Essex Highways

Chelmsford City Growth Package

Army & Navy Improvement: Baddow Road Bus Gate – Design Stage 2 Report

21st December 2017

RINGWAY JACOBS | Essex County Council

Document Control Sheet

Document prepared by:

Essex Highways
Transport Planning
Victoria House
Chelmsford
CM1 1JR

E ChelmsfordGrowthPackage@jacobs.com
W www.essex.gov.uk/highways

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Contents page

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1 Introduction

1.1 Purpose of the report

Essex County Council (ECC) have been allocated £10m by the South-East Local Enterprise Partnership (SE LEP) in addition to an ECC contribution of £5m to deliver a range of transport improvement measures under the Chelmsford City Growth Package. Essex County Council have commissioned Essex Highways to identify the components of the overall package and develop each individual scheme in alignment with the ECC Contract Manual ready for construction of the preferred option during 2018-21.

The Army and Navy / Baddow Road bus gate was put forward as an improvement scheme proposed for the Army & Navy roundabout and is one of a number of transport improvement schemes which have been prioritised for inclusion in this package. This scheme was included based on outputs from the strategic and operational modelling in the 2010 Army & Navy Long Term Options study by Mouchel. This ranked the Baddow Road bus gate proposal in the top two of seven options assessed.

The Baddow Road bus gate option has since been re-modelled using a combination of the more recently developed 2014 Chelmsford strategic VISUM model and 2014 Chelmsford micro-simulation VISSIM model in order to compare outputs with those of the previous more detailed study.

1.2 Option Origin

The Chelmsford City Growth Package option for an improvement scheme at the Army and Navy / Baddow Road was selected based on the findings from two Mouchel studies completed in 2010. The full studies can be found in the following reports:

- Army & Navy Roundabout – Modelling of Long Term Measures – Mouchel August 2010
- Baddow Road Closure Study – Modelling Report – Mouchel August 2010

A brief summary of these reports and the findings are detailed below.

The Army & Navy Roundabout – Modelling of Long Term Options study by Mouchel 2010

This study was commisioned to review long term measures to improve the Army and Navy junction for all users (motor vehicles, public transport, cyclists and pedestrians). Problems identified at the junction included:

- AQMA area at the junction and spreading along Baddow Road
- Significant queuing on all arms during the peak hours
- Five arm roundabout is more challenging to mitigate through signals due to proximity of arms to each other

- Significant delays to buses along the Baddow Road corridor
- Lack of provision for cyclists
- Lack of high quality provision for pedestrians

Mouchel and ECC developed seven potential improvement options to be modelled at the Army & Navy junction, each of which was modelled in strategic modelling software SATURN/DIADEM for 2021 in order to forecast future traffic flows at the Army and Navy junction and the surrounding area by the end of the LDF (Local Development Framework) period. Operational models in TRANSYT/ARCADY were used to assess the localised operation of the junction itself. The options modelled were as follows;

- Two-way flyover (between A1114 and Parkway) with existing roundabout
- Two-way flyover (between A1114 and Parkway) with signal control on one or more approaches to the roundabout
- Tidal flyover (AM inbound and PM outbound) with signal control on one or more approaches to the roundabout
- Revised signalised junction (gyratory) without flyover
- Bus Gate on Baddow Road inbound with existing roundabout and tidal flyover
- A two-way Bus Gate on Baddow Road with existing roundabout and tidal flyover
- Removal of the existing flyover (between A1114 and Parkway) with existing roundabout

Each of the seven 2021 options was ranked in terms of overall performance against the DfT's Delivering a Sustainable Transport System (DaSTS) criteria below (further details shown in Appendix 1) in comparison to the Do-Minimum scenario, across the AM and PM peak hours. The overall rankings are shown in the table below:

	Option 1 - Two-way flyover	**Option 2** – Two-way flyover & Baddow Bypass signalisation	**Option 3** – Tidal flyover & Baddow Bypass signalisation	**Option 4** – Gyratory	**Option 5** – Baddow Road Bus Gate (westbound)	**Option 6** – Baddow Road Bus Gate (westbound & eastbound)	**Option 7** – Removal of Flyover
DaSTS Ranking	1	4	5	5	3	2	7

DaSTS Criteria (full detail in Appendix 1):

• Supporting National Economic Competitiveness and Growth;

• Tackling Climate Change;

• Contributing to Better Safety, Security and Health;

• Promoting Greater Equality of Opportunity;

• Improving Quality of Life and Promoting a Healthy Natural Environment;

The top three options based on the DaSTS criteria were 1) Two-way flyover, 2) Two-way Bus Gate on Baddow Road and 3) One-way Bus Gate on Baddow Road.

Option 1 was the best option – against the DaSTS criteria – scoring highly in terms of improving the performance of the network as a whole, however the increased traffic flow attracted to the junction itself results in a poor performance in terms of 'Contributing to Better Safety, Security and Health' with higher flows and queueing levels on Baddow Road. This option does not offer any additional provision for public transport or provide any benefit to pedestrians and thus sustainable transport.

