Epping Town Centre Strategy

Western Relief Road and High Street Feasibility Study

August 2015

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integrated expertise

Essex County Council

Document Control Sheet

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1 Introduction

1.1 Scheme Background

Epping Forest District Council (EFDC) have commissioned Essex Highways (EH) to undertake a transport-led appraisal of their Local Development Plan containing a quantum of new residential developments in Epping Town Centre. As of June 2014, the location and quantity of proposed residential units is undecided, with plans underway to appraise the impact of low, medium and high volumes of development in the District.

1.2 Scheme Brief

As part of this process, EH have been tasked with investigating measures that would increase and improve highway capacity in order to reduce the existing congestion problems in Epping Town Centre and, in particular, along Epping High Street (B1393). Dependent on the scale of the future housing development, EH have been advised that two particular areas should be explored:

- For the large scale projection the feasibility of introducing a western relief road around Epping High Street should be explored. The alignment of this road along should be such to connect with the existing highway network bypassing the High Street from the north. The designer is to explore an option that will minimise negative impacts upon the highway network and local environment whilst providing maximising benefits to the residents and road users.
- For the small scale projection the feasibility of improving capacity along the High Street should be explored. In particular the feasibility of increasing capacity at the existing double mini roundabout junction of Epping High Street, Station Road and St John's Road will be investigated. Furthermore, the feasibility of rationalising and possibly relocating the existing pedestrian crossings along Epping High Street should be reviewed. Alteration of the parking provision along the High Street should also be explored to enhance efficiency, although the loss of any parking spaces and any measures that would result in the loss of passing trade should be minimised.

EH have been commissioned to identify options for both a western relief road and improvements along Epping High Street as outlined above. This will involve a high level overview study. The alignment of the western relief road will be informed by a desktop study and Ordnance Survey (OS) base mapping at this stage. OS mapping will also be used along the High Street with existing relevant site features noted on this.

The Transport Planning element of this study will look at existing congestion along the B1393 route through Epping and consider the impact of future traffic flows associated with the Local Plan developments proposed. It will then pay specific attention to the traffic impact of a western relief road, using the Epping Spreadsheet Model to determine the in-scope demand for the relief road and appraise its potential to reduce congestion through the town centre.

1.3 Scope of the Study

This study will:

- Establish current and potential future levels of congestion along Epping High Street – looking at junction capacities and journey times along the B1393.
- Identify existing High Street site features and details.
- Study reported Personal Injury Collisions along Epping High Street (B1393) for the most recent 36 month period available. Provide an analysis of all recorded collisions and identify any patterns which may have a bearing upon the measures proposed as part of the scheme.
- Conduct a desktop study to inform proposals for a western relief road element of the scheme. Propose two options for a western (bypass) relief road.
- Propose appropriate measures to alleviate congestion and improve highway capacity along Epping High Street.
- Produce concept design drawings of all proposals and options.
- Detail options within this Feasibility Study for both the western relief road and Epping High Street including discussion of benefits and dis-benefits, design decisions, issues and outline the nature of any investigations that have led to proposed measures.
- Provide a cost estimate for the recommended works.
- Appraise feasibility of a western relief road in terms of congestion relief and in-scope demand.

2 Preliminary Investigation

2.1 Study Area

Located within Epping Forest District Council, Epping Town lies in the western area of Essex. Both the M25 and M11 motorways are situated within close proximity to Epping. Also known as the B1393, Epping High Street is a distributor road carrying traffic from the Loughton and Theydon Bois area in the south to the Harlow area in the north. The B1393 also provides access from Epping to both the M25 and M11 motorways.

The area of Epping expected to be impacted by a western relief road lies between the junctions of B182 Bury Lane to the south-west and B181 The Plain to the north-east. This provides the extent of the wider study area as shown in Figure 2.1 below.

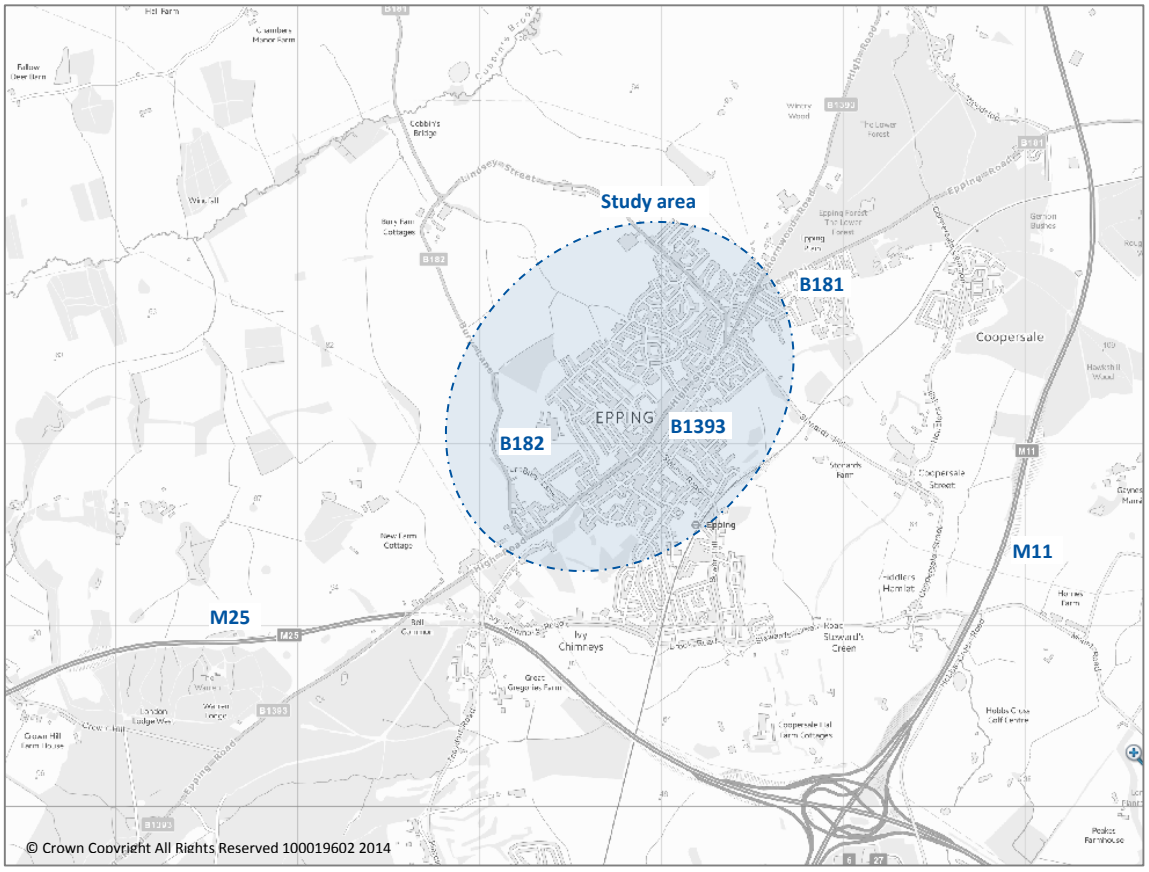


Figure 2.1: Epping study area

2.2 2013 Traffic Conditions

Trafficmaster journey time data has been used to establish patterns of congestion in around Epping town centre. Specifically, 2013/14 link data has been used to determine the peak hour speed compared to the free flow speed along the strategic routes in the area. Peak hour plots are shown in Figure 2.2 and Figure 2.3 below.

