maldon Road.
- Eastways, near junction 22: This junction is over-capacity with construction traffic during the weekday AM and PM peak hours, with queues of nearly 60 vehicles (AM) and 75 vehicles (PM), and delays of approximately three minutes (AM) and 5.5 minutes (PM). The IP weekday peak remains under-capacity with small queues and delays. However, it should be noted that this junction is likely to be over-capacity in 2025 without the construction traffic in the weekday AM and PM peak hours.

6.6 Summary

6.6.1 Mitigation measures identified for the construction phase include compounds and borrow pits being located adjacent to the A12 to keep construction HGVs on the A12 and off the LRN, and the use of mini-buses to transport construction workers from the surrounding towns and cities.

6.6.2 From an assessment of the likely construction programme, the quantities of materials required and their timing within the construction programme, the peak year of construction has been identified as 2025.

6.6.3 During construction, traffic flows will increase on a small number of roads within the study area. Construction HGVs are expected to use the A12, A120 and A130. However, it must be noted that it is not known exactly where materials will be sourced from.

6.6.4 The majority of the construction workers are likely to travel to and from Chelmsford and Colchester, and hence use the A12 to travel to the construction sites. Construction workers are also likely to use the B1024 to and from Braintree, the B1389 to and from Witham and the B1019 to and from Maldon.

6.6.5 The results of the junction assessments for 2025 for the SRN and LRN are summarised in Table 6.2.

Table 6.2 Summary of junction operation results – SRN and LRN – construction phase

Junction		Software (key statistic used)	Construction phase 2025		
			Weekday 07:00-08:00	Weekday Ave 10:00-16:00	Weekday 17:00-18:00
A12 J19	Generals Lane Roundabout (West)	Vissim (LOS)	E	C	D
	Generals Farm Roundabout (East)	Vissim (LOS)	F	C	F
	Boreham Interchange (South)	Vissim (LOS)	F	D	E
A12 J20a off-slip		PICADY (RFC)	N/A - no construction traffic expected		
A12 J20a on-slip		PICADY (RFC)	N/A - no construction traffic expected		
A12 J20b off-slip		Vissim (LOS)	D	A	C
A12 J21 (existing layout)		PICADY (RFC)	0.38	0.11	0.4
A12 J21 (new layout)		Vissim (LOS)	N/A - junction does not exist		
A12 J22 (new layout)		Vissim (LOS)	N/A - junction does not exist		
A12 J23 (existing layout) (give-way junctions between B1024 London Road and Cranes Lane)		PICADY (RFC)	0.04	0.04	0.55
A12 J24 (existing layout) (give-way junction between northbound and southbound slip roads)		PICADY (RFC)	0.02	0.06	0.03
A12 J24 (new layout)		Vissim (LOS)	N/A - junction does not exist		
A12 J25	Western Roundabout	Vissim (LOS)	C	C	E
	Eastern Roundabout	Vissim (LOS)	B	A	B
	London Road Roundabout	Vissim (LOS)	N/A - junction does not exist		
B1019 Maldon Rd / B1137 The Street (Hatfield Peverel)		Vissim (LOS)	D	B	D
B1023 Inworth Rd / B1024 Feering Hill aka "Gore Pit" (near Kelvedon)		PICADY (RFC)	N/A - no construction traffic expected		
B1024 Station Rd / B1024 High St (Kelvedon)		PICADY (RFC)	N/A - no construction traffic expected		
B1023 Kelvedon Rd / B1022 Maldon Rd (Tiptree)		ARCADY (RFC)	N/A - no construction traffic expected		
B1408 London Rd / School Rd (Copford)		PICADY (RFC)	N/A - no construction traffic expected		
B1137 Main Road / Church Road (Boreham)		PICADY (RFC)	N/A - no construction traffic expected		
B1137 Main Road / Plantation Road (Boreham)		PICADY (RFC)	N/A - no construction traffic expected		
B1137 Main Road / Waltham Road (Boreham)		PICADY (RFC)	N/A - no construction traffic expected		
Rivenhall End west roundabout		ARCADY (RFC)	N/A - junction does not exist		
Rivenhall End east roundabout		ARCADY (RFC)	N/A - junction does not exist		
Rivenhall End - Henry Dixon Road		LinSig (PRC)	N/A - junction does not exist		
Eastways, near junction 22		LinSig (PRC)	-18.4%	45.8%	-28.8%

Key showing operating condition:

RFC (ARCADY/ PICADY)	
>1	Over capacity
0.85-1	Approaching capacity
<0.85	Under capacity

PRC (LinSig)	
<0%	Over capacity
0%-15%	Approaching capacity
>15%	Under capacity

LOS (Vissim)	
F	Worst operating conditions
E	
D	
C	
B	
A	Best operating conditions

6.6.6 It can be seen that junction 21, junction 23 and junction 24 operate satisfactorily during the peak year of construction in both the weekday AM, IP and PM peak hours. However, junction 19, junction 25 and Eastways (near junction 22) are either over-capacity or approaching capacity in the weekday AM and PM peak hours, but are mostly under-capacity in the IP.

7 Road safety

7.1 Overview

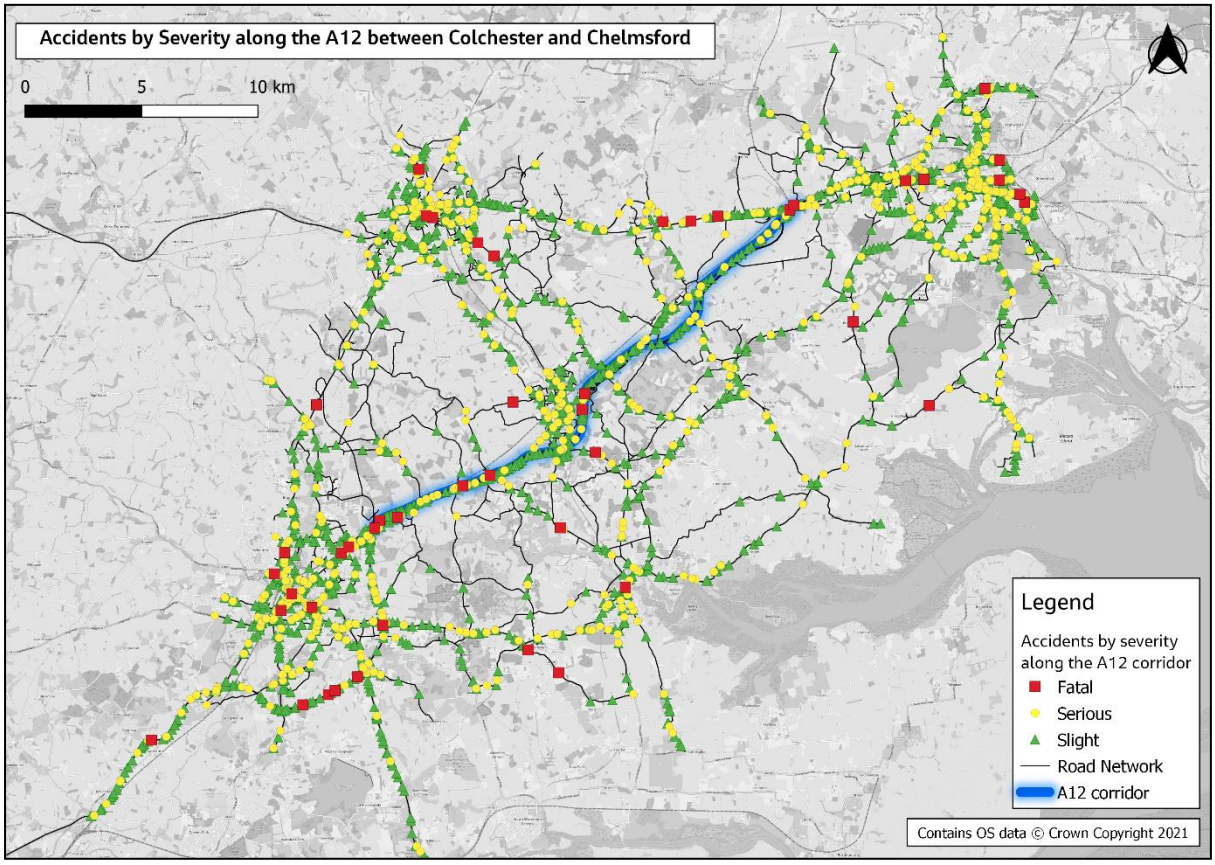
7.1.1 This chapter provides an overview of road safety in the A12 study area. It seeks to explain the current situation in terms of safety, as well as to demonstrate the benefits to safety in the future with the proposed scheme in place.

7.2 Existing situation

Accidents by severity

7.2.1 The current situation in terms of safety has been analysed. This analysis used local observed PIA data from a nine-year period (from 2011 to 2019). Plate 7.1 presents the accidents near the A12 from this period, split by severity. The plate presents mostly serious and slight accidents both along the A12 and in the immediate area, as well as a number of fatal accidents too.

Plate 7.1 Accidents by severity between Colchester and Chelmsford



7.2.2 Analysis has also been undertaken to calculate the number of casualties per collision, which could then be compared with 'standard' default rates from the industry-standard accident software COBALT.

7.2.3 Table 7.1 shows the number of observed collisions and casualties on the A12 links between junction 20a and junction 25 used as part of this analysis.

Table 7.1 Observed collisions and casualties between junction 20a and junction 25

Item	Fatal	Serious	Slight	Total
Collisions (2011–2019)	4	36	206	246
Casualties (2011–2019)	7	68	304	379

7.2.4 Based on the above, the average number of fatal, serious and slight casualties per collision on this section of road were calculated and compared in Table 7.2 to the COBALT default severity split.

Table 7.2 Casualties per collision – observed and COBALT default between junction 20a and junction 25

Item	Fatal	Serious	Slight	Total
Observed data (rebased to 2009 for consistency with default values)	0.031	0.303	1.251	**1.585**
COBALT default values	0.031	0.161	1.328	**1.520**

7.2.5 The fatal and slight casualty rates for the A12 are comparable with the COBALT default rates, but the observed rate for serious casualties is much higher. Overall, the total casualty rate is higher on the A12 than the national default.

7.3 Future situation with the proposed scheme

7.3.1 The impact that the proposed scheme will have on future accidents has been assessed using the industry-standard COBALT software. The analysis shows that in total there would be an increase of 262 accidents with the proposed scheme in place over the 60-year appraisal period. However, in terms of the number of the severity of casualties, there would be two fewer fatal, 200 fewer serious and 496 more slight casualties.

7.3.2 It is important to note that while this COBALT assessment can be used to support the overall economic assessment of the proposed scheme, it is based mainly on accident parameters that reflect national average conditions for different broad categories of road.

7.3.3 Further information regarding the accident analysis can be found in the Combined Modelling and Appraisal Report [TR010060/APP/7.3].

7.4 Summary

7.4.1 The current situation in terms of safety has been assessed using local observed PIA data from a nine-year period (from 2011 to 2019). This

showed that the fatal and slight casualty rates for the A12 are comparable with the COBALT default rates, but the observed rate for serious casualties is much higher. Overall, the total casualty rate is higher on the A12 than the national default.

7.4.2 With the proposed scheme in place, there is predicted to be an overall decrease in the number of fatal and serious casualties, but an increase in the number of slight casualties. An overall increase in accidents is predicted in the study area. However, it is important to note that while the COBALT assessment can be used to support the overall economic assessment of the proposed scheme, it is based mainly on accident parameters that reflect national average conditions for different broad categories of road.

8 Sustainable transport

8.1 Overview

8.1.1 This chapter provides an overview of the provision for travel by sustainable modes of transport in the study area. It identifies the current type and quality of PRoWs and their use for WCH, as well as improvements and changes to be delivered as part of the proposed scheme.