A separate set of objectives set at the time by the County Council were aligned towards measuring the impact of the scheme in terms of its effect on the environment and providing sustainable travel. The objectives were:

- Journey Time Reduction for General Traffic
  - *Using the established road hierarchy to set priority of traffic movements*
- Journey Time Reliability for Public Transport
  - *Through promotion of public transport priority measures*
- Improved Accessibility for Cyclists
  - *To encourage modal shift (not necessarily through the junction)*
- Improved Accessibility for Pedestrians
  - *To encourage modal shift (not necessarily through the junction)*
- Improved Air Quality
  - *In line with the Army & Navy Air Quality Action Plan*

ECC also set the key constraint on options developed that all objectives should be met without a detrimental impact, in traffic terms (queuing and delay), on Parkway. The overall rankings against ECC criteria are shown in the table below:

	Option 1 - Two-way flyover	Option 2 – Two-way flyover & Baddow Bypass signalisation	Option 3 – Tidal flyover & Baddow Bypass signalisation	Option 4 – Gyratory	Option 5 – Baddow Road Bus Gate (westbound)	Option 6 – Baddow Road Bus Gate (westbound & eastbound)	Option 7 – Removal of Flyover
ECC Ranking	4	5	6	3	2	1	6

The ranking based on outputs from strategic and operational modelling ranked the Baddow Road bus gate proposal number 1 of seven options assessed. This is largely due to scoring highly against reliablility for public transport, improved access for cyclists and pedestrians, improved air quality and no detrimental impact on Parkway. However, the previous DaSTS assessment ranked Option 1 as highest scoring this has dropped to 4th against the ECC criteria, most significantly due to low scores against reliablility for public transport, improved access for cyclists and pedestrians.

The top three options based on the ECC criteria were 1) Two-way Bus Gate on Baddow Road 2) One-way Bus Gate on Baddow Road and 3) Gyratory.

It was noted in the report that there may well be scope to test other combinations (for example Option 5 with a two-way flyover). The modelling undertaken provided a broad indication of the area-wide impacts of the options and the impact at the Army & Navy itself, however the study identified that further work would need to be undertaken to better understand potential capacity issues at other junctions in the area of the Army & Navy.

Baddow Road Closure Study – Modelling Report – Mouchel August 2010

A further study, specifically on the potential closure of Baddow Road to general traffic, was completed in 2010 by Mouchel. The Baddow Road Closure Study – Modelling Report was undertaken using the Chelmsford SATURN model with peak spreading and DIADEM and a local area spreadsheet model. This modelling illustrated the potential impact of strategic redistribution of traffic resulting from the road closure and modelled local junctions but did not assess in detail the potential benefits in terms of modal shift to bus, walking and cycling.

The project objective was to further investigate the local traffic impact associated with the potential closure of Baddow Road to general traffic. Two scenarios were investigated:

1. One-way, town centre-bound (known as Option 5 in the Army & Navy study), closure to general traffic with bus gate between Army & Navy and Meadgate Avenue junctions

2. Two-way closure to general traffic (known as Option 6 in the Army & Navy study) with bus gates on Baddow Road at Beehive Lane junction and on Meadgate Ave at the Army & Navy.

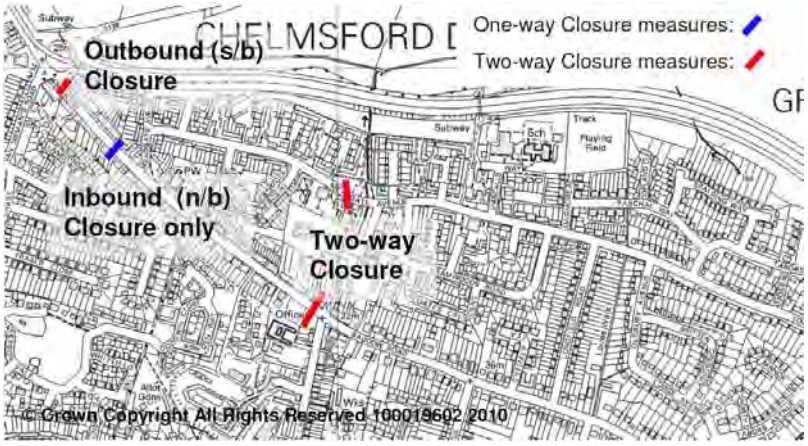

Figure 1 Modelled bus gate locations 2010

The study concluded from the analysis of the one-way and two-way Baddow Road west closure scenarios, that:

- The two-way closure scenario would have a more extensive impact on the operation of the Baddow Road / Maldon Road corridor than the one-way closure scenario due to:
  - Two-way reassigned traffic
  - Additional two-way traffic and delay on High Street/Maldon Road corridor with limited opportunities for mitigation at this location

- The Maldon Road approach to the priority junction with the Baddow Bypass on-slip would see a considerable worsening in operation in the AM peak with the reassignment from either the one-way or two-way closure in place. This junction was considered, at the time, to be likely to be difficult to mitigate due to its constrained location. It should be noted that the Sandon Park and Ride has been expanded since this time and travel behaviour and further modal shift is likely to have occurred on this corridor.

- There were, however, significant benefits which could be accrued with both scheme options. A major benefit on Baddow Road would be the removal of queuing from the Baddow Road approach to the Army & Navy during peak periods, assisting in addressing the Air Quality Management Area (AQMA) issue on the route. The removal of traffic entering the junction would also be likely to assist the Army & Navy junction itself to operate more efficiently.