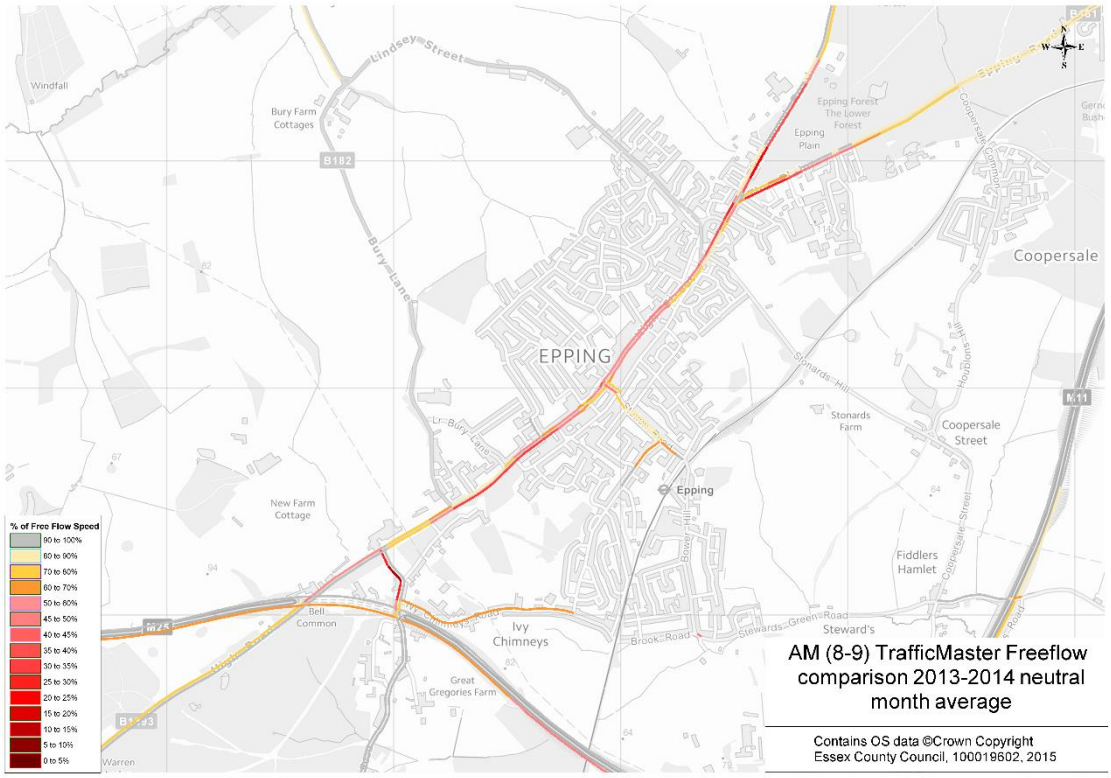


Figure 2.2: Peak hour speed as a percentage of free flow speed – AM Peak

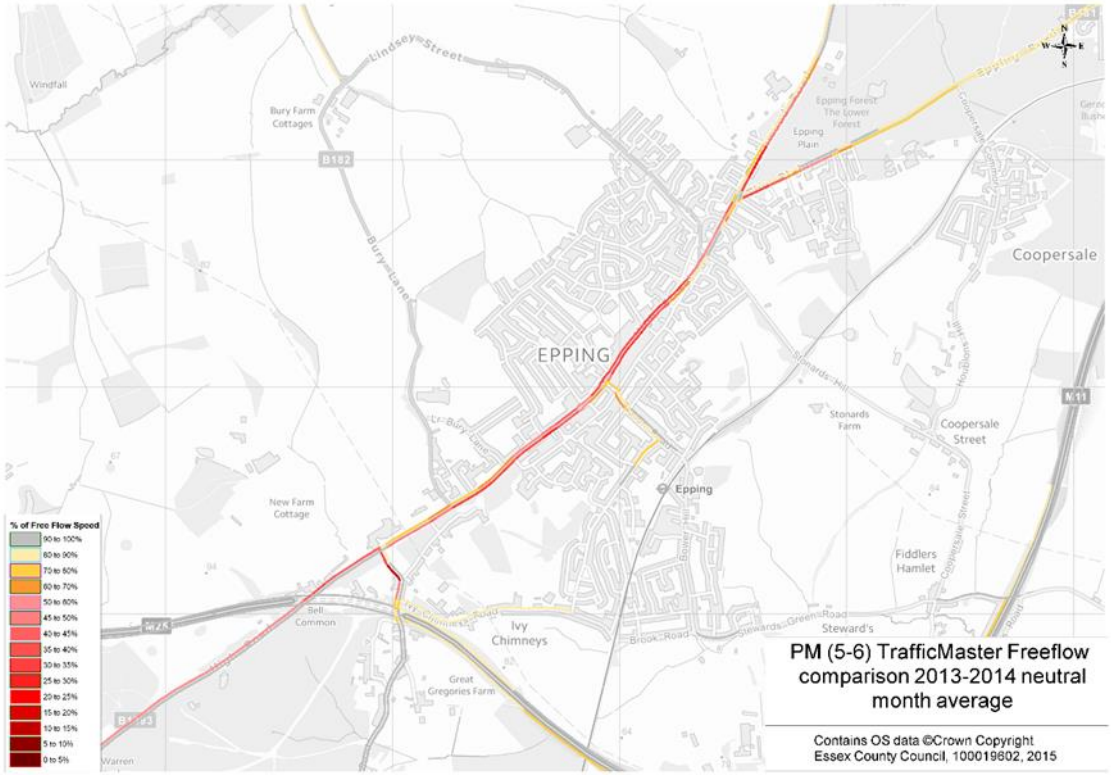


Figure 2.3: Peak hour speed as a percentage of free flow speed – PM Peak

AM peak hour (0800-0900) congestion - as represented by a low percentage of vehicles achieving free flow speed – is apparent through Epping, between and including both the Thornwood Road signalised junction to the north-east, and the B181 Bury Lane roundabout to the south-west of Epping. This congestion is replicated in the PM peak hour (1700-1800) but with more pronounced delays occurring along the B1393 High Street through the town centre.

Four main junctions along the B1393 in Epping have been identified as in-scope for modelling appraisal as part of the town centre review, having previously been assessed as part of the wider LDP study. Using the numbering convention adopted for the Epping Local Plan Appraisal study, these junctions are as follows:

- Junction 8 – Traffic signals at junction of B1393 Thornwood Road and B181 The Plain
- Junction 9a – Mini-roundabout junction of B1393 High Street with Station Road
- Junction 9b – Mini-roundabout junction of B1393 High Street with St. John's Road
- Junction 11 – Mini-roundabout junction of B1393 High Road with B182 Bury Lane

Figure 2.4: Junctions in scope of the Epping Town Centre Review

As part of the Local Plan appraisal, capacity assessments were undertaken using observed 2013 traffic flows at the four main junctions along the B1393 High Street. Results of the modelling are shown in Table 2.1 below.

The tables below document the Ratio of Flow to Capacity (RFC) values and Passenger Car Unit (PCU) queue lengths on each junction approach arm. A glossary of terms can be found in Appendix D of this report.

Table 2.1: 2013 base year junction capacity assessments

Junction 8 (Thornwood Road) - Epping						***2013 - existing network***
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	DOS	LOS	Queue Length	DOS
B1393 Thornwood Road - *Left/Ahead*	-	24	90	-	113	111
B181 The Plain - *Left/Ahead*	-	22	77	-	22	101
B1393 Palmers Hill - *Right/Ahead*	-	20	89	-	161	119

Junction 9a (Station Rd) - Epping						*2013 - existing network*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
B1393 High Street RAB Link	C	4	0.80	E	9	0.92
Station Road	D	3	0.77	C	2	0.69
B1393 High Street	E	9	0.92	D	6	0.87

Junction 9b (St. John's Rd) - Epping						*2013 - existing network*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
St. John's Road	B	1	0.37	E	4	0.82
B1393 High Street	B	2	0.69	E	9	0.93
B1393 High Street RAB Link	D	7	0.89	B	3	0.72

Junction 11 (Bury Ln) - Epping						*2013 - existing network*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
B182 Bury Lane	C	2	0.68	A	1	0.43
B1393 High Road (East)	F	26	1.02	F	21	1.00
B1393 High Road (West)	C	4	0.82	C	6	0.86

Supporting the findings of the Trafficmaster analysis, the 2013 junction capacity analysis highlights similar patterns of congestion currently experienced at the Thornwood Road signals and Bury Lane junction in both peak hours. The capacities of the High Street approach arms at the double mini-roundabout (junction 9a/b) are also shown to be stretched, if not exceeded in the peak hours. Further base year analysis can be found in the 'Epping Local Plan Highway Impact Assessment Technical Note 1' – October 2013.

2.3 2026 Forecast Year Traffic Conditions

As part of EFDC's Local Plan proposals, a maximum total of 2,750 houses are proposed across a number of sites in Epping by 2036. This is expected to place additional pressures on the main B1393 junctions in Epping. Figure 2.5 below illustrates the location and size of the proposed development sites in Epping.

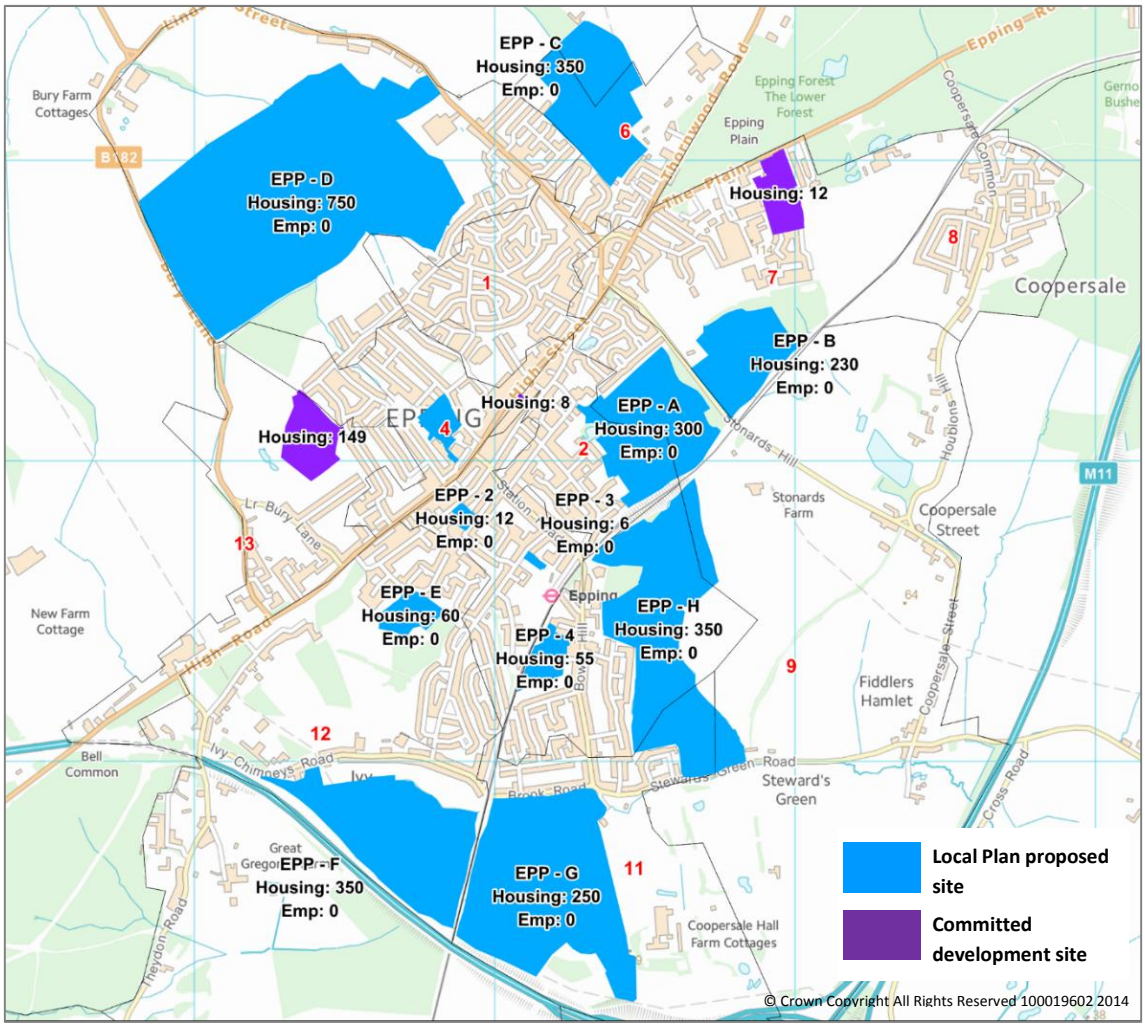


Figure 2.5: Total proposed Local Plan development sites in Epping (as of June 2014)

It is anticipated that the final allocation of LDP housing for Epping will be lower than the maximum proposed. For initial Local Plan forecast modelling (see 'Epping Local Plan Highway Impact Assessment Technical Note 3' – May 2014) EFDC suggested a quota of 2,000 houses in Epping as part of an overall development scenario for the district, termed 'Scenario One'. The quota was maintained for this town centre review and includes the following sites in Epping:

- Epp-B 230 houses
- Epp-C 350 houses
- Epp-D 750 houses
- Epp-F 350 houses
- Epp-H 350 houses

The housing allocation for each site is proposed up to the year 2036. For the 2026 interim assessment year, it was assumed that half of the planned housing total for each site would be built and occupied.