8.2 Existing WCH network

8.2.1 Walkers and cyclists can be considered as two types – those who walk or cycle as part of an active travel journey (e.g., as part of a regular commute or to access services) and those who are walking or cycling for recreational purposes. The first group will typically be more interested in an efficient, convenient route, while the second group would be more interested in the recreational amenity of the route. Equestrian activity is dominated by recreational horse riding, so horse riders are assumed to be recreational unless there is clear evidence otherwise.

8.2.2 Although WCH are not prohibited from using the A12, the current road is not suitable for this type of use for the majority of its length due to high traffic volumes and speeds. Therefore, the A12 is a barrier for WCH in many locations.

8.2.3 There are approximately 15km of footways and cycleways between junctions 19 and 25 that run parallel to the A12 and provide alternative access along the corridor. These include the following:

- Hatfield Peverel to Witham: footways between junction 20b (Hatfield Peverel North interchange) and junction 21 (Witham South interchange)
- Witham to Kelvedon: shared-use footway/cycleway between junction 22 (Colemans Interchange) and junction 23 (Kelvedon South interchange) on the north-west side of the carriageway and a footway on the south-east side of the carriageway
- Kelvedon to Marks Tey: shared-use footway/cycleway on the north-west side of the carriageway and a footway on the south-east side of the carriageway

8.2.4 These routes are not continuous, and the volume and speed of traffic on the A12 can act as a disincentive to their use as there is limited physical segregation provided. Nevertheless, evidence from the Strava Global Heatmap (Strava, 2022) webpage suggests high cycle use between Chelmsford and Colchester, with many cyclists generally following the existing A12 but taking the B1389 through Witham and the B1024 through Kelvedon. The route also appears to be regularly used by runners.

8.2.5 There are three dedicated cycle routes that cross the existing A12:

- National Cycle Network (NCN) Route 50 is a regional route which starts in Rickling Green and is routed in a south-easterly direction towards Wickham Bishops where it connects with NCN Route 1. NCN Route 50 is an on-road route which crosses the A12 via the Terling Hall Road overbridge. The Strava Global Heatmap (Strava, 2022) indicates it is heavily used by both cyclists and runners/walkers.

- NCN Route 16 starts in Birchanger near Stansted and finishes in Great Totham where it connects with NCN Route 1. NCN Route 16 is a predominantly on-road route which crosses the A12 at junction 22 via Colemans Bridge. The cycle route links with Witham train station and therefore may be an important route for commuters. The Strava Global Heatmap (Strava, 2022) indicates it is heavily used by both cyclists south of the A12 and to Colemans Bridge, but then cyclists appear to use the B1389 and B1018 more to travel through Witham itself, rather than continue along NCN Route 16 along Motts Lane within Witham. This indicates that many cyclists deem the railway bridge at Eastways too inconvenient compared to other routes.

- A local traffic-free route in Witham passes under the A12 via a designated combined cycle/footpath (the Blackwater Trail) using the old Maldon Branch railway line. It links two residential areas, Witham and Wickham Bishops, which are divided by the A12. This links with NCN Route 16. Evidence from the Strava Global Heatmap (Strava, 2022) suggests that more cyclists use the parallel Maldon Road (B1018), indicating that the Blackwater Trail may generally be used recreationally.

8.2.6 Minor roads with footways traverse the A12 via overbridges or underbridges at several locations and are important for providing connectivity across the A12. These include Main Road (Boreham interchange); Waltham Road (east of Boreham); Terling Hall Road (between Boreham and Hatfield Peverel); Bury Lane, Station Road and the junction 20b slip road at Hatfield Peverel; Maldon Road and Blackwater Lane (Witham); Henry Dixon Road (Rivenhall End); and Maldon Road, Ewell Hall Chase and Inworth Road (B1023) (Kelvedon).

8.2.7 The vast majority of PRoWs in the study area are public footpaths, with very few bridleways. Over 30 PRoWs have been identified which meet or cross the A12 within the study area, and there are extensive networks of PRoWs north and south of the A12. However, in the past some PRoWs have been severed by highway schemes. For example, the bridleway near Boreham interchange on Paynes Lane (PRoW 213_45) south of the A12 is severed from PRoW 213_23 north of the A12. A public footpath (FP 213_25 and FP 2013_24) some 420m east of Paynes Lane is also severed north–south by the existing A12. There are also other public

footpaths which cross the A12 at grade, utilising breaks in the central reservation barrier. However, the four lanes of high-speed traffic make crossing this road extremely hazardous, and the vast majority of people would not risk these crossings. The footpath entry points on each side of the carriageway are heavily overgrown indicating they are not used, and the footpaths are currently of low value as a resource due to this severance.

8.2.8 Most PRoWs are likely to be used for recreational purposes, although some footpaths within settlements such as Witham, Kelvedon and Marks Tey may be used for active travel journeys by walkers and cyclists.

8.2.9 Regarding horse riders, 11 riding schools have been identified within 10km of the study area, the nearest of which is at Tiptree, approximately 3.7km south of the study area. There is therefore potential for horse riders to use the lanes and bridleways which cross the A12 and who may be potentially affected by the proposed scheme.

8.2.10 Full details of PRoWs within the A12 study area are contained in the Environmental Statement [TR010060/APP/6.1].

8.3 WCH proposals

8.3.1 The proposed scheme has been assessed in accordance with Design Manual for Roads and Bridges GG 142 Walking, Cycling and Horse-Riding Assessment and Review (Highways England, 2019). In this context, all existing WCH provision has been assessed, and impacts identified. Additionally, existing and potential desire lines for WCH usage have been identified. The impact of the proposed scheme on existing PRoWs has also been reviewed, including consideration of those locations where there is severance (including existing severance).

8.3.2 Where the proposed scheme would directly affect existing PRoWs, such as footpaths, bridleways and existing cycle routes, provision has been proposed to ensure that, once the proposed scheme is open to traffic, the route remains open. This is through construction of overbridges or, where a direct connection is not feasible, alternative routes using suitable diversions are proposed.

8.3.3 There is an extensive PRoW network that crosses land within the Order Limits, and therefore many PRoWs would be directly impacted during the construction phase. The following types of measures would be implemented on PRoWs and on-road WCH routes that would be affected by construction activities:

- Segregation of users from the works
- Diversion of users onto new temporary routes
- Closure of routes
- Use of temporary marshals

8.3.4 Further details of impacts on WCH during the construction phase can be found in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1], and further information on temporary WCH route diversions and closures is provided in Chapter 9 of the Outline CTMP [TR010060/APP/7.7].

8.3.5 Once operational, the proposed scheme would have direct impacts on PRoWs, as well as impacts on PRoWs from sections of the A12 which would be bypassed by the proposed scheme. It would also impact a national cycle route, links at various proposed junctions and where the existing A12 is to be bypassed, and existing shared walking/cycling facilities.

8.3.6 Proposals for WCH provision have been developed in discussion with a broad range of stakeholder groups and with local authorities throughout the development of the proposed scheme. The proposals are shown on the Streets, Rights of Way and Access Plans [TR010060/APP/2.6] and include the following:

- Separate walking and cyclist links across four proposed major junctions, enabling users to bypass slip road junctions, including the national cycle route affected by the proposed scheme
- Provision of PRoW bridge connections, either as separate walking and cycling facilities or in conjunction with overbridges or side roads
- Provision of paths to link groups of PRoWs to proposed bridge facilities
- Provision of new toucan crossing facilities (crossings that allow both walkers and cyclists to cross)
- Improvements to existing shared walking/cycling facilities
- Improved walking and cycling connections across sections of the existing A12 to be bypassed, and reintroduction of bus stopping facilities

8.3.7 For safety reasons, WCH, horse-drawn carriages and slow-moving vehicles would be prohibited from using the A12 mainline between junctions 21 and 25 (Witham South interchange to Marks Tey interchange). These user groups would be diverted to safe alternative routes, including de-trunked sections of the existing A12, once realigned sections have been implemented. This is consistent with the specific requirements of the Design Manual for Roads and Bridges GD 300 design standard (Highways England, 2020). Prohibitions would involve notification on direction signs and on-slips to the A12 mainline to alert users as to where prohibitions apply.

8.3.8 Effects on WCH from the proposed scheme are assessed in Chapter 13: Population and human health, of the Environmental Statement [TR010060/APP/6.1].

8.4 Public transport – bus

Overview

8.4.1 This section presents a summary of the bus services on the A12 corridor. The key towns surrounding the A12, together with the bus routes which connect these towns, are shown in Table 8.1. The bus routes are largely operated by Stephensons of Essex, First Essex Buses Limited and Hedingham. Bus services from each of the towns are described later, together with plates showing their routes.

Table 8.1 Origin-destination matrix of bus service numbers between key towns

Destination / Origin	Witham	Maldon	Chelmsford	Hatfield Peverel	Kelvedon	Colchester	Braintree
Witham		90, 505	71, 525	71, 505, 525, 594	71, 91, 505, 525	71, 505, 525	
Maldon	90, 505		73, 673	73, 505, 673	505	505	
Chelmsford	71, 525	73, 673		71, 73, 673	71, 525	70, 71, 525, 676	70, 352
Hatfield Peverel	71, 505, 525, 594	73, 505, 673	71, 525, 676		71, 505, 525	71, 505, 525	
Kelvedon	71, 91, 505, 525	505	71, 525	71, 505, 525		505	
Colchester	71, 505, 525	505	70, 71, 525, 676	71, 505, 525, 676	71, 505, 525		70, 570
Braintree			70, 352			70, 570	

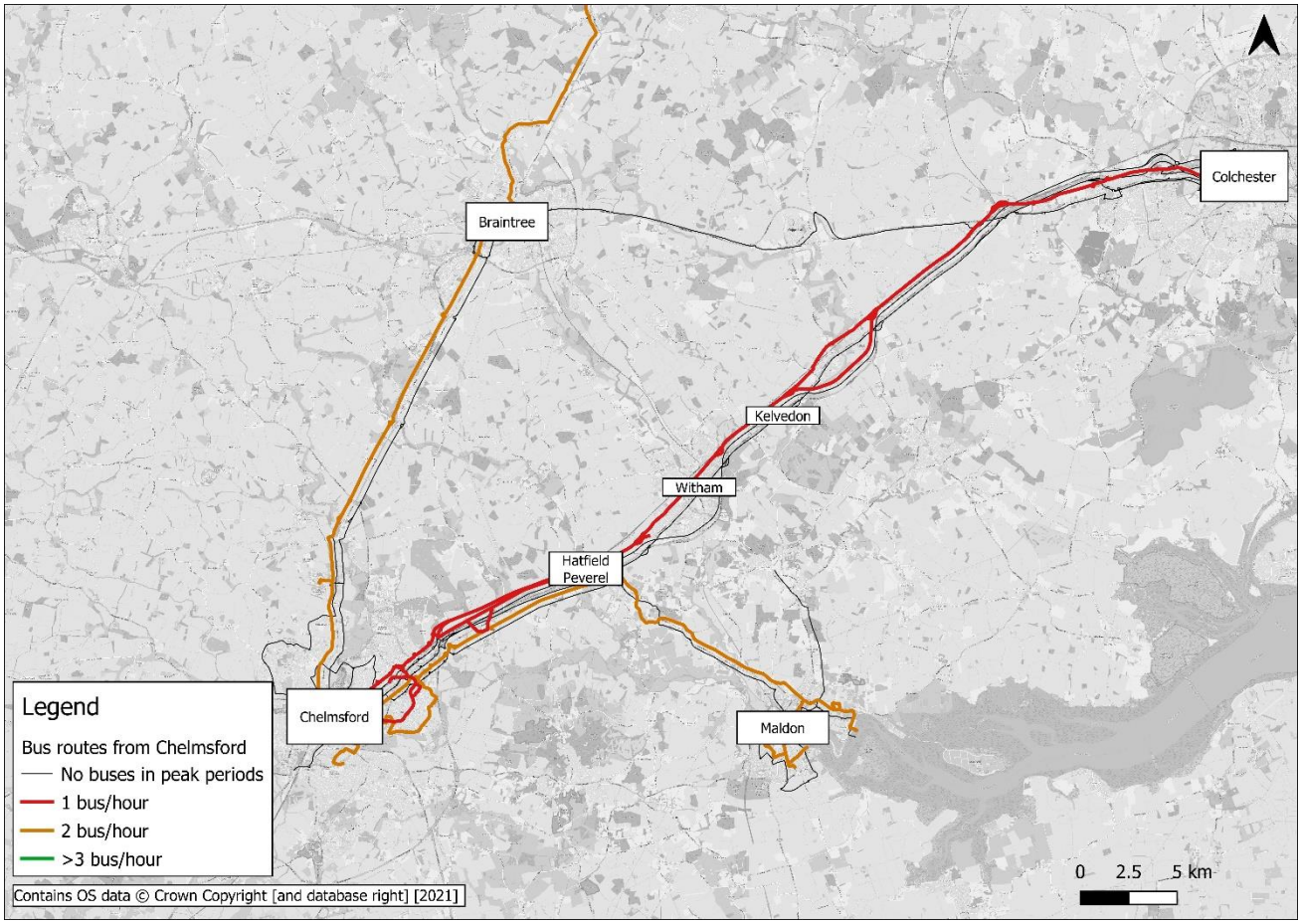
Frequencies

8.4.2 The following sub-sections present the frequency of bus services which originate in each of the key towns outlined above. The plates present the average frequency over the weekday AM (07:00–09:00) and PM (16:00–18:00) peak periods to give an average number of buses per hour on a typical weekday in November 2021. Where there is a bus route shown in black, this is a bus service along that route, but it does not operate during the weekday peak periods.