- Within this study, the transfer to bus was conservatively estimated as a percentage of existing trips and when these trips were removed from the network, it had a negligible positive impact on the operation of the junction approaches. It was highlighted that in order to quantify the overall mode shift to bus as a result of the bus corridor, significantly more detailed demand modelling would need to be undertaken.

- The creation of a bus corridor, with bus priority for the length of Baddow Road between Beehive Lane and the Army & Navy, has the potential to attract people from a wider geographical area onto the public transport system due to increased reliability and reduced journey times. As such this may also help to reduce the impact of traffic reassignment.

The recommendations from the study were:

- Given the limited scope for mitigating the Maldon Road / High Street / Baddow Road junction, it was suggested that it may be more appropriate to pursue the one-way closure option rather than the two-way closure option.

- Further work would therefore be required to understand whether mitigation measures are possible and appropriate at the Maldon Road / Baddow Bypass junction.

- It may also be beneficial to undertake further modelling of the benefits that might be accrued through mode shift to public transport on creation of a Baddow Road public transport corridor.

2 VISSIM model review/update of Mouchel 2010 reports (2016)

2.1 Review of Problems and Issues (2016)

In spite of recent improvements such as the widening of the exit onto Parkway, the left turn slip onto Chelmer Road and the new Chelmer Viaduct, the Army and Navy Roundabout remains over capacity in traffic terms, with heavy flows on all arms in the AM and PM peak. In fact (as predicted in modelling), as capacity is created more traffic is attracted to the junction, potentially worsening existing issues with air quality and queuing and impacts further along Parkway.

A summary of the 2016 issues identified are:

- Trafficmaster journey time data shows that in peak hours, vehicles on Baddow Road sit in queues travelling at speeds of between 0 and 5mph westbound from the junction with Beehive lane until entry onto the Army and Navy roundabout

- To travel the distance of Baddow Road from Beehive Lane to the Army and Navy Roundabout (approximately 650 metres), it can take an average of an additional 6.5 minutes over the free-flow journey time during peak periods – one of the most significant average delays on any route feeding into Parkway.

- A comparison of 5-day average link flows (Monday to Friday month of October), from 2011 through to the most recent counts from 2016 on Baddow Road (between Meadgate Avenue and the Army and Navy junction) has been carried out to provide an indication of recent peak

hour – 8am-9am & 5pm-6pm – traffic flows on the corridor. A six year average for westbound flows shows AM peak hour is 338 vehicles and PM peak hour 451 vehicles. Overall, while flows change from year to year there is no evidence of significant peak hour traffic growth on this corridor over the last 6 years. This lack of growth indicates that the route is at capacity in these time periods.

- Baddow Road accounts for just 7% of the total traffic flow entering the Army and Navy Roundabout in the AM peak and 8% in the PM peak. However this traffic directly affects the significantly larger flow of traffic entering from Van Diemans Road.

- There is no bus priority in this corridor despite this being a key route for buses.

- Air quality is poor with the area formally registered as an Air Quality Management Area (AQMA) identified as covering the Army & Navy junction and the western section of Baddow Road.

Background data for the figures detailed above are contained in Appendix 2.

2.2 Review of Modelling (2016)

The Chelmsford City Growth Package option for an improvement scheme at the Army and Navy / Baddow Road was selected based on the findings from two Mouchel studies completed in 2010. The identified options were reviewed using current data and modelled in the Chelmsford VISSIM model (2014). The full studies can be found in the following reports:

- TN01 Army and Navy Options Tested Technical Note 25th April 2016
- TN03 Army and Navy – Baddow Road Closure Technical Note 6th September 2016

A brief summary of these reports and the findings are detailed below.

TN01 Army and Navy Options Tested Technical Note

A number of potential options for improvement of the Army and Navy were assessed at the request of ECC using the 2014 Chelmsford central area VISSIM model.

The specific options tested and modelled outcomes are:

1. Full/partial signalisation of the roundabout (with signal timings from LinSig model).
   The VISSIM model showed that the close proximity of stop lanes on the roundabout and the lack of stacking capacity for circulating stop lines caused the roundabout to very rapidly lock

up, inhibiting traffic from entering the roundabout and significantly increasing the queues on the approaches to the junction.

2. Baddow Road - Bus Gate north-westbound and no change to general traffic exiting from the roundabout south-eastbound, without signals.
   This option indicated the best potential for improvement but limitations in available data on rerouting of traffic meant that it was impossible to reach a conclusion as to its suitability within this report – to be tested again with VISUM strategic modelling results

3. Baddow Road - Bus Gate north-westbound and no change to general traffic exiting from the roundabout south-eastbound, with partial signalisation of the roundabout.
   The VISSIM model showed that the close proximity of stop lanes on the roundabout and the lack of stacking capacity for circulating stop lines caused the roundabout to very rapidly lock up in the section between Chelmer Road and the circulatory stop line for Essex Yeomanry Way, inhibiting traffic from entering the roundabout and significantly increasing the queues on that approach to the junction and on Chelmer Road.