A spreadsheet model of Epping, developed for the Local Plan appraisal, was used to determine the impact of traffic flows associated with the Local Plan developments by modelling the volume and distribution of trips through the local road network. Details of the modelling are discussed further in the 'Epping Local Plan Highway Impact Assessment Technical Note 2' – January 2014.

Using 2026 flow outputs from the spreadsheet model, further capacity assessments were undertaken at the four main junctions along the B1393 High Street. The results are shown in Table 2.2 below.

Table 2.2: 2026 forecast year junction capacity assessments

Junction 8 (Thornwood Road) - Epping						*2026 - existing network*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	DOS	LOS	Queue Length	DOS
B1393 Thornwood Road - *Left/Ahead*	-	243	131	-	143	115
B181 The Plain - *Left/Ahead*	-	46	98	-	77	115
B1393 Palmers Hill - *Right/Ahead*	-	66	103	-	574	192

Junction 9a (Station Rd) - Epping						*2026 - existing network*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
B1393 High Street RAB Link	F	77	1.12	F	99	1.17
Station Road	F	33	1.11	F	7	0.91
B1393 High Street	F	95	1.17	F	148	1.26

Junction 9b (St. John's Rd) - Epping						*2026 - existing network*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
St. John's Road	F	11	1.05	F	49	1.31
B1393 High Street	F	188	1.35	F	155	1.34
B1393 High Street RAB Link	F	84	1.13	F	44	1.05

Junction 11 (Bury Ln) - Epping						*2026 - existing network*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
B182 Bury Lane	F	30	1.07	B	1	0.59
B1393 High Road (East)	F	297	1.52	F	154	1.30
B1393 High Road (West)	F	23	0.99	F	200	1.26

The results of the capacity modelling suggest that the junctions along the B1393 will all exceed capacity in both peak periods. It should however, be noted that queue length outputs are best viewed as indicative of the levels of congestion possible. Furthermore, as flow outputs have been taken from a fixed assignment spreadsheet model, junction capacity results should be deemed 'worse case'. In reality, it might be expected that

vehicles will attempt to avoid the worst incidences of congestion by changing route, mode of travel or time of travel.

Nevertheless, it can be concluded from the modelling that a combination of infrastructure improvements and sustainable travel initiatives will likely be required across the road network in Epping in order for future traffic flows to be accommodated in the peak hours.

Given the extent of congestion modelled in Epping in 2026 with half the quota of development traffic proposed, it was considered superfluous to model conditions at the junctions in 2036 with the full traffic quota. This future year scenario would be reserved for the appraisal of mitigation measures.

2.4 Town Centre Site Detail

The central area of Epping High Street under investigation as part of the High Street improvement study, lies between the junctions of Tower Road to the south-west and Grove Lane to the north-east. Within this area the land use immediately adjacent to Epping High Street is distinctly commercial in nature. Beyond both of these junctions the land use takes on a more noticeably rural feel.

The town centre route can further be categorised into two sections which are effectively separated by a double mini roundabout junction located approximately mid-way along the study route. To the north-east of the double mini roundabout a market is present (operational on Mondays) and the retail units are more of a 'town centre' nature. Site observations show that there appears to be more vehicle and pedestrian activity along this section. To the south-west of the double mini roundabout retail units are more 'local shopping parade' in character.

The south-eastern arm of the double mini roundabout provides access to Epping Underground Station via Station Road. In addition to the double mini roundabout, Epping High Street also has a number of other priority junctions with the High Street designated as the main road. It should be noted that some of the minor roads, particularly adjacent to the market area, appear to be quiet access roads with low traffic flows where give way road markings have been omitted.

Epping High Street (B1393) is a single carriageway road with one traffic lane in each direction along most of the study route. The carriageway does flare out to incorporate two traffic lanes on the south-western and north-eastern approach arms at the double mini roundabout. Central hatch road markings are present from the double mini roundabout, south-west to Tower Road. Right turning lanes and gaps have also been

incorporated along this section of the High Street. A small length of hatch road markings are present to the north-east of the double mini roundabout although traffic lanes are generally separated by a central demarcation line to the north-east of the double mini roundabout. Epping High Street has a speed limit of 30mph. Thirteen bus routes serve Epping High Street with three bus stops located along the study route for each direction (six in total).

A total of eight pedestrian crossings are present along the study route. These consist of three signalised crossings, two zebra crossings (that both incorporate refuge islands and three further pedestrian refuge islands. The signalised crossings have been implemented at the north-eastern and south-western extremities of the High Street and the zebra crossings to either side of the double mini roundabout.

Two of the pedestrian refuge islands on the High Street are adjacent to the market area with the remaining refuge island close to the Crows Road junction. The refuge islands adjacent to the market have narrow dropped kerb crossing and no tactile paving provision. Accessibility of the north-easternmost of these refuge islands is further hampered as it is flanked by parking bays to the east and market stalls to the west (when the market is in operation). Tactile paving and dropped kerb crossings are present at all other pedestrian crossings along the High Street.

There are a number of on-street parking bays on the High Street. To the south-west of the double mini roundabout lengths of parking bays are intermittent with restrictions between Mondays and Saturdays, 8am to 6pm, allowing parking for one hour. To the north-east of the double mini roundabout lengths of parking bays are more continuous. Restrictions along the eastern side of the highway are between Mondays and Saturdays, 9am to 5.30pm, allowing parking for one hour. On the western side of the highway a further restriction has been imposed for Monday from midnight to 6pm, prohibiting parking whilst the market is in operation.

In addition to these parking bays there are also a number of bays situated towards the north-eastern end of the study route for loading, blue badge holders, police vehicles and taxis. In addition to parking bays, bus stops and controlled crossing areas, road markings of single and double yellow lining are present long the remainder of the study route.

The carriageway generally has a bituminous surface along the length of the study route although some parking bays and a bus stop are modular block paved at the north-eastern end. The footway is surfaced with a variety of surfaces including concrete slab paving, modular block paving and bituminous surfacing along the study route. Site observations have highlighted that the condition of the footway and carriageway is moderate along much of the route.

2.5 Collision Data and Analysis

Personal Injury Collision data (PICs) for the 50-month period from 31 December 2008 to 31 December 2013 recorded by Essex Police has been obtained and analysed along Epping High Street between the junction with Tower Road to the junction with Grove Lane. Collision stick diagrams, collision plot and interpreted listings have been used in order to provide an analysis of the collision history. These are located in Appendix A of this report.

Table 2.3 gives a summary of the collision data (to 31 December 2013) for Epping High Street. During this period there were a total of 30 PICs resulting in 1 fatal, 1 serious and 28 slight collisions with a total of 33 casualties being recorded.

Annually, trends indicate that there is a fluctuation of the number of collisions taking place each year, with 4 collisions occurring in the first and third years, 10 collisions in the second year, 7 in the fourth year and 5 in the final year. A Poisson statistical test has been carried out to measure whether or not the fluctuations are statistically significant or not.

The results show that there is a fair to high chance that the fluctuation in the second year of data is statistically significant and that there is also some statistical significance that the fluctuations in the first and third year may not be random as well. This implies that these fluctuations, particularly the data observed in the second year may not be due to random fluctuation and that there may have been an external influence in this area that contributed towards these variations.

Table 2.3: Collisions by severity and time period

Collisions in the 12 month period ending	Slight	Serious	Fatal	Total
December 2009	2	1	1	4
December 2010	10	0	0	10
December 2011	4	0	0	4
December 2012	7	0	0	7
December 2013	5	0	0	5
TOTAL COLLISIONS	**28**	**1**	**1**	**30**

The main contributory factor, which is subjective, has been interpreted for each of the collisions. Ten (33.3%) of the collisions involved vehicles making a poor turn or manoeuvre and a further eight (26.7%) of the collisions involved road users failing to look properly. Four collisions (13.3%) involved drivers disobeying give way controls and a further two collisions (6.7%) could be attributed to aggressive driving. The remaining collisions were all attributed to isolated causation factors.

Further analysis of the collision data has highlighted certain trends. A sizeable proportion of collisions involved pedal cyclists (6 collisions or 20%) and motorcyclists (8 collisions or 26.7%). A further 7 collisions (23.3%) directly involved vehicles pulling into or out of parking bays. These collisions may suggest a potential issue with the manner in which carriageway space and traffic lane widths are distributed along the High Street. Table 2.4 outlines these collision patterns that have been observed.