Chelmsford

8.4.3 Plate 8.1 shows all of the bus routes from Chelmsford by frequency. Chelmsford has good connectivity to Maldon in the weekday peak periods, as well as other services that connect Chelmsford to Hatfield Peverel, Witham, Kelvedon, Braintree and Colchester. Many of the bus services use the A12 for part of their journey, as well as using the B1008, B1019 and the A131.

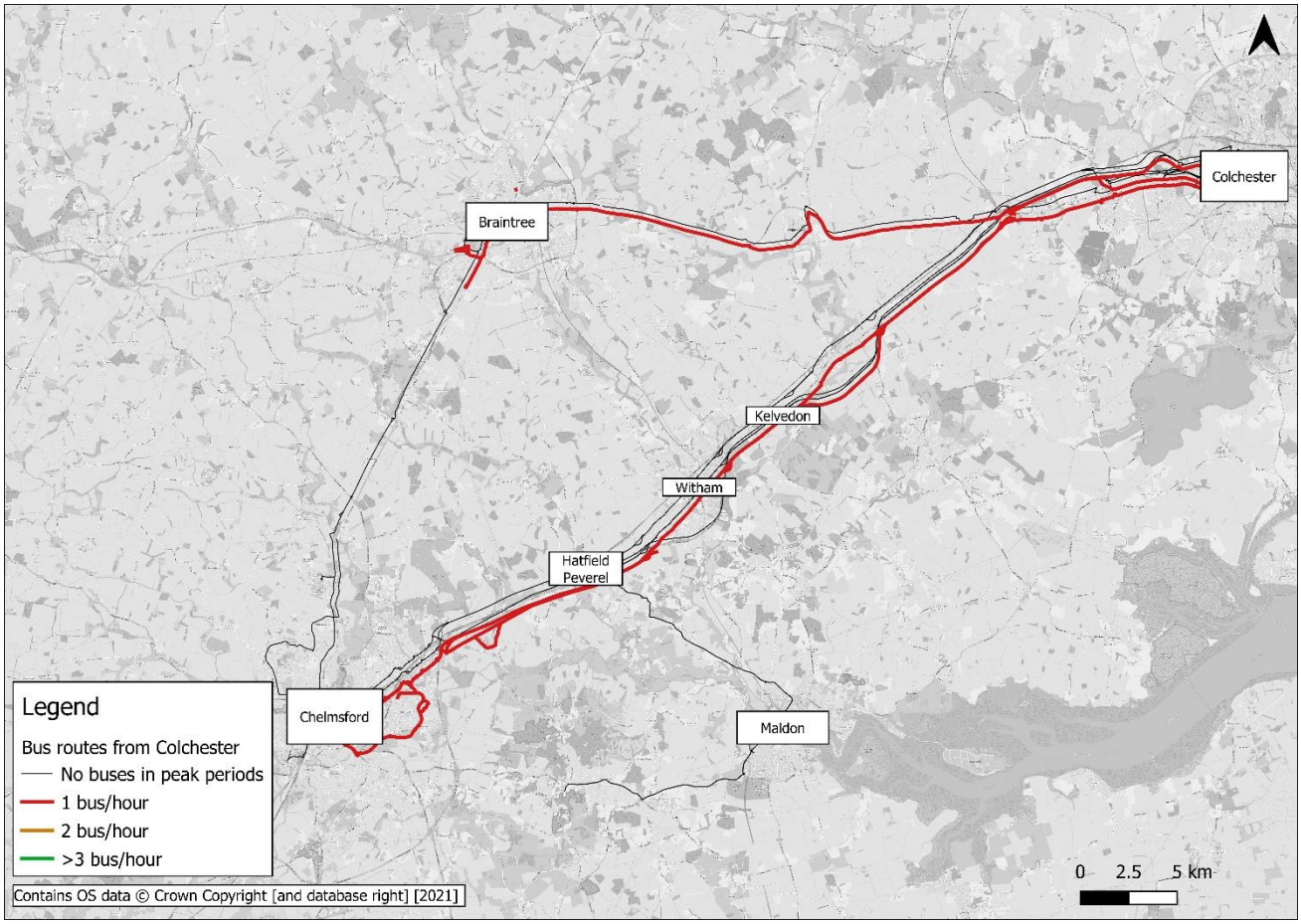
Plate 8.1 Bus routes from Chelmsford – weekday peak periods



Colchester

8.4.4 Plate 8.2 shows the bus routes from Colchester. There are a number of routes which connect Colchester to the other large towns in the area, but they do not all operate during the weekday peak periods. There are bus routes connecting Colchester to Kelvedon, Witham, Hatfield Peverel, Chelmsford and Braintree during the peak periods at a frequency of one bus per hour (on average), using the A12 and A120. There are no direct bus services connecting Colchester to Maldon in the weekday peak periods.

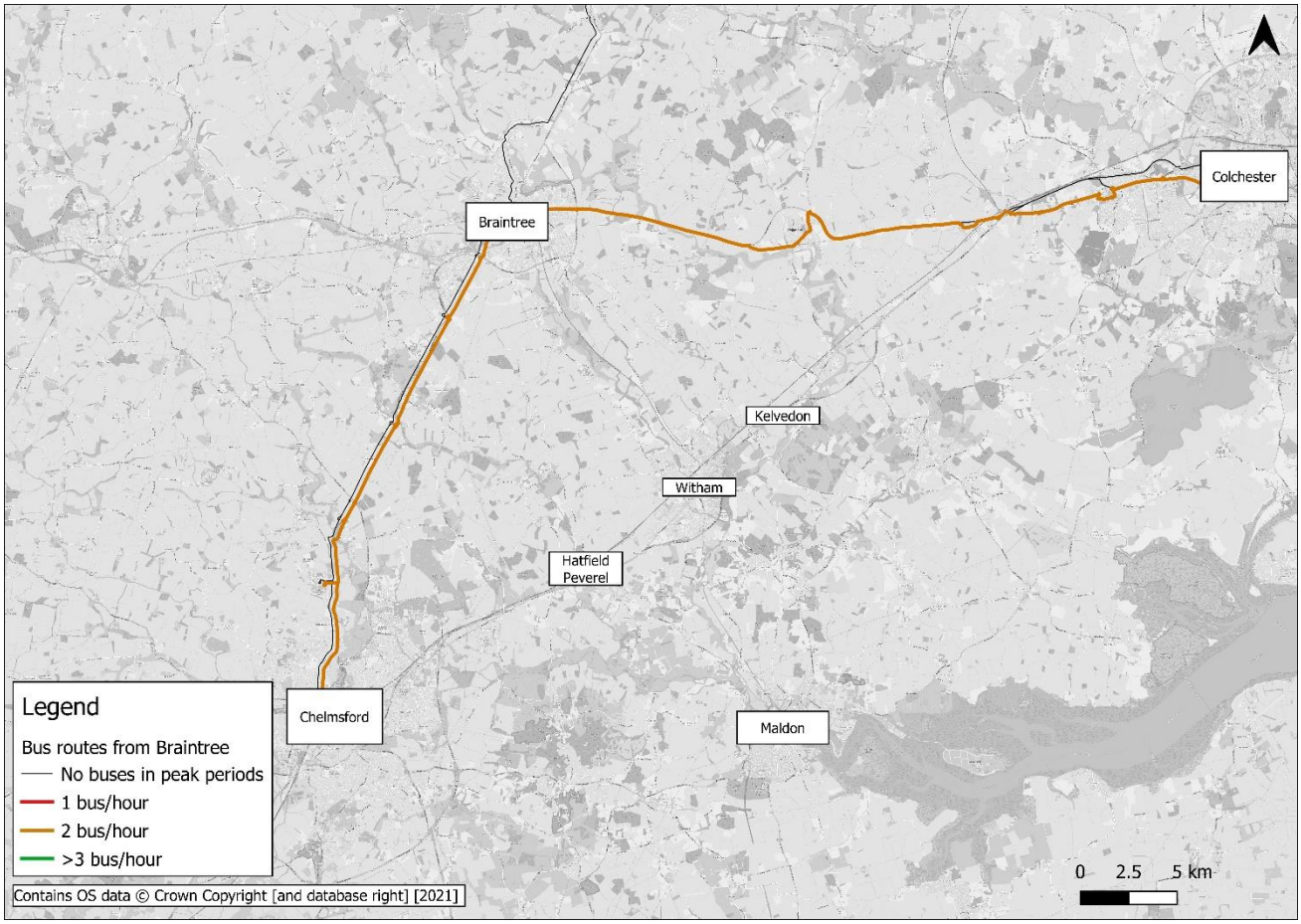
Plate 8.2 Bus routes from Colchester – weekday peak periods



Braintree

8.4.5 Plate 8.3 shows that there are very limited bus services in the weekday peak periods from Braintree, although there are two buses per hour to both Colchester and Chelmsford.