4. Two way flyover to replace / supplement existing structure.
   In order to construct a two-way structure without significant land purchase it was necessary to lose a lane on the Parkway approach to the roundabout. The AM peak period shows some improvement to Chelmer Road since circulating traffic past this entry drops. It shows an increase in delay on all other arms because the traffic originally queued on Chelmer Road is released to add to circulatory flows.
   The PM peak shows a significant worsening of the queuing and delay on Parkway because of the reduced capacity of the roundabout entry, with a latent demand of 600-700 vehicles on that approach (4km of queuing traffic). Without significant land take this option was not considered viable with current traffic flows.

   Note: Replacement flyover options are currently being evaluated further by ECC as a separate longer term option study outside of the Chelmsford City Growth Package.

TN03 Army and Navy – Baddow Road Closure Technical Note

A number of potential options for improvement of the Army and Navy have been identified in the previous studies detailed above. Option 2 – 'Making Baddow Road exit only from the roundabout for general traffic' offered the best potential for improvement.

A strategic 2014 Chelmsford VISUM model covering the entire city has since been constructed by Essex Highways on behalf of ECC. This model allowed for an updated prediction in relation to likely redistribution of traffic over the wider area and the scenario was modelled using the version available at the time (pre-Local Plan testing).

The results of the strategic modelling, with and without Baddow Road open, indicate that traffic currently using Baddow Road is likely to redistribute over the wider network, heading back through Great Baddow, via Wood Street or via the A12. These findings are broadly in line with the original 2010 study.

Of specific concern to the Army and Navy roundabout are the redistributions to Essex Yeomanry Way (Baddow Bypass) and Van Diemans Road. This modelled redistribution is shown below.

Table 1: Absolute increase in traffic on Army & Navy approaches from the 2014 Chelmsford VISUM Model

	To Essex Yeomanry Way (Baddow Bypass)	To Van Diemans Road
From Baddow Road AM peak period (0800-0900)	102 pcus* (26.2% Baddow Rd flow)	48 pcus* (12.3% Baddow Rd flow)
From Baddow Road PM peak period (1700-1800)	121 pcus* (25.0% Baddow Rd flow)	45 pcus* (9.4% Baddow Rd flow)

*pcus – passenger car units

The remainder of traffic reassigned over a wider area, for example accessing the A12 or travelling via Wood Street and New London Road. Due to the nature of strategic traffic reassignment, as traffic moves from one route to another, it in turn displaces traffic on this route so absolute increases may not necessarily be seen on all other routes.

The traffic flows used within the VISSIM model were manually adjusted to take account of traffic redistribution indicated by the VISUM model and the VISSIM models re-run to assess the impact of the closure of Baddow Road westbound to all vehicles except buses and cycles.

The results are summarised as follows:

- Removal of one of the five arms of the roundabout is shown to improve the overall traffic operation of the Army & Navy junction but without the overall disbenefit of causing significant traffic growth at the junction and along Parkway.
    - Although queuing is expected to increase on Baddow Bypass, VISSIM modelling shows that the adjusted balance of flows at the Army and Navy is likely to result in no overall increase in delay on this arm.

    - Modelling in VISSIM identifies a significant benefit in terms of reduced delay for traffic approaching via Van Diemans Road in the evening peak (around 2.5 minutes on average per vehicle). The morning peak is broadly similar to existing conditions.
- Removal of queuing traffic on Baddow Road likely to provide a beneficial impact on the existing AQMA.
- Significant potential for modal shift to bus and cycle due to removal of inbound queuing and improved bus journey times along Baddow Road.

The 2010 study identified the Maldon Road / Baddow Bypass junction as being particularly under pressure with the closure of Baddow Road westbound and possibly requiring mitigation. The junction has been remodelled with 2016 traffic data in ARCADY software in order to assess possible mitigation. This assesses the current situation and the assumed 'worst case', where all traffic from Baddow Road enters the roundabout from Maldon Road west.

A modelled RFC of 1.0 indicates that the junction is at capacity and that significant queuing may become apparent. All of the reassigned traffic from Baddow Road being assigned to the Maldon Road west arm results in an RFC of 0.72, indicating that the junction is still likely to be working within capacity (this assumes that the exit from the junction remains clear).

It should also be noted that the average traffic flows for Baddow Road identified in this report are 338 vehicles in the AM peak and 451 for the PM peak based on a 6-year 5-day average of October flows. Therefore, the figures used in the ARCADY are considered robust in assuming 430 vehicles reassigning to the junction in the AM peak and 540 vehicles in the PM peak.

2.3 Meadgate Bus Gate Option

It was initially proposed to Essex Highways that an alternative option of a bus gate via Meadgate Avenue connecting to Essex Yeomanry Way / Baddow Bypass Bus Lane should be reviewed. On site investigations to look at this option were undertaken alongside the VISSIM modelling to establish whether this could be viable.

The findings from this initial review were as follows:

- Disparity of levels, over a very short distance, between Meadgate Avenue and Essex Yeomanry Way would present a number of engineering challenges.
- 'Punching through' from the existing residential cul-de-sac would require the removal of the current safety barrier, street furniture and the removal of the current vegitated fence which provides a visual and sound barrier for residents of the local area. This could potentially extend as far as the current turning head outside property no. 1 Meadgate Terrace.
- Junction design could require removal of or alterations to private retaining walls for adjacent properties.
- Removal of the fencing would no longer prevent pedestrian access to Essex Yeomanry Way.