Table 2.4: Collision patterns

Pattern of Collision	Total	Percentage
Pedal Cyclist involvement	6	20.0%
Motorcyclist involvement	8	26.7%
Vehicles manoeuvring into/from parking bays	7	23.3%

Additionally, a substantial proportion of collisions involved vehicles entering the double mini roundabout. Seven collisions (23.3% of collisions) involved vehicles either circulating or approaching the junction. The four collisions involving vehicles disobeying give way controls all relate to this junction. Furthermore, two collisions were recorded which involved pedestrians crossing the road to the south-west of Crows Road, at the site of one of the pedestrian refuge islands. It should be noted that one of these collisions was fatal.

With the exception of the patterns noted above, collisions appear to be reasonably evenly distributed geographically along the study route. Table 2.5 provides a breakdown of collisions occurring by road condition and speed related factors. The data shows that 12 (40%) of the collisions occurred during the hours of darkness. Collisions occurring whilst the road surface was not dry were recorded at 23.2% (7 collisions). Analysis of the data has also highlighted that a relatively high number of collisions (30% or 9 collisions) involved pedestrians. This would suggest a need for additional or improved pedestrian crossing facilities along the High Street.

Table 2.5: Collisions by road conditions and speed related factors

Cause	Number	Percentage
Dark	12	40.0%
Non dry	7	23.3%
Pedestrian	9	30.0%

3 Town Centre Proposed Measures

3.1 Town Centre Existing Problems and Site Observations

During a site visit, conducted on Monday 24 February 2014, a number of observations were made which identified where obstructions were evident along Epping High Street. These obstructions appear to have a negative impact upon traffic flows and, in some instances, safety along the High Street. All of these obstructions were observed between St John's Road and Grove Lane – the area of the High Street with the greatest pedestrian activity, shops that are more 'town centre' in nature and where a market operates on Mondays.

The existing configuration of the highway appears to contribute towards these obstructions. Firstly it was noted that some vehicles attempting to park in the tight on street parallel parking bays on the south eastern side of the carriageway resulted in an obstruction to traffic flows downstream. Site measurements show that the existing parking bays are narrow, 1.8 metres wide, and are not delineated by length. Therefore, some vehicles were observed trying to park in a space that was not of an adequate length to manoeuvre into and accommodate their vehicle.

Figure 3.1: Pedestrian Refuge Island and adjacent parking outside 188 High Street

Site observations showed that the existing pedestrian refuge islands along this section of the High Street also contributed towards obstructing free flowing traffic. In particular, the position of the pedestrian refuge island outside of 190 High Street results in a pinch point to the adjacent southbound traffic lane of 2.8metres. During the site visit a vehicle

was poorly parked in the area of parking bays adjacent to the island (shown in Figure 3.1). Consequently larger vehicles had difficulty navigating between the vehicle and the island. As demonstrated by a bus which was seen mounting the kerbs of the island. Furthermore, the islands afford poor accessibility. Neither accommodate tactile paving and the island outside of 188 High Street guides pedestrians directly into parking bays and the market area. The islands, therefore, fall outside of current design standards with regards to accessibility.

Finally, the arrangement of the market area on the north-western side of the carriageway also appeared to contribute towards an obstruction for the passage of traffic travelling northbound. The market operates within the existing carriageway area currently occupied by parking bays on the north-western side of the carriageway. As the market is not bound by any physical demarcation a number of market stalls, vehicles and even objects associated with the market have spilled out into the live carriageway. Figure 3.2, an image produced from Google Earth, provides evidence of this.

Figure 3.2: Vehicle associated with market area causing obstruction to live carriageway. Image produced from Google Earth: ©2014 Google

The observations noted during February 2014 site visit, therefore, suggest that the carriageway is poorly aligned along the northern stretch of the High Street. The collision analysis findings identified in Section 2.5 also suggest that there are safety concerns which may be as a result of the existing carriageway alignment. Furthermore, a sizable number of collisions have occurred on the approach to the double mini roundabout and have involved pedestrians.

3.2 Proposed Measures along Epping High Street

In order to facilitate more efficient traffic flows along the High Street it is proposed to redistribute the carriageway in order to reduce and remove obstructions. Firstly, it is proposed to alter the arrangement of the existing parking bays along the High Street in order to allow vehicles to park more easily and therefore contribute towards a reduction in waiting times for travelling vehicles. It is proposed to widen all parking bays along the south-eastern side of the carriageway from the existing 1.8metres to 2.0metres.

It is proposed to demarcate each of the parking bays by length in order to promote more effective parking discipline. This would result in the parking bay road marking being changed to a marking to TSRGD diagram number 1032. In order to allow vehicles to park as easily as possible proposed lengths are as near to the maximum permissible length of 6.6metres. Although this alteration to parking bay lengths may result in a reduction to overall parking capacity along the south-eastern side of the High Street the overall length of area designated for parking bays will be the same as the existing configuration.

To the north-west of the parking bay areas it is proposed to implement two traffic lanes at 4.0 metres in width (this is wider than the standard 3.65m, see Section 3.3 for further explanation). This would mean that the existing traffic islands outside of 180 and 190 High Street would need to be removed. This is considered to represent more benefits than dis-benefits. However, as the existing islands not only result in pinch points for traffic movement they are also not designed to current standards and represent safety concerns in relation to visibility and accessibility.

Traffic lane widths of 4.0 metre have been chosen so to allow HGVs and PSVs to safely pass pedal and motor cyclists without obstruction. The collision analysis data shows a significant number involve pedal and motor cyclists along the High Street. A large number of bus routes also serve the High Street and HGV numbers would also be high given the large number of commercial premises.

On the north-western side of the High Street it is proposed to formalise the existing area where the market takes place. In its present form the Monday market takes place largely within an area of carriageway designated with parallel and echelon parking. It is proposed to convert this area from carriageway to a paved area which could be physically differentiated from the carriageway by being implemented at footway level and bounded by kerbing. The exact configuration and form would be detailed further into the design process. It is considered that these new areas would complement the existing paved area at the north-eastern end of the High Street which currently

accommodates road markings for market stalls as well as parking bays. However, a consultation with the market stall holders will be required.

As well as accommodating areas for the Monday market, market stalls and activities the proposed paved areas could also allow for on street parking at other times in the week. Indicative dropped kerbs have been shown on the proposed measures plans to indicate where these facilities may be introduced. As it is considered that this new arrangement may result in the loss of on street parking spaces a number of additional parallel parking bays have been incorporated as part of the proposals adjacent to the main market area. As with the parking bays on the opposite side of the High Street it is proposed to implement 2.0metres by 6.6metres bays. It is considered that the existing build out area to the south of the market area could be adjusted to complement the proposed paved market area and act as an extension of this facility.

Finally, it is proposed to relocate the existing bus stop clearway near to St John's Road on the south-eastern side of the carriageway further to the north-east so that it is adjacent to the existing disabled parking bays. It is proposed to alter the alignment of the kerb line adjacent to the existing relocated bus stop clearway in order to facilitate for smoother bus stopping movements and allow for additional carriageway space. The new kerb alignment would result in a number of telephone call boxes having to be relocated. A tree may also need to be removed and utility service apparatus may also need to be diverted as part of the proposed kerb re-alignment. It is also proposed to relocate the bus shelter to be closer to the new bus stop area.

3.3 Proposed Measures at the Existing Double-Mini Roundabout

Further to the design brief for the project, measures have been proposed that would increase capacity at the existing double mini roundabout junction on the High Street. Additionally the collision analysis has highlighted safety concerns at this junction, in particular with regards to vehicles disobeying the give way controls at the junction. The most obvious measure to control traffic streams in order to increase capacity and reduce collision risk would be to signalise the junction. A geometric design has therefore been formulated presenting a design for the signalisation of the site. The proposals have been formulated using design guidance from TD 50 of the Design Manual for Roads and Bridges and Chapter 5 of the Traffic Signs Manual (TSM).

TD 50 provides a number of permutations for signalised junction arrangements and types. As the existing junction operates with a stagger between St Johns Road and Station Road it appears that the most suitable type of signal controlled junction would be a right/left stagger. TD 50 states that for a junction to be considered as a single signal controlled staggered junction the maximum stagger distance, i.e. the distance along the major road between the two centre lines of the minor roads, is 75metres. The stagger

distance in this case is 50metres and therefore satisfies this criteria. Furthermore, TD 50 also places a requirement on the reservoir length, i.e. the distance between the inner stop lines, to be a minimum of 15metres. In this case the proposals would result in a reservoir length of 29 metres.

The next factor to consider was capacity at the junction. Although the analysis of traffic flows and the production of traffic modelling is beyond the scope of this particular part of the study it was considered necessary to produce a layout which introduces as many traffic lanes as possible and that could operate under as many stages as possible. Therefore, two lanes are proposed in both directions along the High Street in all cases except for the exit on the north-eastern arm. The existing highway configuration does not allow for two lanes to be accommodated here that could be safely merged into one lane further north the High Street.

On the south-western approach arm it is proposed to introduce two approach lanes for a distance of approximately 70metres from the junction. On the exit it is proposed to introduce two segregated lanes for a distance of approximately 40metres. The proposed configuration then allows for vehicles to merge over a further 50 to 60metres. It is considered that this could be refined further pending the results of modelling requirements and from further discussions to ascertain whether or not it would be acceptable to remove, relocate or reduce the existing parking bays on the south-eastern side of the carriageway. Due to constricted highway space only one approach and exit lane could be provided along both St John's Road and Station Road.

Traffic lane and traffic island widths have been proposed considering existing highway space, safety and capacity issues. TD 50 proposes lane widths at junctions between 3.0 and 3.65 metres. Considering the significant numbers of cyclists and larger vehicles that would be using the junction it is considered that 3.0metres will be narrow. A 3.25 metres width is considered to represent a safe width which would allow larger vehicles to pass cyclists as recommended in Local Transport Note 1/07, Traffic Calming. Additionally, island widths of 3.0 metres have been selected to allow for staggered pedestrian movements.