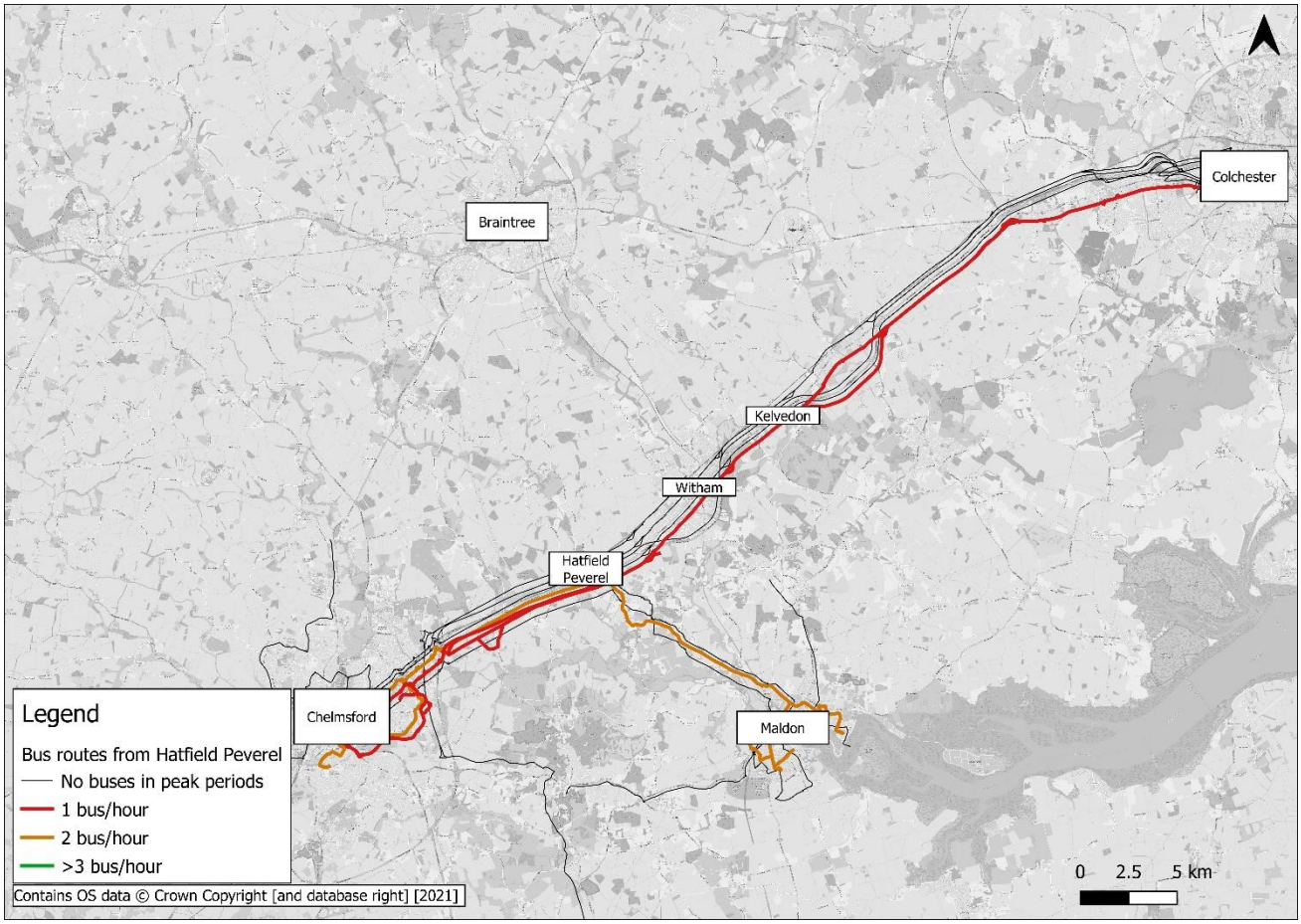
Plate 8.3 Bus routes from Braintree – weekday peak periods



Hatfield Peverel

8.4.6 Plate 8.4 shows the bus routes from Hatfield Peverel that travel to the neighbouring key towns in the weekday peak periods. There are buses to both Maldon and Chelmsford at a frequency of two buses per hour as well as buses to Witham, Kelvedon and Colchester at a frequency of one bus per hour. Most of the bus services which originate in Hatfield Peverel use the A12.

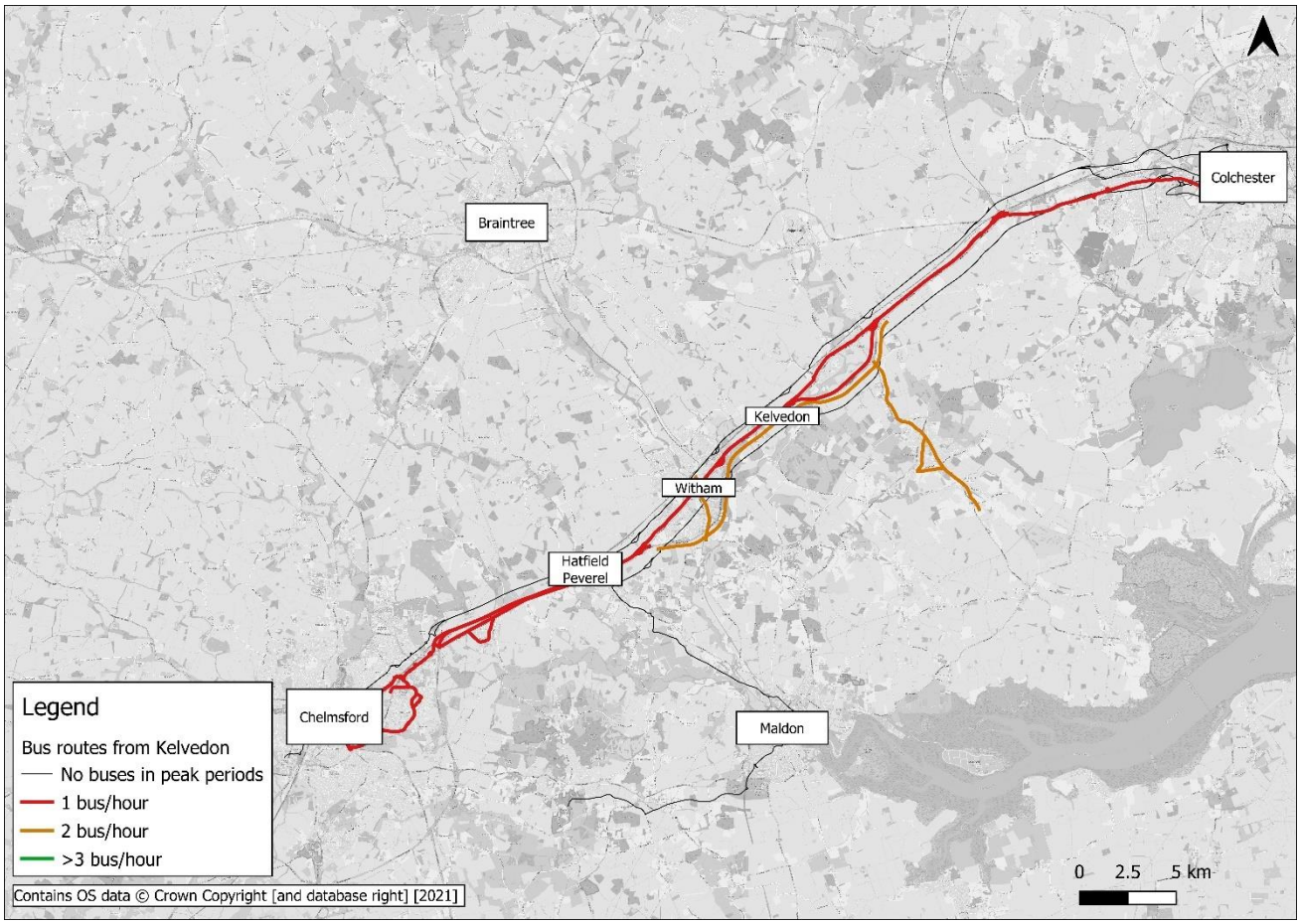
Plate 8.4 Bus routes from Hatfield Peverel – weekday peak periods



Kelvedon

8.4.7 Plate 8.5 shows the bus routes from Kelvedon which travel to the neighbouring key towns. There are two buses per hour during the weekday peak periods to Witham and Hatfield Peverel from Kelvedon, as well as one bus per hour to Colchester and Chelmsford. All of the bus routes originating in Kelvedon that travel to other key towns use the A12.

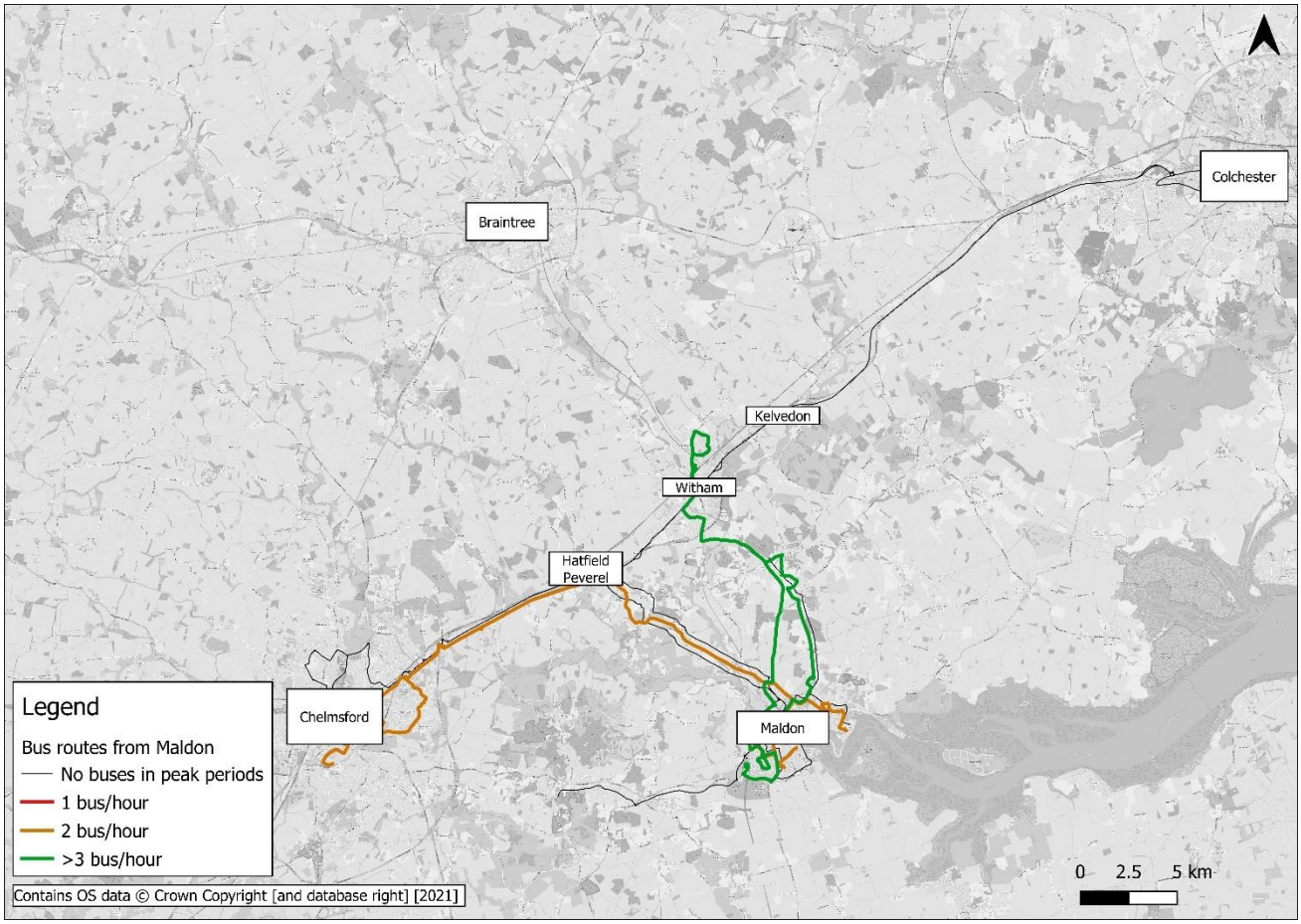
Plate 8.5 Bus routes from Kelvedon – weekday peak periods



Maldon

8.4.8 Plate 8.6 shows all of the bus routes from Maldon which travel to the neighbouring key towns in the weekday peak periods. There is a very frequent bus service to Witham at over three buses per hour, as well as buses which travel to Hatfield Peverel and Chelmsford at a rate of two buses per hour. The B1019 and the A12 are the main roads used by these bus services.