- A signalised junction would be required to allow buses to safely access Essex Yeomanry Way (due to poor visibility). This would need to be designed to accommodate the swept path of the buses turning out of the junction. The location of this junction would be adjacent to the base of the flyover.
- The residents of Meadgate Terrace would only be able to enter / exit via a signalised junction.
- Residents parking in Meadgate Avenue would need to be removed and relocated.
- The current width of Meadgate Avenue on the approach to Meadgate Terrace may only accommodate single directional flow when being used by buses.
- The alignment of the Baddow Road / Meadgate Avenue junction would need to reviewed to accommodate increased bus usage.
- Enforcement of junction would have to be considered.
- Multiple Statutory Undertakers have apparatus within the area that would require diversion works.

VISSIM modelling indicated 'no benefits' to buses over existing conditions. The key issue of the bus having to sit in the same congestion down Baddow Rd will continue to exist. Buses right turning into Meadgate Avenue from Baddow Road would not have priority over exiting eastbound traffic from the Army and Navy and would have to wait to right turn. Alternatively, buses could be given priority into Meadgate Avenue however this would interrupt the flow of traffic exiting the Army and Navy.

Through discussion of these issues and review against cost and benefit, it was concluded that this option was not viable.

2.4 Potential mitigation

Optimisation of Army and Navy Part Time Signals

There are currently part time signals for the Parkway and Chelmer Road arms of the roundabout. It is considered that the existing part-time signals on the Army & Navy roundabout could be used to better optimise and control the balance of flow between Baddow Bypass and Chelmer Road with the bus gate in place. The recent reconfiguration of Chelmer Road and potential future addition of traffic to Baddow Bypass would warrant a review of signal timings and operation. This will be reviewed through later detailed design of any preferred option.

The 'TN01 Army and Navy Options Tested Technical Note' modelling results indicated that 'lack of circulatory space' will cause problems with signal usage on the Army and Navy roundabout if signals are added at the Baddow Road arm.

Maldon Road Baddow Bypass

If mitigation were required at the Maldon Road / Baddow Bypass on-slip junction it is considered likely (without having undertaken detailed modelling) that based on recent flow data at the junction, signalisation would be possible to ensure that traffic from Maldon Road west can exit onto the Bypass.

2.5 Trial Period

Given the complexity of potential re-routing / mode changing options for vehicles currently travelling down Baddow Road, it is suggested that trialling of the scheme for a period of 18 months under an experimental order would be most appropriate to assess the issues and opportunities on the ground and allow full optimisation of the scheme.

3 Public Consultation

Essex County Council has developed a vision of a 'Future Transport Network' for the city with the intention to make all modes of transport attractive,encouraging more sustainable travel on foot, by bicycle and on public transport with an aim of reducing the number of cars on the road and improving air quality for all residents.

In March 2017 Essex County Council spoke to all residents, workers, shoppers and partners about Chelmsford's Future Transport Network and sought feedback on the corridors that were identified as in need of investment. From this feedback and issues raised on these corridors a number of schemes were developed. These schemes were developed into a package of measures and taken forward in the consultation documents for the public and stakeholders to view and respond to.

The Chelmsford City Growth Package public consultation commenced on 17th July 2017 for a six week duration, closing on 28th August 2017. All detail of the consultation were hosted on the Essex County Council Website, which also allowed respondents to leave feedback regarding the proposals.

www.essex.gov.uk/chelmsfordtransport

Feedback on the proposals could be given by:

- Completing the online questionnaire on Essex County Councils website;
- Emailing feedback to ChelmsfordGrowthPackage@Jacobs.com or
- Completing the questionnaire in the consultation brochure and submitting it via post.

The questionnaire contained a total of 11 questions, and these were a mixture of closed questions to allow for the capture of information, and open questions to gather respondents' views. Demographic questions were also included to aid understanding of who had responded.

The consultation was publicised using social media (including Essex County Council's Facebook page and Twitter feed), press releases and email updates. Seven public events were held locally, to allow stakeholders to view the proposals, meet the project team, ask any questions, and raise any concerns.

The Chelmsford City Growth Package proposed 28 potential schemes, which were documented over 5 volumes of information (Baddow Road Bus Gate was presented in two volumes), along with measures for city-wide signage and technology improvements.

The findings from the consultation are detailed in full in the **'Chelmsford City Growth Package – Consultation Report' - dated 27th October 2017**.

3.1 Description of preferred option presented at consultation

Army and Navy Roundabout Improvements: Baddow Road Bus Gate

Where is the scheme?

The Army and Navy roundabout is a key gateway to the city and is a key point on the network where five roads meet at the junction. The Baddow Road approach to the junction is a primarily residential access onto the junction and suffers severe congestion during peak periods.

The recommendation based on assessment to this point was to install a westbound 'bus gate' between Meadgate Avenue and the Arny & Navy roundabout on the Baddow Road arm of the Army and Navy roundabout proposed to be in operation 24 hrs per day and 7 days per week.

The Western end of Baddow Road falls within the Air Quality Management Area (AQMA) around the Army and Navy junction. An Air Quality Management Area is designated by a local authority when it considers that national air quality objectives will not be met.