The above proposals would allow for more permutations of signal staging and therefore should allow for the junction to operate with increased capacity. It was also considered that standard pedestrian refuge islands without staggers may not be suitable when taking into account the significant crossing lengths of at least 14.5metres (pedestrians would have to navigate as part of a pedestrian phase). A reduction in crossing widths and spaces would allow for green phases to operate for a longer time. The pedestrian staggers have been designed to the preferred left/right orientation. Crossing widths have been provided at 2.4metres, as recommended in Chapter 5 of the TSM, and tactile

paving has been designed to the specification set out in the DETR guidance on Tactile Paving. No crossing facilities have been provided within the junction reservoir as there is considered to be no pedestrian desire line present here.

It is proposed to retain the pedestrian crossing point along St John's Road in order to serve the existing pedestrian desire line. It is proposed to relocate the pedestrian crossing point and stop line on Station Road slightly to the north-west as this would allow for a reduction in the associated inter-green period for traffic exiting Station Road. The existing pedestrian crossing point here does not appear to be located on any desire line. It is also proposed to realign kerbs on both sides of the carriageway along Station Road to allow for increased footway capacity on the north-eastern footway. The effective carriageway width would stay similar here but the increased capacity would mean that the south-western footway width would need to be reduced in width from 4.0metres to 2.5 metres.

Road markings and the locations of signal posts have been determined using the guidance set out in Chapter 5 of the TSM. Primary, secondary and pedestrian phase aspects are shown indicatively on the proposed measures drawing, although this can be revised pending the results of modelling work. Destination arrows have been omitted from the proposed measures drawing as will be subject to modelling work and should be advised pending the results of this exercise. Swept path movements have been conducted which shows that small articulated and rigid pantechnicon vehicles can manoeuvre the junction in all directions. It appears that any vehicles larger than these would have difficulty negotiating the junction in its present form and therefore these have not been catered for in the proposal.

It is proposed to effectively set out the geometry of the junction from the building line on the south-eastern side of the junction along the High Street. It is proposed to provide a 3.0metre footway here before introducing four traffic lanes of 3.25metres in width and the traffic island of 3.0metres in width. It is proposed to alter the kerb line on the south-eastern side of the highway to the north-east to complement this arrangement. This would allow for two approach lanes of approximately 50metres on the north-eastern approach arm. To allow for the proposed carriageway and island capacity the existing grass verge on the north-western side of the highway along the High Street would need to be reduced from the St John's Road junction to the Crows Road junction. There are a number of problems associated with this however. Preliminary investigations have shown that this may have some bearing upon services utility apparatus here although detailed analysis to determine this is beyond the scope of this study. Furthermore, a number of mature trees will need to be removed on the south-western approach arm to the junction in order to allow for the new carriageway alignment.

A significant risk is to the proposed measures the ownership of land. Plans outlining the public maintainable highway have been procured to determine whether or not the proposals fall within the existing highway boundary. The results from this search show that the grass verge and footpath on the north-western side of the highway between St John's Road and Crows Road is not highway land. Further investigations have shown that this area is likely to be common land which would have significant protected rights. Its adoption to highway may require State approval. This is likely to represent a major risk towards the development of these proposals.

Consequently, alternative geometric arrangements have been considered that would fit within the existing highway boundary. Further land ownership and site constraints would prevent the creation of additional carriageway space on the south-eastern side of the highway. It is considered that any alternative design for a signal controlled junction within the existing carriageway footprint would not have a positive effect upon reducing capacity as only one lane would realistically be achievable in each direction. Therefore, it is recommended to retain the original proposals as this was considered most appropriate towards improving capacity at the junction.

3.4 Benefits and Dis-Benefits

Table 3.1 outlines the benefits and the dis-benefits associated with the proposals. Proposals have been segregated along the High Street but grouped together at the junction as it was considered unsuitable to segregate the benefits and dis-benefits for the individual proposals here.

Table 3.1: Benefits and dis-benefits of proposed measures

Proposal	Benefits	Dis-benefits
Conversion of the existing double mini roundabout to a staggered signal controlled junction	• Potential for increased capacity – Note: modelling needs to be undertaken to confirm this. • Reduced risk of collision	• Costs – Construction design and project management. • Some utility apparatus may require diversions • Removal of trees. • The conversion of common land to highway may not be achievable and even if it is may require state approvals process.
Alteration of parking bays to maximise lengths and widths	• Potential for reduced congestion downstream. • Reduced risk of low impact collisions from vehicles manoeuvring into tight spaces.	• Actual reduction in overall number of vehicles able to park although no loss in overall space.

Removal of pedestrian refuges outside of 180 and 188 Epping High Street	• Removal of pinch point which can cause difficulty for large vehicles passing. • Removal of facility which has safety and accessibility concerns.	• Removal of feature that can provide refuge for pedestrians crossing. • Costs – Construction, design and project management.
Formalisation of market area	• Containment of market area and associated activities will reduce objects 'spilling out' onto the live carriageway. • Potential for area with more aesthetic appeal.	• Costs – Construction, design and project management. • Potential reduction in parking spaces (although mitigated by adjacent parallel bays and potential for parking within area outside of market day)
Relocation of bus stop near to St John's Road north-eastwards	• Creation of smoother kerb line allowing more effective alignment for buses. • Creation of additional capacity on the approach to the St John's Road / Station Road junction	• Costs – Construction, design and project management. • Telephone call boxes would require relocation • A tree and service apparatus may require removal and diverting.

4 Western Relief Road

4.1 General

Epping has one main road that runs through the town centre, specifically the B1393, High Road, High Street and Palmers Hills. The road is heavily trafficked as it provides access to the commercial high street and residential estates; a link between Loughton, Epping, Harlow and Ongar; access to the M11 and M25 motorways as well as the A414 to Chelmsford. Due to its proximity to the junction of the M11 and M25 motorways, it is known to be an alternative route when there are congestion problems on the motorways. Should the town further expand the traffic through the high street will significantly increase from the demand of the local residents alone. Therefore, Essex Highways have been commissioned to investigate the possibility of introducing a western relief road to reduce the congestion on the High Street.

It must be noted that the recommendations in this feasibility study are based on a desktop study and Ordnance Survey base mapping.

The outline design is based is on the horizontal alignment only. No investigation work has been carried out on the vertical alignment. Further investigation work is required to confirm its feasibility; discussed further in Section 4.3.

4.2 Site Observations and Desktop Study

A general site visit was carried out on Monday 24 February 2014. All site observations were carried out via the road side as the ownership of the land within the area of the proposed road is unknown and therefore assumed to be privately owned.

The land proposed to be used is mainly agricultural land used for farming and grazing. Farms, and accesses to them, are scattered throughout the area.

Ground levels varied significantly along the proposed route. From site observation, the ground level difference were significant when compare with the rest of the site at the locations of land drainage watercourse.

Observations were carried out to the B182 Bury Lane to review if this road could be used as access to the bypass. The road is a single lane carriageway with a footway along the eastern side; the western side has a narrow verge and ditches. Road lighting columns are situated along the narrow western verge. The southern section of the lane is mainly surrounded by residential properties and a school along the eastern side. The western side has a couple of residential properties at the approach with the B1393 High Road. Epping's cemetery is also located on the western side of the lane about 590metres north

of the junction. The lane is not straight; it has a number of bends along its length and is surrounded by trees, hedgerows and vegetation.

An internet based search indicated that within the proposed area of works there are a number of specific environmental interests that may restrict the works. Based on the MAGIC website, which is a website that provides authoritative geographic information about the natural environment from several government departments, indicated that the location of the proposed relief road is an area with sensitive environmental agreements such as woodlands, common land and allotment gardens. These areas of interest have been highlighted on the drawings attached to this study.

Essex County Council's website indicated that there are a number of public rights of ways (footpaths and a bridleway) in the vicinity. These too have been indicated on the drawings.

The Environment Agency's website indicated that there is a Main River watercourse adjacent to Wintry Wood, which flows northwest to join Cobbins Brook.

OS mapping information indicates that there are a number of watercourses and drainage streams located within the area of interest

During the site visit it was noted that a number of electricity pylons were situated in the land; the desktop study confirmed these as well as the existence of electricity substations.

4.3 Proposed Options

Following the desktop study various options for the relief road have been developed to determine suitable horizontal line. It must be noted that the options are based on the constrictions identified. This does not take into consideration any level differences along the land. They are possible horizontal alignments which will require further investigation work and feasibility studies will be required to confirm their buildability.

It is anticipated that the relief road will have a medium to high usage by the motorists who require driving though Epping as part of their journey and wish to avoid the High Street and by those driving through Epping when the M11 and M25 motorways are congested.

It must be noted that the desktop study indicated that nearly the whole of the northern section of Bury Lane is common land and consequently this will impose risks to the development of this proposal. Further land ownership investigation works will be required to confirm the status of the all land required for the proposed routes.

The first option to be reviewed was to determine if the Bury Lane could be used as a main access point to the new relief road. An initial review indicated that there are limited alterations that could be carried out to this lane to improve the alignment based on the findings in Section 4.2. It is possibly surrounded by common land and may have environmental constraints. This lane also provides an access to a school and has limited space to possible enable widening of the junction with the High Road. Modelling information will be required during the feasibility stage to confirm if this lane could be utilised.

In the case where it was established that Bury Lane could not be used the only other possible location for a junction to the relief road is approximately 210metres south of Bury Lane utilising the land next to a hotel. The desktop study did not indicate any environmental constraints within this land. Possible risks with this option could be the objections from the residents and business adjacent to the proposed junction, the additional cost for land purchase and cost to construct the road up to Bury Lane. However, this option will allow for the design of an option without restriction to road widths.