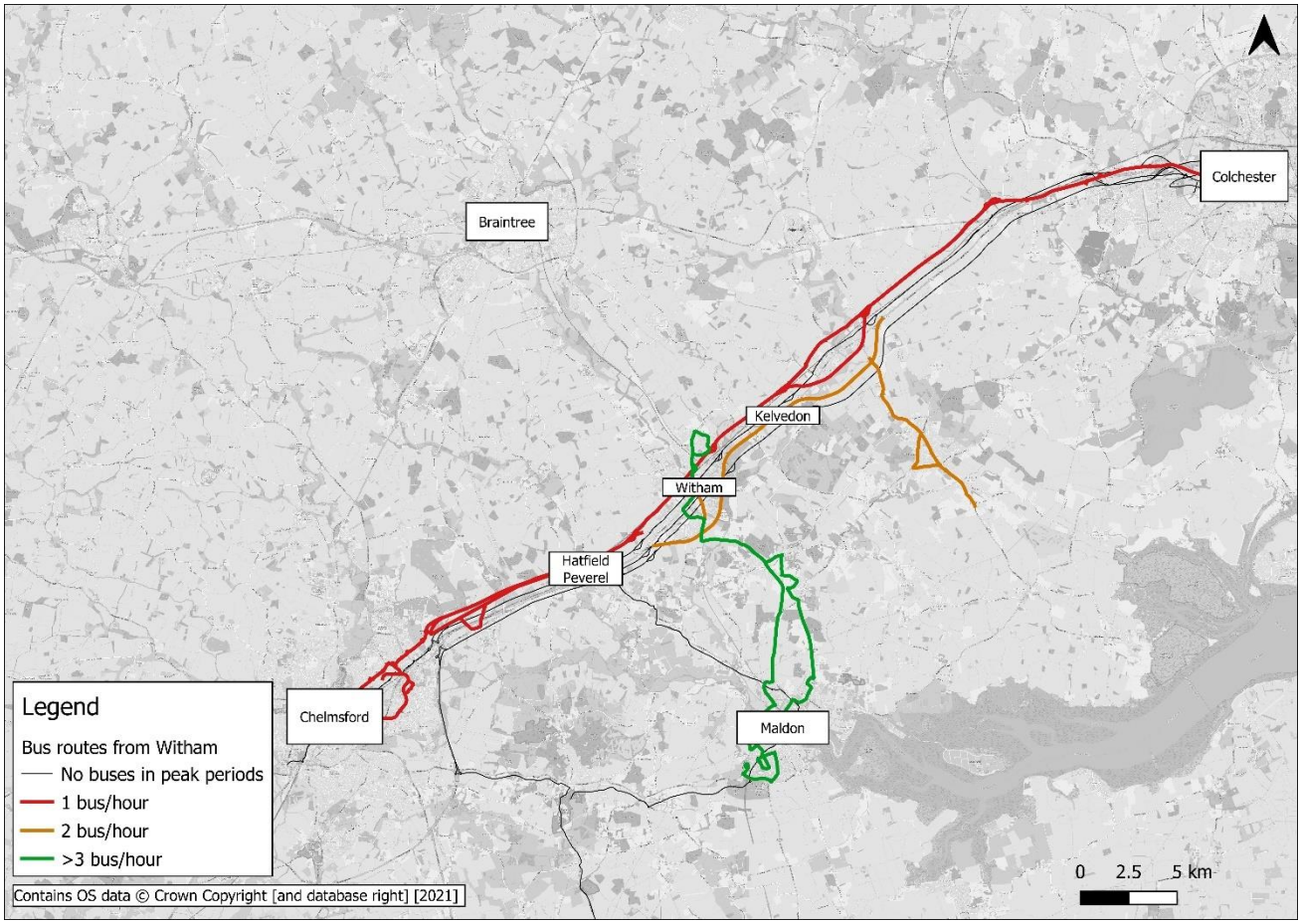
Plate 8.6 Bus routes from Maldon – weekday peak periods



Witham

8.4.9 Plate 8.7 shows all bus routes from Witham which travel to the key neighbouring towns in the weekday peak periods. There is a good service connecting Witham to Maldon at over three buses per hour, as well as two buses per hour connecting Witham with Kelvedon and Hatfield Peverel. There is also one bus per hour connecting Witham to Chelmsford and Colchester. The majority of these services primarily travel along the A12.

Plate 8.7 Bus routes from Witham – weekday peak periods



Evening and weekend bus services

8.4.10 The majority of the bus services described above still operate in the evenings and at weekends, but the frequency is significantly reduced.

Bus journey times

8.4.11 Table 8.2 presents the journey times between the key towns on the A12 corridor. This includes the bus and car journey times, presented as follows:

- Bus (where N/A has been included, there is no bus connectivity in the weekday peak periods)
- Car peak (information used is the worst-case scenario in either the weekday AM or PM peak, therefore reflecting the commuting journey times
- Car off-peak (average weekday off-peak journey times)

Table 8.2 Comparison of bus and car journey times along the proposed scheme corridor (minutes)

Destination / Origin	Witham	Maldon	Chelmsford	Hatfield Peverel	Kelvedon	Colchester	Braintree
Witham		22-45 24/20	15-22 26/20	9-11 10/9	10-16 16/12	31-42 28/19	N/A 28/26
Maldon	24-34 24/16		38-47 40/24	19-29 20/12	N/A 30/22	62 50/35	N/A 50/35
Chelmsford	23-34 35/19	41-56 40/26		22-28 24/14	38-48 55/26	65-79 48/31	26-30 32/24
Hatfield Peverel	5-6 11/10	11-38 22/18	6-18 20/16		20-21 14/12	37-45 32/22	N/A 31/26
Kelvedon	7-8 14/12	N/A 28/24	26-31 35/28	19 14/12		N/A 30/20	N/A 35/22
Colchester	29-43 26/21	51 50/40	45-76 39/35	39-52 26/22	28-33 28/22		28-43 35/32
Braintree	N/A 28/20	N/A 50/35	33-36 31/24	N/A 40/28	N/A 30/20	45-46 40/29	

8.4.12 Table 8.2 shows that bus journey times are much higher in the weekday peak periods when compared against those in the weekday off-peak. Many of the car journey times are faster than the bus journey times, but there are variations to this trend, suggesting that congestion on the road network affects both car and bus travel.

Bus usage numbers

8.4.13 It has not been possible to assess the numbers of passengers using the various bus services in the area as such data is considered to be commercially confidential.

Current bus service provision – summary

8.4.14 Overall, the connectivity between the towns is good but does vary. Most of the towns are well connected to each other by bus, with the exception of Maldon and Braintree which lie on the periphery of the study area. The bus services which run along or parallel to the A12 between Colchester and Chelmsford often run at a rate of one bus per hour in the peak periods, which may be due to there also being a rail line which services these towns too.

8.4.15 The car journey times show the large difference between travel times in the peak and off-peak periods, suggesting that the peak periods are a lot more congested, which will also affect some bus services travelling on the road network.

Future bus conditions without the proposed scheme

8.4.16 There are plans to increase the size of the Sandon Park and Ride at Chelmsford, which suggests changes to the bus services in this area as well as the frequency of buses to and from Chelmsford.

8.4.17 Essex County Council published their sustainable modes of travel strategy which '*aims to deliver long term improvements to the passenger transport (bus, minibus, taxi and community transport) network in Essex*' (Essex County Council, 2020). Essex County Council does not go into detail within this strategy but states that there are future developments and plans based around improving the bus network and accessibility.

8.4.18 Essex County Council have also published their Bus Service Improvement Plan for 2021 to 2026 (Essex County Council, 2021). The document focuses on improving patronage closer to pre-COVID-19 levels as well as improving reliability and customer satisfaction, and there are targets for increasing accessibility and modal shift, but the plan does not include details of any specific proposals or network changes which may impact or be impacted by improvements to the A12.

Future bus conditions during construction

8.4.19 During construction, there is a likelihood of disruption to bus services due to traffic management and construction activities, as presented in Table 8.3.

Table 8.3 Bus routes affected by construction activities

Works at junction	Bus routes affected	Notes
Junction 19	40, 71, 71A, 71C, 71E, 71X, 73, 73a	
Junction 25	15, 70, 71, 71A, 71C, 71E, 71X, 82, 82A, 133, 901, 903, 910	Some services are school buses. Some service Stansted Airport.
Junction 21	621	

8.4.20 There would be short- to medium-term disruption to pedestrian access to the following bus stops during the construction phase for the proposed scheme (and therefore the disruption in just the peak year of construction may not be as significant). Minimal significant alteration to the permanent location of these stops would be required, but stops may be relocated or closed in the short term:

- Boreham House, Main Road, Chelmsford
- Eight stops on The Street, Hatfield Peverel
- Two stops on the B1389 Hatfield Road, Witham
- Two stops on the B1023 Inworth Road, Kelvedon
- One stop on the existing A12 at Kelvedon Park (permanently relocated onto the proposed new access road for Kelvedon Park)
- One stop on the B1024 London Road southbound off-slip of the existing junction 24
- Seven stops on the former A12 London Road between Feering and Marks Tey
- Two stops on the A12 London Road southbound on-slip at junction 25
- Two stops on Coggeshall Road, Marks Tey
- Two stops on the B1408 London Road at Marks Tey

8.4.21 It is assumed that the following bus stops would be permanently relocated to an appropriate position on Little Braxted Road, Witham, and the new Prested Hall/Threshelfords access road respectively:

- One stop on Little Braxted Road, Witham
- One stop on the B1024 London Road northbound on-slip to the existing junction 24

8.4.22 It is likely that temporary traffic management measures implemented during construction of the proposed scheme would affect the timetabling of routes which make use of affected roads; however, this would be a commercial matter dictated by bus operator scheduling.

8.4.23 In summary, it is considered that there will be a small adverse impact on bus services during the construction phase.

Future bus conditions during operation

8.4.24 The proposed scheme would bring opportunities to improve public transport provision by reducing congestion on the A12 and improving the accessibility to bus stops on the former A12. For example, at Rivenhall End, traffic flows would significantly reduce along the former A12, and toucan crossings (crossings that allow both walkers and cyclists to cross) and shared-use footway/cycleways would be installed, thereby improving access to the existing bus stops. Another example is that there would be a substantial reduction in traffic flows on the former A12 London Road between Feering and Marks Tey, and the opportunity would be taken to relocate the bus stop from its existing location at the Kelvedon Park access onto a local access road with shared-use walking/cycling provision, thereby improving the amenity of these stops and their access routes.

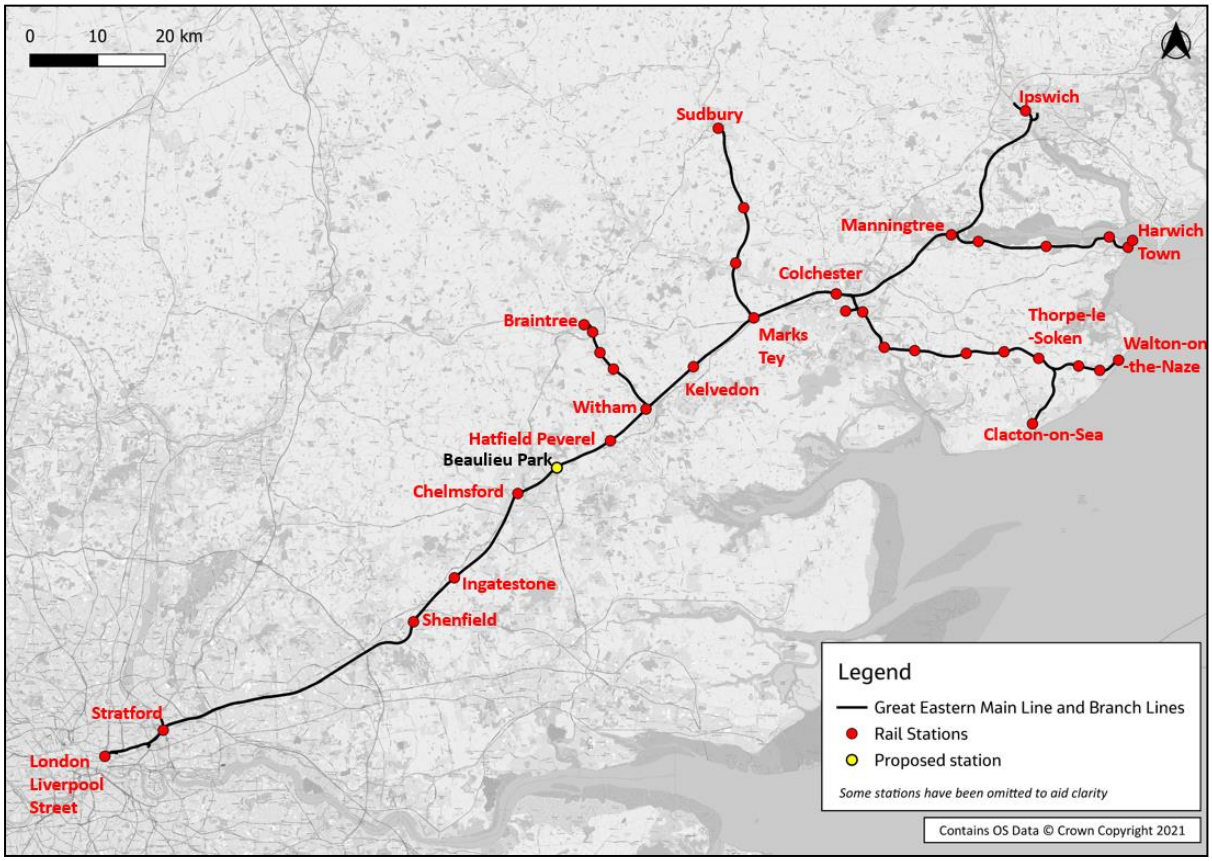
8.4.25 In summary, it is considered that there will be a small beneficial impact on bus services once the proposed scheme is operational.