The Consultation Proposal
The proposal at the consultation was to:

- Install a 'bus gate' on the Baddow Road arm of the Army and Navy roundabout. A westbound bus gate between Meadgate Avenue and the roundabout was proposed to be in operation 24 hrs per day and 7 days per week.
- Cameras would be in place to enforce the bus gate.
- Access into Baddow Road from the roundabout would remain as it is.
- To improve the operation of the Army and Navy roundabout by removing one of the approaches for regular vehicle movements
- To create a faster and more reliable sustainable transport corridor making bus journeys an attractive alternative to car journeys.

The proposal at consultation was for operation 24 hrs per day and 7 days per week as this would provide:

- Greater benefits with regard to congestion reduction / air quality improvements
- Simple operation of the bus gate with no confusion over operating hours

The Initial assessment, detailed further in Section 5, suggests that the scheme is likely to improve air quality on Baddow Road by reducing general traffic and associated queuing.

Figure 2: Consultation Illustration to show Baddow Road Proposal

The Baddow Road bus gate scheme will also be supported by complementary measures that have been included in the overall package of proposals. These include:

- Gt Baddow to City Centre cycleway (see Volume 5 of the consultation document); and
- Parkway Corridor improvements (see Volume 4 of the consultation document).

The first part of the bus gate would be installed just to the north-west of the junction with Meadgate Avenue adjacent to the grass verge area and would take the form of two “gateway signs” either side of the carriageway displaying signs to TSRGD diagram number 953 (route for use by Buses, pedal cycles, motorcycles and Taxis only) which would prevent any other vehicles from continuing towards the Army and Navy Roundabout at all times. A second gateway with the same signage would be installed just prior to the entry to the Army and Navy Roundabout to prevent any unauthorised vehicles exiting onto the roundabout at all times. This is to discourage drivers from attempting to bypass the first bus gate by travelling along Meadgate Terrace and cutting through the car park and access of the Sutherland Lodge Doctors Surgery.

Both Gateways would be enforced by CCTV cameras.

Advance signage along Baddow Road, Maldon Road and Beehive Lane would be erected to discourage drivers from travelling along Baddow Road to access the Army and Navy prior to reaching the Meadgate Avenue junction.

Residents located within Baddow Road between the Army and Navy Roundabout and Meadgate Avenue would only be able to access their properties via the Army and Navy Roundabout and leave their properties via Baddow Road south-eastbound.

The details are shown on General Arrangement Drawing B355338A-01-001 rev- included within Appendix 5.

The bus gate will be implemented for an 18-month trial to monitor the impacts on both local traffic and the traffic using the Army and Navy roundabout. Further options to optimise operation at the Army and Navy will be assessed during this period once traffic has settled into the new travel patterns.

It is anticipated that the scheme would be implemented within the duration of Growth Package Implementation of 2018-21, with monitoring being carried out through financial years 2019/2020 and 2020/2021 and any additional mitigation measures being installed as identified from monitoring of the scheme.

4 Consultation Outputs

Summary of Consultation Findings

A total of 921 responses were received. Most (85%) were from individuals responding on their own or, in one instance, on behalf of a friend or relative. Responses were received from 29 Councils, businesses and other organisations, making up 3% of responses. Some respondents (12%) did not indicate in their response, but were assumed to be individuals.

Open Questions

Respondents to the consultation could leave comments on any of the proposed schemes.

The schemes that received the most comments were:

- Army & Navy Roundabout Improvements: Baddow Road Bus Gate (Volumes 4 and 5 – 697 responses from the two volumes)
- Broomfield Road Corridor (Volume 1 – 102 responses)
- Odeon Bridge /High Bridge Road (Volume 4 – 91 responses)

Many comments were received saying that the introduction of a bus gate at this location would displace traffic and the respondents disagreed with the scheme overall. Some responses commented that the flyover should be improved to allow two-way operation.

Closed Questions

Over two thirds of responses came from respondents who travel most regularly by car, mainly as drivers, with a small number as passengers. Just under a quarter of responses came from those who identify their most regular mode of travel as walking, cycling or bus.

The percentage of those who responded with ‘strongly agreed’ or ‘agreed’ with the consultation statements are detailed below:

- 91% that ‘Something needs to be done to improve traffic and congestion in Chelmsford’
- 70% that ‘more transport options were needed in Chelmsford’
- 80% that ‘they regularly experience congestion when travelling in or around Chelmsford’
- 63% ‘We need to do more to encourage people to cycle, walk or use public transport rather than use private vehicles’
- 59% that ‘more focus was needed to improve cycling provisions’
- 55% that ‘more focus was needed to improve walking options’
- 40% that ‘public transport needs greater priority over private vehicles’
- 77% that ‘Where they obstruct traffic flows (and particularly in peak periods), vehicles should be encouraged to park elsewhere’
- 46% that ‘better enforcement of bus lanes was needed’

Amongst those who gave a response, the three areas where there was most interest in seeing improvements made as part of the Chelmsford City Growth Package were:

1. The City Centre;
2. Parkway Corridor; and
3. Southern and Eastern areas of the city.

Of the schemes consulted on, the top three by prioritisation were:

- Broomfield Road Corridor – 66 responses as Priority 1
- Army & Navy Roundabout Improvements (Parkway Corridor) – 60 responses as Priority 1
- Chelmsford City Centre Cycling Connectivity – 59 responses as Priority 1

Army & Navy Roundabout Improvements: Baddow Road Bus Gate (Volume 4 and Volume 5 responses)

Comments on this scheme (combined): 697

This scheme received a large number of responses, including the submission of a petition signed by 1,628 people (opposing the Baddow Road Bus Gate scheme, but supporting a two lane flyover), and one campaign, with 15 submissions (#NoToBaddowBusGate). Chelmsford City Council, Great Baddow Parish Council and the Mid Essex Business Group objected to the proposal for the bus

gate. Sutherland Lodge Surgery Patients Representation Group submitted a response on behalf of the surgery that is located in Baddow Road.