The second design option was to find a suitable line for the bypass between the B181 and B182. Problems arose along the B182 side as there are a number of residential properties, farms and business estate along the road. The option of possibly utilising Bolt Cellar Lane was disregarded as the road appears to terminate as you approach Shaftsbury Farm and there isn't sufficient land available to extend the road and provide a junction to the B182 at that location. (refer to Drawing Number DC20053-00-009)

There is a possibility that a junction could be provided through the land north of Shaftesbury Farm, but the desktop study revealed that that parcel of land is dedicated to allotment gardens. Further investigation work is required to confirm this. If this is definitely the case the land maybe protected by the Allotment Act 1908 to 1950. It may be possible to use this land if an alternative location is provided. As there is a strong case that this land cannot be used a further alternative route needs to be investigated. (Refer to Drawing Number DC20053-00-009)

The final alternative for this section would be to provide a road north of all residential properties along the B182. The environmental desktop study indicated the road may cut through an area where tree felling licenses are in place. An environmental desktop study is required to confirm this and its implications. However it is believed that this option would have fewer constraints to develop. (refer to Drawing Number DC20053-00-010)

The third and final stage of the review was to find a suitable location to tie in the new relief road with the B1393 Thornwood Road. Ideally, the tie in would need to be situated close to the junction of Thornwood Road with Palmers Hill and The Plain (B181).

The desktop study indicated that there are two locations of Deciduous Woodland Biodiversity Action Plan (BAP) Protected Habitats; specifically Wintry Wood and the woodland areas along Thornwood Road. Internet searches indicated that BAP protected habitats were those that were identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan and therefore were bypassed during the outline design process.

It was investigated if the access road to the electricity substation area could be utilised but there is very limited land available to provide a wider road as well as to provide a suitable horizontal alignment due to adjacent residential properties, their accesses, another allotment garden and electricity pylons.

Following the raising of these issues, the only suitable location to tie in the proposed relief road with the B1393 Thornwood Road is north of the small woodland area located on the western verge, as illustrated on Drawings Numbers DC20053-00-009 and 010.

At this stage of the study the options for connecting the bypass to any of the existing roads has not been finalised. Modelling work with predicted vehicle movement will be necessary to determine the type of junction required; whether it is a signalised junction, simple T junction or roundabout.

High level estimates have been prepared for the main proposed options indicated on Drawings DC20053-00-009 Epping Western Relief Road Option One and DC20053-00-010 Epping Western Relief Road Option Two. The cost estimates are provided in Appendix B.

At this moment in time it is difficult to recommend a preferred option for the western relief road as the land to be used appears to have environmentally sensitive designation. An environmental constraints, land ownership and topographical survey will be required to enable the Essex Highways recommend a suitable option.

4.4 Transport Appraisal of a Proposed Western Relief Road

4.4.1 Spreadsheet Model Reconfiguration

The proposed western relief road was incorporated into the Epping Spreadsheet Model through a manual reassignment of traffic away from the B1393 route, and onto the proposed bypass link.

As base traffic flows had been taken from junction turning counts rather than origin-destination matrices, it was not possible to differentiate between through-traffic and town centre flows in the model. Consequently, it was not possible to ascertain with certainty, the proportion of background vehicle trips in-scope to relocate to the relief road.

To overcome this, the maximum volume of in-scope background traffic was estimated by determining the point at which the reassignment of traffic to the relief road left turning movements at junctions along the existing B1393 route with negative values in the spreadsheet.

As part of this process, assumptions were made in determining the traffic movements that would reassign to the relief road.

The modelling assumed use of the B182 Bury Lane and the existing mini-roundabout junction with the B1393 as part of the western relief road alignment. As documented in Section 4.3, the Major Projects desktop study also considered a new-build link extension connecting into a new junction on the B1393 between Bury Lane and Theydon Road. Regardless of the choice of connectivity into the B1393, the analysis presented in this report can largely be applied to either alignment, with there being no anticipated effect on the route reassignment calculations.

For north-eastbound journeys along the B1393 at the junction with the B182 Bury Lane, those with onward destinations via the B1393 Thornwood Road and B181 The Plain were assumed to be in-scope to divert to the relief road. The split in through traffic movements was derived from the proportions recorded for all traffic flows approaching the junction from Epping town centre.

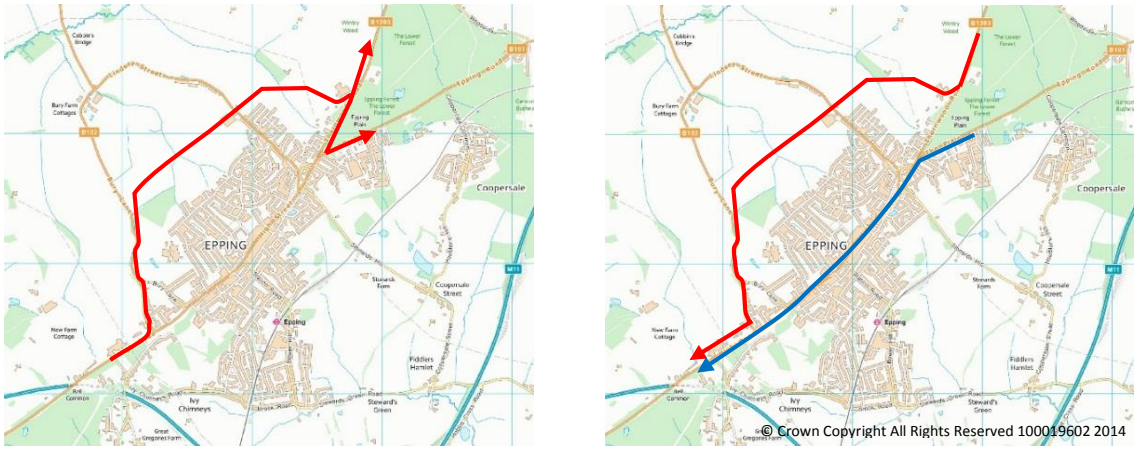


Figure 4.1: Assumed NEB and SWB reassigned trip movements to the relief road

For journeys heading south-west from the signals on the B1393 Thornwood Road, it was assumed that those from the B1393 Thornwood Road were in-scope to divert to the relief road. In contrast, through movements from the B181 The Plain were assumed to route through the town centre rather than head north-east to access the relief road. These routing assumptions are illustrated in Figure 4.1 above.

It was recognised that a route via the relief road would not be as direct as the existing B1393 route though Epping town centre. Under free-flow conditions, the town centre route would likely offer a faster journey time than the relief road – without stringent traffic management measures in place. For this reason, it was assumed that vehicles travelling through the town centre would continue to use the existing route so long as the junctions along it remained within capacity. In this regard, an iterative approach to the junction capacity modelling would determine whether a proportion of background traffic flows, below the maximum amount estimated, should be assigned to the relief road.

Development trips associated with the 'Scenario One' quota were reassigned to the relief road where the link offered a reasonable alternative to the congested B1393 route without significant diversion. In this respect, only development trips with origins and destinations on the periphery of the town centre, either from an internal or external model zone, were considered for reassignment to the relief road.

The reassignment was undertaken by adjusting the assigned routes manually between model zones in the spreadsheet. For each affected zone OD pair, this involved adding the relevant junction turning movements along each route via the relief road, and then removing the relevant turning movements along the old route.

4.4.2 Assignment of Traffic to the Relief Road

Initial junction capacity tests using the 'Scenario One' development quota showed that that a number of junctions along the B1393 would likely remain over capacity with the maximum allocation of background traffic flows assigned to the relief road.

For this reason, the maximum allocation was taken forward for inclusion in the future year relief road appraisal, as shown in Figure 4.2 below:

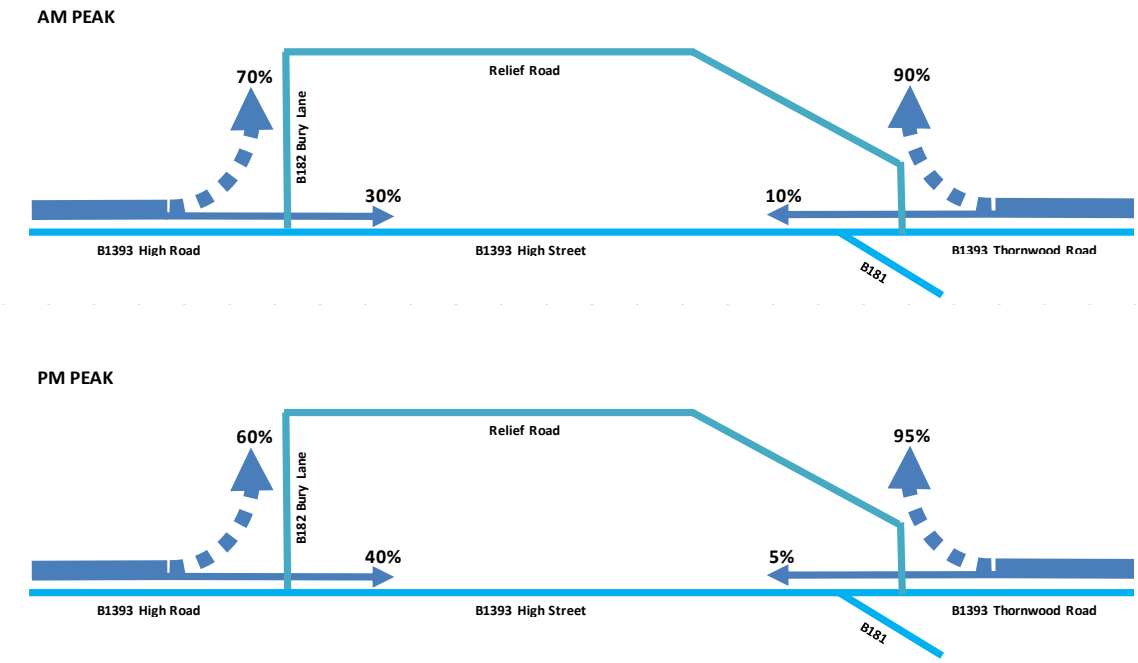


Figure 4.2: Max percentage of peak hour background traffic to western relief road

Adopting a broad assumption that half of Local Plan development would be built by 2026 across all proposed sites, with the remaining half built by 2036, turning proportions thus remained consistent across the assessment years 2026 and 2036.