8.5 Public transport – rail

Overview

8.5.1 The rail network that runs parallel to the A12 corridor is shown in Plate 8.8. The rail network consists of stations along the GEML between Ipswich and London Liverpool Street, which is generally a two-track railway with only a limited number of passing loops to allow fast trains to overtake slower local or freight trains. The GEML therefore has limited capacity. There are also branch lines and a proposed new station on the route at Beaulieu Park, near Chelmsford.

Plate 8.8 Existing and proposed rail network surrounding the A12 corridor



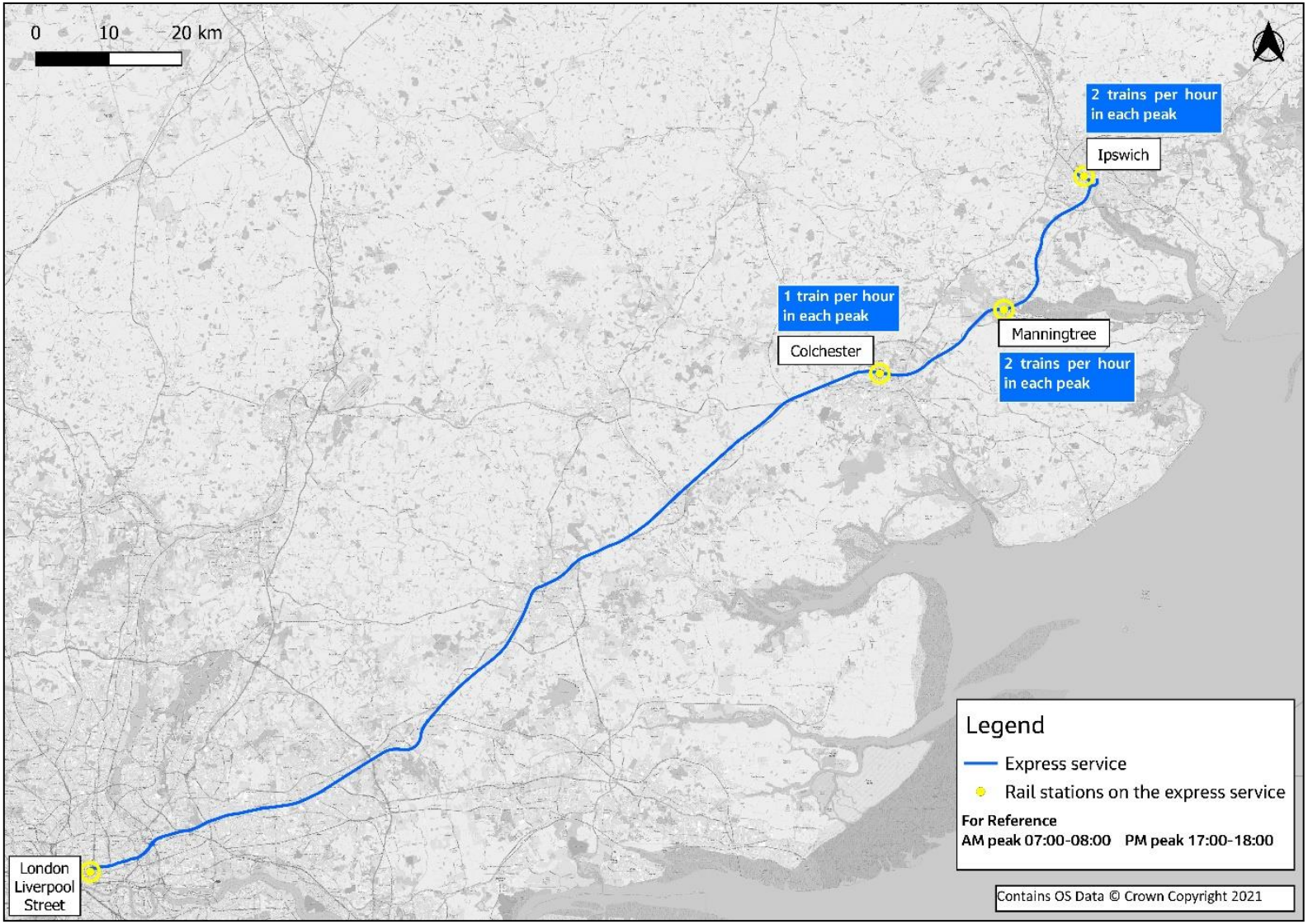
8.5.2 The main train service provider is Greater Anglia, who run the mainline service between London Liverpool Street and Norwich. They also operate local train services on a number of branch lines which include services to Braintree, Sudbury, Clacton-on-Sea, Walton-on-the-Naze and Harwich Town.

8.5.3 The largest communities on the A12 corridor which are not serviced by rail include Boreham, Maldon, Tiptree, Danbury, Heybridge and Coggeshall.

Frequencies

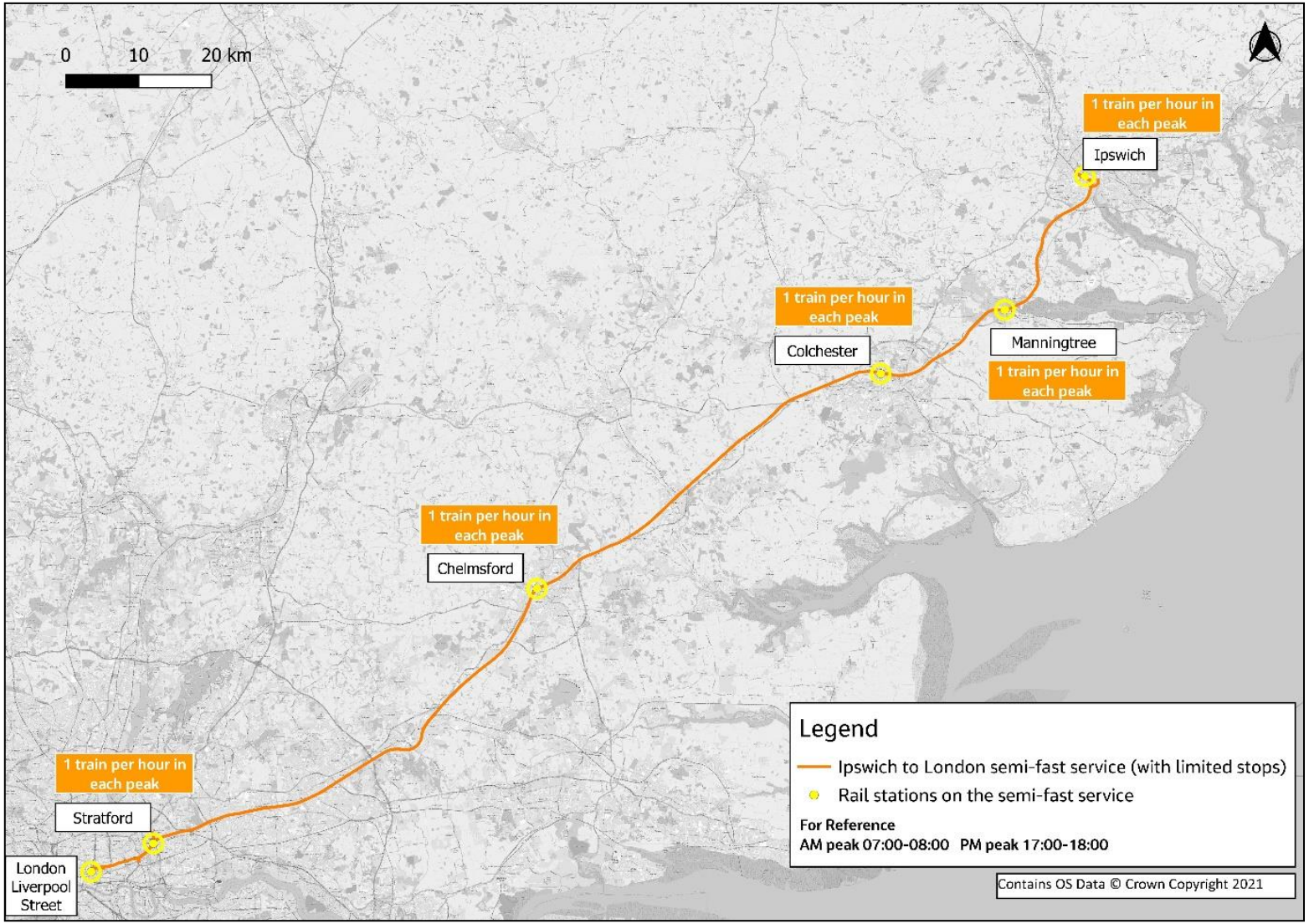
8.5.4 In terms of frequency, there are three types of rail service on the GEML. Plate 8.9 shows the express service between Ipswich and London Liverpool Street. All frequency information presented is for the AM (07:00–08:00) and PM peaks (17:00–18:00).