Many respondents disagreed with the proposal whilst a few respondents agreed or agreed with caveats. Many respondents disagreed with the benefits the scheme may achieve, with many stating that congestion will be displaced to other areas and roads. A number of responses to other questions stated that congestion would be displaced by this proposal. A large proportion of responses to other questions also disagreed with the scheme, with a large number also disagreeing with the benefits of the scheme.

Several respondents disagreed with the proposed installation of a 'bus gate' between Meadgate Avenue and the Army & Navy roundabout. A large proportion of responses to other questions also disagreed with this element of the scheme, with a number of respondents making suggestions regarding this.

Some disagreed with the proposed hours of operation of the bus gate, with a few comments being made regarding this. A number of respondents to other schemes also stated that they disagreed with the proposed hours of operation of the bus gate. One respondent agreed with the proposed installation of the bus gate, and two respondents agreed with caveats. Several respondents mentioned possible other impacts from the scheme or making suggestions about the scheme. Several also submitted alternative proposals.

Some respondents replied that a flyover was preferable to the proposed scheme. A few commented on the discounted option that the flyover should be replaced with a two-way structure or made comments about the existing flyover. Some respondents to other schemes also made comments with regards to the flyover being a discounted option. A large number of respondents to other schemes stated that a flyover was their preferred option for the scheme, with a large number making general comments about the flyover.

A few respondents made comments about the discounted option of full signalisation of roundabout.

Individual responses to the Baddow Road Bus Gate can be found summarised in Appendix 3. Stakeholder responses can be found summarised in Appendix 4.

5 Revised Preferred Option

5.1 Reasoning

Feedback from the consultation and further engagement with ECC Network Assurance and Network Operations Teams has led to a revised proposal that should deliver the majority of the benefits whilst addressing some of the key concerns raised at consultation.

The revised proposal comprises of a gateway only being installed just to the north-west of the junction with Meadgate Avenue adjacent to the grass verge area. Operation of the bus gate will be

part-time for AM (07:00–10:00) and PM (16:00–19:00) weekday peak hours only. Outside of these times all traffic will be able to travel north-west along Baddow Road and access the Army and Navy Roundabout. The part-time operational hours mirror those of the nearby New London Road bus lane and county-wide policy and interact with the operation of the tidal Army and Navy flyover.

A small central island will be installed in Baddow Road to locate the gateway signage and a CCTV used for enforcement during the operational hours. Advance signage with operational times displayed would be erected along Baddow Road, Maldon Road and Beehive Lane (as a minimum) to discourage drivers from travelling along Baddow Road to access the Army and Navy prior to reaching the Meadgate Avenue junction. The details are shown on Scheme Overview Drawing B355338A-00-001 rev- included within Appendix 5.

Implications:

- Reduced operational hours are likely to slightly diminish the benefits of the proposal (congestion reduction / air quality improvements), however the benefit reduction is anticipated to be relatively minor.
- Residents with the longest diversions to access the Army and Navy Roundabout – i.e. those between the Army and Navy and Meadgate Avenue – will still be able to access the roundabout at any time.
- Reduced likelihood of vehicles using the on-street parking attempting to make U-turns.
- No bus priority measures are in operation during the weekends so weekend shopping would be unaffected.
- No bus priority measures are in operation during the weekends so congestion and bus delay may still occur during weekend peak times.
- Visitors to the Doctors surgery can exit towards the roundabout at all times.
- Responds to public comments and criticism of perception that scheme was diverting traffic unnecessarily during quieter off-peak periods.
- Risk that, although the part-time operation should limit the dis-benefits, it may add to the complexity of the solution in terms of signage (additional sub-plates are required) and to the confusion around its operational hours.

5.2 Air Quality Modelling

In accordance with HA207/07 of the Design Manual for Roads and Bridges (DMRB), detailed air quality modelling was undertaken to assess the impact of the Baddow Road Bus Gate both in isolation and combined with the other CCGP improvements along the Parkway corridor. This modelling was undertaken to ascertain whether the implementation of these proposals had a significant impact – positively or negatively – to the local air quality, particularly within the designated AQMA. Below are detailed the conclusions associated specifically related to Baddow Road Bus Gate as a standalone project; Design Scenario 3 (DS3).

Existing nitrogen dioxide (NO_2) concentrations along Baddow Road (from the circulatory of the roundabout to Meadgate Avenue) are modelled at between 68% and 103% of the national Air Quality Objectives (AQO) (with a mean of 84%). The report concludes that, due to the proposed changes at this location, small improvements in NO_2 concentrations (of up to 5%) would be realised at the 10 modelled sites on Baddow Road. Equally, there were also small improvements at the 3 sites on Van Diemans Road due to the reduced congestion on the approach to the junction.