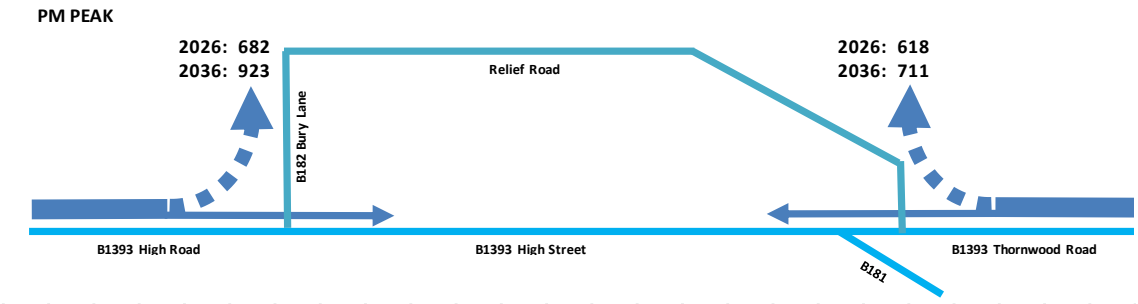


Figure 4.3 below illustrates the difference in flows along the B1393 between the existing network and the modelled network incorporating a western relief road. This effectively represents the total diverted traffic flow (background flow and development traffic)

from the B1393 to the relief road as shown in the spreadsheet model for the three assessment years.

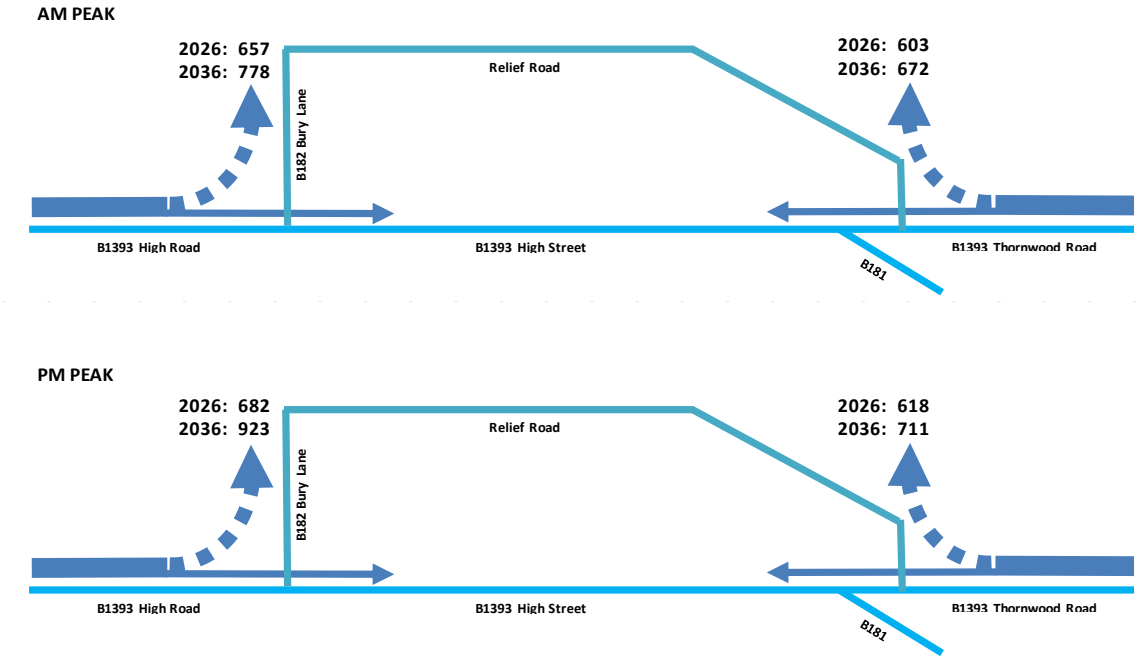
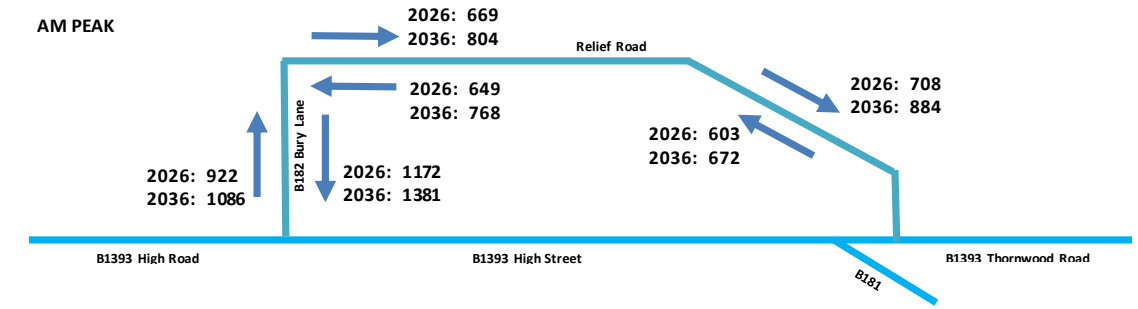


Figure 4.3: Peak hour modelled diverted flows to the western relief road

The final set of diagrams below show the directional flows modelled at the extremities of the relief road – incorporating a section of the B182 Bury Lane at its western end. In addition to diverted B1393 traffic, the directional flows also include B181/B182 traffic flows and all development traffic associated with the EPP-D development site to the north of the town centre.

These flows are likely to represent the maximum traffic volumes along the relief road incorporating the 'Scenario One' development quota in 2026 and 2036.



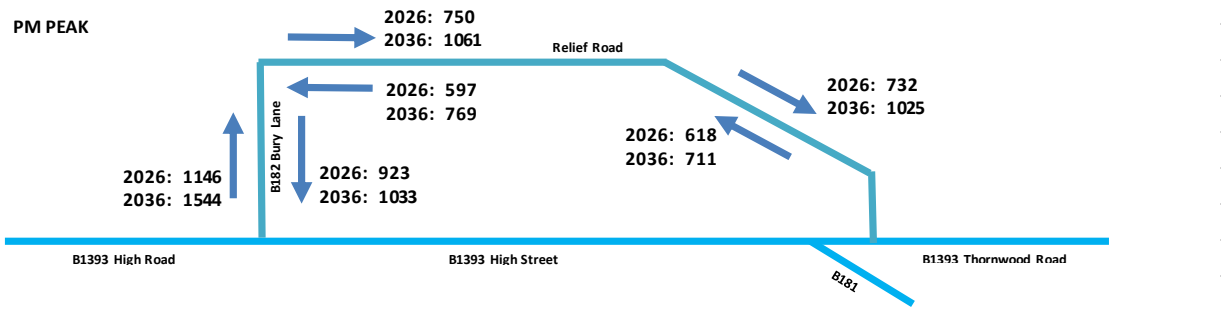


Figure 4.4: Peak hour modelled directional flows along the western relief road

4.4.3 Junction Capacity Assessments

Capacity assessments have been undertaken using reassigned traffic flows in the 2026 and 2036 forecast years at the four junctions along the B1393 High Street that are impacted by the development of a western relief road. Using the numbering convention adopted for the Epping LDP study, these are as follows.

- Junction 8 – Traffic signals at junction of B1393 Thornwood Road and B181 The Plain
- Junction 9a – Mini-roundabout junction of B1393 High Street with Station Road
- Junction 9b – Mini-roundabout junction of B1393 High Street with St. John's Road
- Junction 11 – Mini-roundabout junction of B1393 High Road with B182 Bury Lane

Original proposals were to include the signalised junction of B1393 High Road with Theydon Road. However, following a manual redistribution of traffic in the spreadsheet model to accommodate a western relief road, flows at the junction remained unaffected.

It is proposed that the relief road would connect into the B1393 at its eastern end via a new junction located north-east of the traffic signals at the B1393/B181. An assumption has been made that any new junction will be designed with sufficient capacity to accommodate future traffic flows.

At the relief road's western end, it is anticipated that the junction of Bury Lane with the B1393 will be redesigned to cater for the shift in traffic flow to the (current) minor approach arm. Capacity assessments have been undertaken using the existing junction geometries in order to identify the future areas of constraint associated with an altered distribution of trips through the junction.

The tables below document the Ratio of Flow to Capacity (RFC) / Degree of Saturation (DoS) values and Passenger Car Unit (PCU) queue lengths on each junction approach arm. A glossary of terms can be found in Appendix D of this report.

It should be acknowledged that modelled queue lengths in Junctions 8 (ARCADY) are considered to become less reliable as RFC/DoS values increase beyond capacity limits. Where approach arms are modelled to operate over capacity, associated queue lengths should therefore be seen as indicative rather than representative of future conditions.

Furthermore, it is important to state that the modelling undertaken in this appraisal utilises a fixed model assignment with a fixed demand. The outputs are therefore likely to demonstrate a worst-case scenario of future congestion on the existing network. In reality, there would likely be greater variability in peak hour route choice and traffic volumes due to the effects of peak spreading. This would subsequently limit the extent of congestion at junctions during the AM and PM peak hours.