Plate 8.9 Frequency of trains per station on the express service between Ipswich and London Liverpool Street



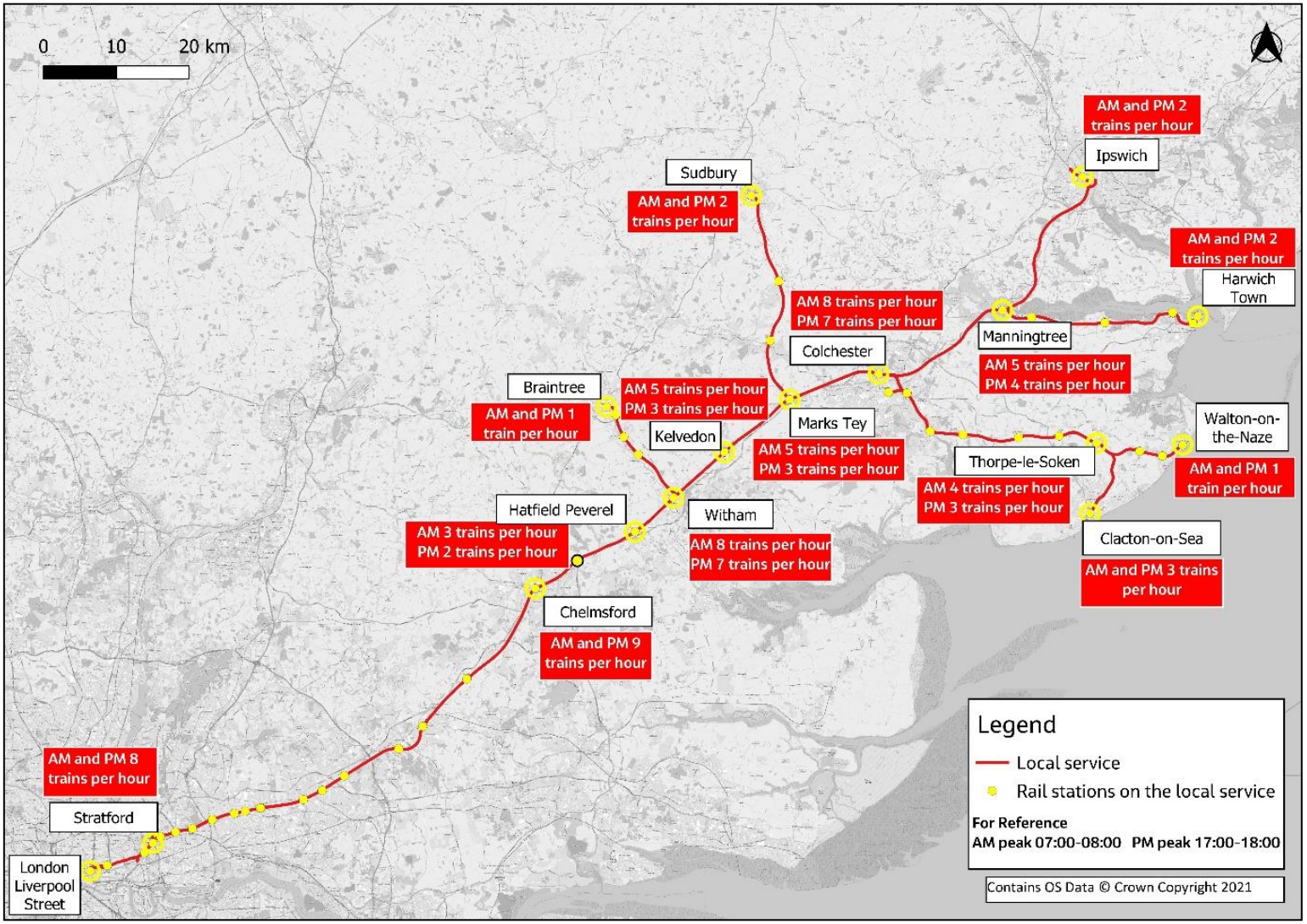
8.5.5 The second service in terms of frequency is the semi-fast service between Ipswich and London Liverpool Street, which has limited stops, as shown in Plate 8.10.

Plate 8.10 Frequency of trains per station on the semi-fast service between Ipswich and London Liverpool Street



8.5.6 The final service with the most stops is the local service between Ipswich and London Liverpool Street, including the branch lines, as shown in Plate 8.11.

Plate 8.11 Frequency of trains per hour on the local services between Ipswich and London Liverpool Street, including the branch lines



8.5.7 The express and semi-fast services provide excellent connections between Ipswich and London, with fast journey times and a good frequency of trains on weekdays.

8.5.8 In terms of the local services, there are eight or nine trains per hour which run between London and Colchester during the weekday peak hours, providing a very frequent service for passengers. The frequency reduces to approximately five trains per hour for the smaller stations on the GEML, such as Marks Tey and Kelvedon, while Hatfield Peverel has two or three trains per hour and the branch lines typically have one or two trains per hour.

8.5.9 For rail frequencies outside of the weekday peak hours, there is one express and one semi-fast service per hour between London Liverpool Street and Ipswich in the interpeak (between 08:00 and 17:00), along with one local service per hour to each of the destinations from London Liverpool Street, namely Clacton-on-Sea, Ipswich, Colchester Town and Braintree, and one service to Walton-on-the-Naze starting at Colchester.

8.5.10 The services on weekday evenings and Saturdays are also one train per hour to each of the destinations mentioned above but including an extra service to Manningtree. The service on a Sunday is broadly the same as the weekday interpeak.

8.5.11 In summary, despite the lack of capacity, a good level of service is provided to the towns on the GEML through a mix of express, semi-fast and local services.

Rail journey times

8.5.12 Table 8.4 below shows the rail and car journey times (both weekday peak and off-peak) for key towns along the A12 corridor and to London Liverpool Street. The journey times presented in the table are as follows:

- Rail journey time range
- Car peak hour (information used is the worst-case scenario in either the weekday AM or PM peak, therefore reflecting the commuting journey)
- Car off-peak (average weekday off-peak journey times)

Table 8.4 Comparison of rail and car journey times along the proposed scheme corridor (minutes)

Destination / Origin	Ipswich	Colchester	Witham	Hatfield Peverel	Chelmsford	Braintree	London Liverpool Street
Ipswich		18-20 35/29	35-40 44/39	40-60 43/41	36-55 59/53	54-90 53/50	57-88 121/111
Colchester	18-21 33/30		12-17 26/21	18-21 26/22	17-27 39/35	35-40 35/32	48-66 105/94
Witham	31-45 47/40	12-17 28/19		4 10/9	8-10 26/20	16-18 28/26	43-51 95/80
Hatfield Peverel	44-60 54/43	18-25 32/22	6 11/10		6 20/16	24 31/26	40-45 90/72
Chelmsford	40-56 68/55	18-30 48/31	10-12 35/19	6 24/14		27-31 32/24	33-41 88/71
Braintree	57-85 58/53	38-50 40/29	15-17 28/20	22-36 40/28	25-27 31/24		61-67 87/77
London Liverpool Street	55-85 136/106	46-67 114/82	39-48 101/72	38-43 93/66	29-37 89/62	62-67 94/70	

8.5.13 In the majority of cases, the rail journey times are significantly quicker than travelling by car. The key exception to this is where travelling by train involves the use of branch lines with waiting times for onwards connections.

8.5.14 It is evident that the car journey times are significantly longer in the weekday peak hours than in the off-peak in the majority of cases, especially for longer journeys, for example from Ipswich to London. The table also highlights that car journey times are less reliable than rail journey times, as there is typically a larger range between peak and off-peak journey times for car than for rail.

Rail station usage

8.5.15 The top three busiest stations along the A12 corridor are Chelmsford, Colchester and Witham respectively. The passenger usage numbers of all rail stations between Colchester and Witham between March 2019 and February 2020, as well as for London Liverpool Street, are as follows, displayed in descending order (Office for Rail and Road, 2020):

- London Liverpool Street 66 million

- Chelmsford 8.6 million
- Colchester 4.3 million
- Ipswich 3.3 million
- Witham 2.3 million
- Manningtree 1.1 million
- Kelvedon 0.8 million
- Marks Tey 0.6 million
- Hatfield Peverel 0.4 million

Existing rail service – summary

8.5.16 Overall, there is a good quality rail service along the GEML that runs parallel to the A12 corridor between Chelmsford and Colchester, with frequent services and journey times which are significantly quicker than driving. While the highest frequency rail service is along the mainline, there are at least hourly services to the branch lines, such as Braintree and Clacton-on-Sea.

Future rail conditions without the proposed scheme

8.5.17 The key future rail upgrade is the addition of Beaulieu Park station. This is a proposed station which will be located on the GEML between Hatfield Peverel and Chelmsford stations, as shown in Plate 8.8 above. It will be a new three platform station which will support the new housing development (of up to 14,000 homes) in north-east Chelmsford. Beaulieu Park station is expected to reduce pressure on the existing rail stations, particularly Chelmsford and Witham. Network Rail have predicted that this station will see approximately two million passengers in the first year, with a current target opening date of 2025/2026.

Future rail conditions during construction

8.5.18 During the proposed scheme construction, there is expected to be disruption to residents who live in Hatfield Peverel and south of the A12, as the proposed replacement of the Bury Lane Overbridge and the Station Road Overbridge will temporarily sever access to Hatfield Peverel railway station. The nearest alternative station is Chelmsford (to the west), or Witham (to the east).

8.5.19 There is also expected to be short-term, localised impacts on walking and cycling access to rail stations, but access would be maintained at all times.

8.5.20 A temporary rail possession would be required to install the new footbridge at Paynes Lane. This will take place overnight, so it is not anticipated to disrupt rail services. Discussions are currently ongoing with Network Rail regarding this.

Future rail conditions during operation

8.5.21 The proposed scheme will bring opportunities to improve accessibility to railway stations located between Hatfield Peverel and Marks Tey, as well as the proposed Beaulieu Park station.

8.6 Summary

8.6.1 Over 30 PRoWs have been identified which meet or cross the A12 within the study area, the majority of these being public footpaths. The A12 has historically been a barrier for WCH in many locations. Although there are 15km of footways and cycleways which run parallel to the A12 providing access along the corridor, the routes are not continuous and the volume and speed of traffic on the A12 can act as a disincentive to their use. There are three dedicated cycle routes that cross the existing A12, namely NCN Route 50, NCN Route 16 and a local traffic-free route in Witham.

8.6.2 The proposed scheme will directly impact a number of existing PRoWs. Provision has been proposed to ensure that, once the proposed scheme is open to traffic, the routes remain open. This would be achieved through the construction of overbridges or, where a direct connection is not feasible, alternative routes using suitable diversions. The proposals have been developed in discussion with a broad range of stakeholder groups and with local authorities throughout the development of the proposed scheme.

8.6.3 For safety reasons, horse-drawn carriages and slow-moving vehicles would be prohibited from using the A12 mainline between junction 21 and junction 25. These users would be diverted to safe alternative routes.

8.6.4 Regarding public transport, there is generally a good service currently for both rail and bus between the main towns in the study area. The proposed scheme would bring opportunities to improve public transport provision, particularly bus services, by reducing congestion on the A12 and improving accessibility to bus stops on the former A12. In terms of impacts on rail services, the proposed scheme will bring opportunities to improve accessibility to railway stations located between Hatfield Peverel and Marks Tey, as well as the proposed Beulieu Park station.

9 Summary and conclusions

Summary

9.1.1 This TA report described the likely impacts of the proposed scheme on the SRN, LRN, road safety, WCH and public transport users.

9.1.2 A traffic model has been developed, using industry-standard SATURN software, to identify the study area and to assess the likely impacts of the proposed scheme. Forecast traffic flows with and without the proposed scheme in place have been used to identify those communities likely to see a significant increase or decrease in traffic, or no significant change. For those communities likely to experience a significant increase in traffic, key junctions have been identified and assessed. In addition, the existing and proposed junctions on the A12 have also been assessed, including those affected by the construction phase. The outputs from the traffic model have been used as inputs into the assessments described within this report.

9.1.3 The starting point for the A12 SATURN base model was the A120 traffic model, which built upon National Highways' SERTM. The A120 traffic model has been extended to provide an area of detailed modelling appropriate for the proposed scheme.

9.1.4 To enable the SATURN base model to be refined further, observed traffic count data and journey time data was used to calibrate and validate the model to a base year of 2019.

9.1.5 The current level of traffic on the A12 between junction 19 and junction 25 is extremely high for a two-lane dual carriageway and is close to or exceeds the maximum recommended limit for a new road of that type. The high volumes of traffic are such that the A12 is close to capacity on numerous sections between junction 19 and junction 25.

9.1.6 As the A12 has gotten closer to its capacity, queues and delays have become more regular and severe, and are expected to continue to increase in the future. Road users experience increased journey times, as well as journey times which are difficult to predict from day to day. All sections of the A12 between junction 19 and junction 25 are in the worst performing 10% of links on National Highways' network in the East of England in terms of Vehicle Hours Delay (Highways Agency, 2014). Based on the 2019 journey time data, average journey times towards Chelmsford in the morning peak were almost four minutes slower than in the middle of the day. Journey times towards Colchester in the evening peak were over five minutes slower.

9.1.7 In order to demonstrate the long-term impacts of the proposed scheme, three forecast years have been modelled, namely 2027 (current programmed opening year), 2042 (15 years after opening) and 2051 (final year for which traffic growth forecasts are available).