Table 4.1: LINSIG tables for junction of B1393 Thornwood Road and B181 The Plain

Junction 8 (Thornwood Road) - Epping						*2026 - existing network*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	DOS	LOS	Queue Length	DOS
B1393 Thornwood Road - *Left/Ahead*	-	243	131	-	143	115
B181 The Plain - *Left/Ahead*	-	46	98	-	77	115
B1393 Palmers Hill - *Right/Ahead*	-	66	103	-	574	192

Junction 8 (Thornwood Road) - Epping						*2026 - with relief road*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	DOS	LOS	Queue Length	DOS
B1393 Thornwood Road - *Left/Ahead*	-	26	100	-	22	97
B181 The Plain - *Left/Ahead*	-	46	97	-	19	93
B1393 Palmers Hill - *Right/Ahead*	-	7	47	-	23	95

Junction 8 (Thornwood Road) - Epping						*2036 - with relief road*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	DOS	LOS	Queue Length	DOS
B1393 Thornwood Road - *Left/Ahead*	-	294	171	-	335	172
B181 The Plain - *Left/Ahead*	-	71	100	-	41	100
B1393 Palmers Hill - *Right/Ahead*	-	7	49	-	49	101

Using development Scenario One, and assuming a maximum transferral of trips to a relief road, Thornwood Road junction sees a significant reduction in congestion along the B1393 approach arms in both peak periods in 2026. However, the Thornwood Road approach arm is shown to operate at capacity, largely as a result of the increased volume of left-turners to the B181 from the relief road. By 2036, it is likely that the junction would require capacity improvements to the left-turn filter from the Thornwood Road approach arm in order to tackle heavy congestion along the link.

Table 4.2: Junctions 8 tables for junction of B1393 High Street with Station Road

Junction 9a (Station Rd) - Epping						*2026 - existing network*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
B1393 High Street RAB Link	F	77	1.12	F	99	1.17
Station Road	F	33	1.11	F	7	0.91
B1393 High Street	F	95	1.17	F	148	1.26

Junction 9a (Station Rd) - Epping						*2026 - with relief road*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
B1393 High Street RAB Link	A	1	0.52	A	1	0.56
Station Road	C	3	0.75	C	2	0.64
B1393 High Street	A	1	0.45	A	1	0.52

Junction 9a (Station Rd) - Epping						*2036 - with relief road*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
B1393 High Street RAB Link	C	4	0.79	C	3	0.78
Station Road	F	22	1.03	D	4	0.82
B1393 High Street	A	1	0.53	A	2	0.61

Under the same development and assignment assumptions, the mini-roundabout on the High Street at Station Road is shown to be congestion free in 2026. The diversion of through traffic to the relief road also leaves the High Street approach arms comfortably within capacity in 2036, although by this time, the Station Road arm approach arm might be expected to exceed capacity.

Table 4.3: Junctions 8 tables for junction of B1393 High Street with St. John's Road

Junction 9b (St. John's Rd) - Epping						*2026 - existing network*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
St. John's Road	F	11	1.05	F	49	1.31
B1393 High Street	F	188	1.35	F	155	1.34
B1393 High Street RAB Link	F	84	1.13	F	44	1.05

Junction 9b (St. John's Rd) - Epping						*2026 - with relief road*
Arm	**AM PEAK**			**PM PEAK**		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
St. John's Road	A	0	0.29	B	1	0.52
B1393 High Street	A	1	0.45	A	0	0.31
B1393 High Street RAB Link	A	1	0.50	A	1	0.41

Junction 9b (St. John's Rd) - Epping						2036 - with relief road
Arm	AM PEAK			PM PEAK		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
St. John's Road	A	0	0.33	C	2	0.66
B1393 High Street	B	2	0.70	A	1	0.47
B1393 High Street RAB Link	A	2	0.61	A	1	0.49

Under the same development and assignment assumptions, the mini-roundabout on the High Street at St. John's Road is shown to operate well within capacity in 2026 and 2036.

Table 4.4: Junctions 8 tables for junction of B1393 High Road with B182 Bury Lane

Junction 11 (Bury Ln) - Epping						2026 - existing network
Arm	AM PEAK			PM PEAK		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
B182 Bury Lane	F	30	1.07	B	1	0.59
B1393 High Road (East)	F	297	1.52	F	154	1.30
B1393 High Road (West)	F	23	0.99	F	200	1.26

Junction 11 (Bury Ln) - Epping						2026 - with relief road
Arm	AM PEAK			PM PEAK		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
B182 Bury Lane	F	182	1.30	F	36	1.04
B1393 High Road (East)	F	12	0.96	F	6	0.88
B1393 High Road (West)	F	25	1.00	F	207	1.28

Junction 11 (Bury Ln) - Epping						2036 - with relief road
Arm	AM PEAK			PM PEAK		
	LOS	Queue Length	RFC	LOS	Queue Length	RFC
B182 Bury Lane	F	414	1.53	F	82	1.14
B1393 High Road (East)	F	151	1.38	F	60	1.20
B1393 High Road (West)	F	118	1.16	F	715	1.66

It is envisaged that the junction of the B1393 with Bury Lane will require upgrading to accommodate development of a relief road. Based on the latest capacity assessments in this study, it should be expected that all arms of the roundabout would require capacity improvement in order for the junction to operate within capacity by 2036.

There would be a likely requirement for approach arm widening along Bury Lane to accommodate the significant increase in traffic flow along the link. At the same time, the left-turn movement from the B1393 into Bury Lane would require attention in order to accommodate the heavy turning flow predicted. This might best be addressed through the provision of a dedicated left-turn filter lane.

With traffic flows along the B1393 eastern approach arm giving way to a significantly higher volume of right-turning traffic from Bury Lane, there is the potential for heavy

congestion along the link by 2036 – despite there being a significant reduction in B1393 traffic flow. A straight-ahead filter lane may have the potential to tackle this turning movement conflict.

It should be noted that any new junction built further west of the B182 to provide access to the western relief road from the B1393, would likely require similar filter lanes to be incorporated into its design in order for it to function within capacity.

5 Summary of findings

The purpose of this study has been to investigate the existing factors that contribute towards congestion along the High Street and propose measures that would have a positive impact upon increasing capacity and traffic flows. In particular the existing pedestrian crossings, parking bays and measures that would increase capacity at the High Street junction with Station Road and St John's Road. The study also required the investigation to provide a relief road on the western side of Epping town, to reduce congestion along the High Street and to divert motorists who use the High Street as a diversion route.

The results of the forecast-year capacity modelling suggest that the junctions along the B1393 will all significantly exceed capacity in both peak periods by 2026. A combination of infrastructure improvements and sustainable travel initiatives will likely be required across the road network in Epping in order for future traffic flows to be accommodated in the peak hours.

The collision analysis has determined that a high proportion of collisions have been recorded for vehicles approaching the double mini roundabout. Furthermore, high proportions of collisions appear to be as a result of the carriageway alignment. A high number of collisions have involved cyclists and powered two wheelers and a high number of collisions have involved vehicles parking or pulling out of parking bays along the High Street. Site observations have re-enforced the sentiment that the carriageway alignment is not effective between the St John's Road and Grove Lane junctions. The parking bays, market area and pedestrian refuge islands all appear to negatively contribute towards increased localised congestion along the High Street by creating obstructions to free flowing traffic.

In order to remedy the above issues a series of proposals have been made, shown on Drawing Numbers DC20053-00-006 and DC20053-00-007. The proposals seek to improve congestion along the High Street by redistributing the carriageway to facilitate wider parking bays that are demarcated by length, removing the pedestrian refuge islands, rationalising carriageway widths and relocating the market so that it does not overspill onto the carriageway. It is also recommended that the existing double mini roundabout be changed to a staggered traffic signal controlled junction in order to increase capacity. A geometric arrangement has been proposed for the junction that should maximise capacity although modelling assessments will need to be carried out to inform if this would deliver increased capacity and if any of the geometric features need to be revised to facilitate this. Furthermore, the incidence of common land on the north-

western side of the junction may require State approval and may be a major risk towards the further development of this proposal.

A Level 1 Cost Estimate has been produced for the proposals outlined as part of the study. The cost for the scheme is estimated to total £3.2 million. This is comprised from costs totalling to £1.35 million for the junction elements, £665k for the High Street elements with the remaining costs prescribed to risk, scheme preparation and contract management. The cost breakdown is provided in Appendix B.

With regards to the western relief road the desktop study identified a number of constraints which could affect the alignment of the western relief road which in turn could raise the cost. Two options were developed taking into account the findings from the desktop study. As the area may have a number of environmental constraints it is recommend that an environmental constraints investigation is carried out to confirm the findings of this report. Following that the horizontal alignment can be better determined. However, if a more realistic alignment and cost is required a topographical survey will necessary. This will enable the Essex Highways to carry out a more detailed preliminary design.

Using the specific Local Plan development quota used for this study, and assuming a maximum possible transferral of trips to the relief road, the junctions along the B1393 might be expected to demonstrate considerable reductions in congestion with a relief road in place. However, minor capacity improvements at junctions may still be required to accommodate certain movements in the town centre. Should the relief road connect into the B1393 via the B182 Bury Lane at its south-western end, the mini-roundabout junction will likely require significant capacity upgrades.

It should be acknowledged that the maximum transferal of trips to the western relief road was incorporated into the modelling on the understanding that the existing B1393 route through Epping town centre would remain sufficiently congested for the less-direct relief road route to continue to offer up journey time savings once all in-scope trips were transferred. To this effect, the relief road might not be expected to remove congestion from the B1393, but rather help to reduce it in the peak periods.

Should the feasibility of a western relief road be investigated further, it is recommended that ANPR surveys are undertaken or mobile phone data obtained and analysed in order to better determine the proportion of through-traffic on the B1393 in Epping. It is also recommended that a micro-simulation model of the scheme is built in order to better understand the extent of route reassignment. This would in turn, provide a more robust assessment of the mitigation impact on junction capacities along the B1393.

Appendices

Appendix A:

Collision Stick Diagrams, Collision Data and Collision Plot