9.1.8 On the SRN, traffic is expected to reduce significantly on the two sections of the existing A12 that will be bypassed as part of the proposed scheme (between

junction 22 and junction 23 at Rivenhall End and between junction 24 and junction 25). Traffic levels would also increase on the A12 between junction 19 and junction 25, as well as on the sections of the A12 on either side of the proposed scheme. This is because traffic would re-route onto the A12 away from other less suitable routes and because the increase in capacity on the proposed A12 would result in a general increase in trips (known as Variable Demand).

9.1.9 On the LRN, traffic is generally expected to reduce, with some increases in traffic on roads leading into the A12 junctions, such as the B1023 north of Tiptree and the B1408 at Copford.

9.1.10 Communities expected to experience a significant decrease in traffic include Kelvedon, Hatfield Peverel and Rivenhall End; those likely to experience no significant increase or decrease include Braintree, Witham, Chelmsford, Colchester, Marks Tey, Maldon and Danbury; while those expected to experience a significant increase in traffic include Boreham, Copford, Messing and Tiptree.

9.1.11 For the purposes of this TA, junction models have also been developed using industry-standard software to assess key junctions in the study area for their current and future performance, including junctions on the A12 and on the LRN. The junction modelling assessments have used traffic flow outputs from the SATURN traffic models as their basis. Where relevant, traffic flows from observed junction turning counts have also been utilised for further robustness.

9.1.12 On the SRN, without the proposed scheme in place, some of the A12 junctions do not operate satisfactorily, namely junction 19 and junction 25. On the LRN, without the proposed scheme in place, the vast majority of the junctions are below capacity in 2027 and by 2042 the majority are still below capacity, the exceptions being the B1023 Inworth Road / B1024 Feering Hill (‘Gore Pit’) near Kelvedon, B1024 Station Road / B1024 High Street at Kelvedon, the B1023 Kelvedon Road / B1022 Maldon Road at Tiptree, the B1137 Main Road / Waltham Road at Boreham and the Eastways junction near junction 22.

9.1.13 On the SRN, with the proposed scheme, all of the proposed junctions operate satisfactorily by 2027 and 2042.

9.1.14 On the LRN, with the proposed scheme in place, the vast majority of the junctions are below capacity in 2027, and by 2042 the majority are still below capacity, the exceptions being the B1023 Inworth Road / B1024 Feering Hill (‘Gore Pit’) near Kelvedon, the B1023 Kelvedon Road / B1022 Maldon Road at Tiptree, the B1137 Main Road / Waltham Road at Boreham and the Eastways junction near junction 22. However, it should be noted that for the first, third and last of those four junctions, the operation improves with the proposed scheme in place compared to the situation without the proposed scheme in place. The operation of the second junction remains similar with and without the proposed scheme in place.

9.1.15 Regarding the construction phase, the peak year of construction has been identified as 2025. High-level mitigation measures identified include

locating compounds and borrow pits adjacent to the A12 to keep construction HGVs on the A12 and off the LRN, and the use of mini-buses and public transport to transport construction workers from the surrounding towns and cities.

9.1.16 During construction, traffic flows will increase on a small number of roads within the study area. Construction HGVs are expected to use the A12, A120 and A130. However, it must be noted that it is not known exactly where materials will be sourced from.

9.1.17 The majority of the construction workers are likely to travel to and from Chelmsford and Colchester, and hence use the A12 to travel to the construction sites. Construction workers are also likely to use the B1024 to and from Braintree, the B1389 to and from Witham and the B1019 to and from Maldon.

9.1.18 Junction 21, junction 23 and junction 24 operate satisfactorily during the peak year of construction (2025). Junction 19 is over-capacity in the weekday AM and PM peak hours though under-capacity in the IP. Junction 25 is also approaching capacity in the weekday PM peak hour, and the Eastways junction near to junction 22 is over-capacity in the AM and PM peak hours.

9.1.19 Road safety has been assessed using local observed PIA data from a nine-year period (from 2011 to 2019), which showed that the fatal and slight casualty rates for the A12 are comparable with the COBALT default rates, but that for serious casualties the rate is much higher. Overall, the total casualty rate is higher on the A12 than the national default.

9.1.20 With the proposed scheme in place, there is predicted to be an overall decrease in the number of fatal and serious casualties, but an increase in the number of slight casualties. An overall increase in accidents is predicted in the study area. However, it is important to note that the COBALT assessment is based mainly on accident parameters that reflect national average conditions

9.1.21 Over 30 PRoWs have been identified which meet or cross the A12 within the study area, the majority of these being public footpaths. The A12 has historically been a barrier for WCH in many locations. Although there are 15km of footways and cycleways which run parallel to the A12 providing access along the corridor, the routes are not continuous and the volume and speed of traffic on the A12 can act as a disincentive to their use. There are three dedicated cycle routes that cross the existing A12, namely NCN Route 50, NCN Route 16 and a local traffic-free route in Witham.

9.1.22 The proposed scheme will directly impact a number of existing PRoWs. Provision has been proposed to ensure that, once the proposed scheme is open to traffic, the routes remain open. This would be achieved through the construction of overbridges or, where a direct connection is not feasible, alternative routes using suitable diversions. The proposals have been developed in discussion with a broad range of stakeholder groups

and with local authorities throughout the development of the proposed scheme.

9.1.23 For safety reasons, horse-drawn carriages and slow-moving vehicles would be prohibited from using the A12 mainline between junction 21 and junction 25. These users would be diverted to safe alternative routes.

9.1.24 Regarding public transport, there is generally a good service currently for both rail and bus between the main towns in the study area. The proposed scheme would bring opportunities to improve public transport provision, particularly bus services, by reducing congestion on the A12 and improving accessibility to bus stops on the former A12. In terms of impacts on rail services, the proposed scheme will bring opportunities to improve accessibility to railway stations located between Hatfield Peverel and Marks Tey, as well as the proposed Beulieu Park station.

Conclusions

9.1.25 The analysis presented in this TA has demonstrated that the following:

- The A12 between junction 19 and junction 25 is close to capacity, resulting in queues, delays and unreliable journeys, all of which will become more regular and severe in the future.
- With the proposed scheme in place, Kelvedon, Hatfield Peverel and Rivenhall End are expected to experience a significant decrease in traffic; Braintree, Witham, Chelmsford, Colchester, Marks Tey, Maldon and Danbury are expected to experience no significant increase or decrease in traffic; while Boreham, Copford, Messing and Tiptree are expected to experience a significant increase in traffic.
- On the SRN, with the proposed scheme in place, all of the proposed junctions operate satisfactorily by 2027 and 2042.
- With the proposed scheme in place, the vast majority of LRN junctions are below capacity in 2027, and by 2042 the majority are still below capacity. Of the four LRN junctions identified as over-capacity, three of them see an improvement in their operation compared to the situation without the proposed scheme in place and the other remains similar.
- For the construction phase, mitigation measures will ensure that traffic flows will only increase on a small number of roads within the study area. Junction 21, junction 23 and junction 24 operate satisfactorily during the peak year of construction (2025), but junction 19 is over-capacity in the weekday AM and PM peak hours. Junction 25 is also approaching capacity in the weekday PM peak hour, and the Eastways junction near to junction 22 is over-capacity in the AM and PM peak hours.

Acronyms

Abbreviation	Term
AADT	Annual Average Daily Traffic
COBALT	Costs and Benefits Appraisal – Light Touch
CTMP	Construction Traffic Management Plan
DCO	Development Consent Order
DM	Do-Minimum
DS	Do-Something
GEML	Great Eastern Main Line
HGV	Heavy goods vehicle
IP	Inter-peak
LoS	Level of Service
LRN	Local Road Network
NCN	National Cycle Network
PIA	Personal Injury Accident
PRC	Practical Reserve Capacity
PRoW	Public right of way
RFC	Ratio of Flow to Capacity
SATURN	Simulation and Assignment of Traffic to Urban Road Networks
SERTM	South East Regional Traffic Model
SRN	Strategic Road Network
TA	Transport Assessment
WCH	Walking, cycling and horse riding

Glossary

Term	Definition
Annual Average Daily Traffic (AADT)	An estimate of the average daily traffic along a defined segment of roadway. This value is calculated from short-term counts taken along the same section, which are then factored to produce the estimate of AADT. Because of this process, the most recent AADT for any given roadway will always be for the previous year.
Borrow pit	A temporary mineral working to supply material for a specific construction project.
Construction compound	Construction compounds generally act as the points of entry to the worksites from the public highway. They may also be used for major stockpiling of materials such as topsoil, be used to facilitate transfer of materials, and accommodate offices and welfare facilities.
Costs and Benefits Appraisal – Light Touch (COBALT)	Department for Transport's accidents appraisal software
Cutting (earthwork)	Excavation of earth material to lower the ground level on which a road would be positioned, in order to help reduce noise and/or visual impacts.
De-trunk	The transfer of trunk roads from National Highways' responsibility to the local highway authority.
Desire line	Line likely to be taken by walkers, cyclists or horse riders finding the shortest route between two points.
Development Consent Order (DCO)	Introduced by the Planning Act 2008, a DCO is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIPs).
Do-Minimum (DM)	The scenario that represents the situation that would occur without the project in operation, which includes permitted developments.
Do-Something (DS)	The scenario that represents the situation that would occur with the project in operation, which includes permitted developments.
Heavy goods vehicle (HGV)	A commercial carrier vehicle with a gross vehicle weight of more than 3.5 tonnes.
Junctions 9	Modelling software for roundabouts and priority junctions. Programs such as ARCADY and PICADY used to be separate, however are now incorporated within Junctions 9.
Level of Service (LoS)	Used to assess the operation of traffic
Light goods vehicle	A motor vehicle used to carry goods with a total mass of up to 3.5 tonnes.

Term	Definition
LinSig	Modelling software for signalised junctions
Mainline	The carriageway carrying the main flow of traffic, generally traffic passing straight through a junction or interchange
Nationally Significant Infrastructure Project (NSIP)	Major infrastructure developments in England and Wales, such as proposals for power plants, large renewable energy projects, new airports and airport extensions, and major road projects, as set out in the Planning Act 2008. See entry for Development Consent Order.
Opening year	The first year of operation.
Order Limits	The spatial boundaries of the proposed scheme.
Overbridge	A bridge crossing over a transport corridor (for example a highway).
Practical Reserve Capacity (PRC)	A measurement of capacity at a junction. A positive value indicates that there is spare capacity, whereas a negative value indicates over-capacity.
Public right of way (PRoW)	A right to cross land owned by another person is known as a 'right of way'. If this is a right exercisable by the public at large, it is a 'public right of way'.
Ratio of Flow to Capacity (RFC)	Provides an indication of how close the flow is to the capacity of a road. An RFC of 1 indicates that the arm is at capacity and above 1 the road is over capacity.
Slip road	A connector road within a junction between a mainline carriageway and the local highway network, or vice versa, which meets the local highway network at-grade.
Simulation and Assignment of Traffic to Urban Road Networks (SATURN)	Software used to build transport models (Simulation and Assignment of Traffic to Urban Road Networks)
Strategic Road Network (SRN)	The network of motorways and trunk roads in England.
Variable Demand	Demand which takes into account a change in transport conditions (such as cost) and quantifies that change.
Vehicle Hours Delay	Vehicle Hours Delay is an estimate of the total travel time experienced by all road users over and above the expected theoretical free-flow travel time.
Vissim	Traffic simulation software
Walkers, cyclists and horse riders (WCH)	Users that include:

Term	Definition
	• pedestrians – including mobility impaired and vulnerable pedestrians • cyclists – including mobility impaired and vulnerable cyclists • equestrians – including mobility impaired and vulnerable equestrians Other users considered as part of this group include (but are not limited to): • scooter riders (non-motorised) • cyclists with electrically assisted pedal cycles (where these conform to Department for Transport or other relevant regional regulations and where they can legally be used) users of powered wheelchairs (where these conform to Department for Transport regulations and where they can legally be used)

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