Conversely, small deteriorations are expected at 2 of the modelled sites along Baddow Bypass. However, it is recognised that existing air quality at these sites is at a lower background concentration (<70% of the AQO) than Baddow Road. This is, in part, due to the receptors being further from the highway but also due to the corridor being open on the Northern side.

It should be noted that air quality is measured in annual mean (yearly average) figures which 'smooth over' peaks in air quality improvements/deteriorations over shorter periods. Therefore, expected improvements (or deteriorations) are not large percentages due to this smoothing effect. As a guide, what is deemed a 'large impact' correlates to approximately a 10% change in NO_2 concentrations against the AQO.

Further detailed modelling can be found in the Baddow Road and Parkway Schemes Air Quality Assessment Report 2017.

6 Report Summary

The Army and Navy Roundabout has historically been and remains over capacity in traffic terms, with heavy flows on all arms in the AM and PM peak hours. More efficient operation of the Army & Navy could be achieved by effectively removing one arm onto the roundabout. The installation of a bus gate operating on Baddow Road in a north-westbound direction between the junction with Meadgate Avenue and the Army & Navy roundabout is likely to facilitate improvements in traffic flow at the junction and also improve public transport access to the junction during peak hours.

Feedback from the consultation on the Baddow Road Bus Gate scheme and further engagement with ECC Network Assurance and Network Operations Teams, has led to a revised proposal of a part-time bus gate that should deliver the majority of the benefits whilst addressing some of the key concerns.

In response to feedback, the revised proposal comprises of a gateway being installed just to the north-west of the junction with Meadgate Avenue adjacent to the grass verge area. Operation of the bus gate will be part-time for AM (07:00–10:00) and PM (16:00–19:00) weekday peak periods only. Outside of these times all traffic will be able to travel north-west along Baddow Road and access the Army and Navy Roundabout. All traffic will be able to travel south-east at all times. The part-time operational hours mirror those of the nearby New London Road bus lane and county-wide policy.

The anticipated benefits of this proposal include:

- Improved air quality along Baddow Road through substantial reduction in queuing traffic by prohibiting the majority of north-westbound general traffic;
- Creation of an attractive bus corridor along Baddow Road; and
- Improved operation of the Army & Navy roundabout by effectively removing one arm.

The revised proposal addresses some of the concerns raised through the public consultation. Potential mitigation measures can be identified ahead of implementation and during the 18-month trial. It is therefore recommended that the preferred option is amended to account for the above changes and is taken forward to the next phase of design and implementation.

Note: Options for a replacement flyover should continue to be looked at by ECC as a separate longer term option study to assess the cost and benefits of such a solution.

Appendices

Appendix 1 – 5 DaSTS goals

Each of the improvement options were evaluated against this scenario using model outputs aligned to the 5 DaSTS goals;

• Supporting National Economic Competitiveness and Growth;

- Effect of Peak Spreading & DIADEM
- Total Distance Travelled
- Distance per Vehicle Loaded
- Total Travel Time
- Travel Time per PCU
- Difference in Travel Time compared to Do-Minimum
- % Change in traffic on A12

• Tackling Climate Change;

- CO2 (kg) across the network
- Difference in CO2 (%) compared to Do-Minimum

• Contributing to Better Safety, Security and Health;

- Queuing weighted by approach to the Army & Navy
- Traffic Flow on each approach to the Army & Navy
- Difference in Traffic Flow compared to Do-Minimum

• Promoting Greater Equality of Opportunity;

- Qualitative Impact on Bus and Rail

• Improving Quality of Life and Promoting a Healthy Natural Environment;

- Qualitative Impact on Pedestrians & Cyclists
- Sum of queuing on all approaches

Appendix 2 – Data for 2016 update

The Army and Navy Roundabout is widely recognised as a key pinch-point on the Chelmsford transport network, with heavy traffic flows on all arms in the AM and PM peak periods in particular. As a result, queuing is prevalent and air quality is poor with the area formally registered as an Air Quality Management Area (AQMA) identified covering the junction and the western section of Baddow Road.

Figure 1: Chelmsford AQMA (Source DEFRA AQMA Interactive Map)

Speed Analysis

The table below shows analysis of free flow versus peak hour speeds along the corridor from the 2014/15 Traffic Master data. This shows significant speed reductions of between 85 and 87% on the westbound AM flows due to congestion on the section between Parkway and the Beehive Lane junction. As there is no current provision of bus lanes at this location, bus service journey times and reliability are also affected by the reduction in speed and observed queuing.

Table 1: Observed Average Speed v's Free Flow Speed AM/PM Peak Baddow Road

Route (between Beehive Lane Roundabout and the Army and Navy)	Length (m)	Free Flow Speed (mph)	Speed (mph)	Speed reduction (mph)	% of Free Flow Speed
Baddow Road North-westbound (8:00-9:00)	666	26	3	23	13%
Baddow Road North-westbound (17:00-18:00)	666	26	4	22	15%

This information is presented visually in the following congestion plots based on 2014/15 Traffic Master data again showing congestion pressures on Baddow Road in the AM north-westbound.

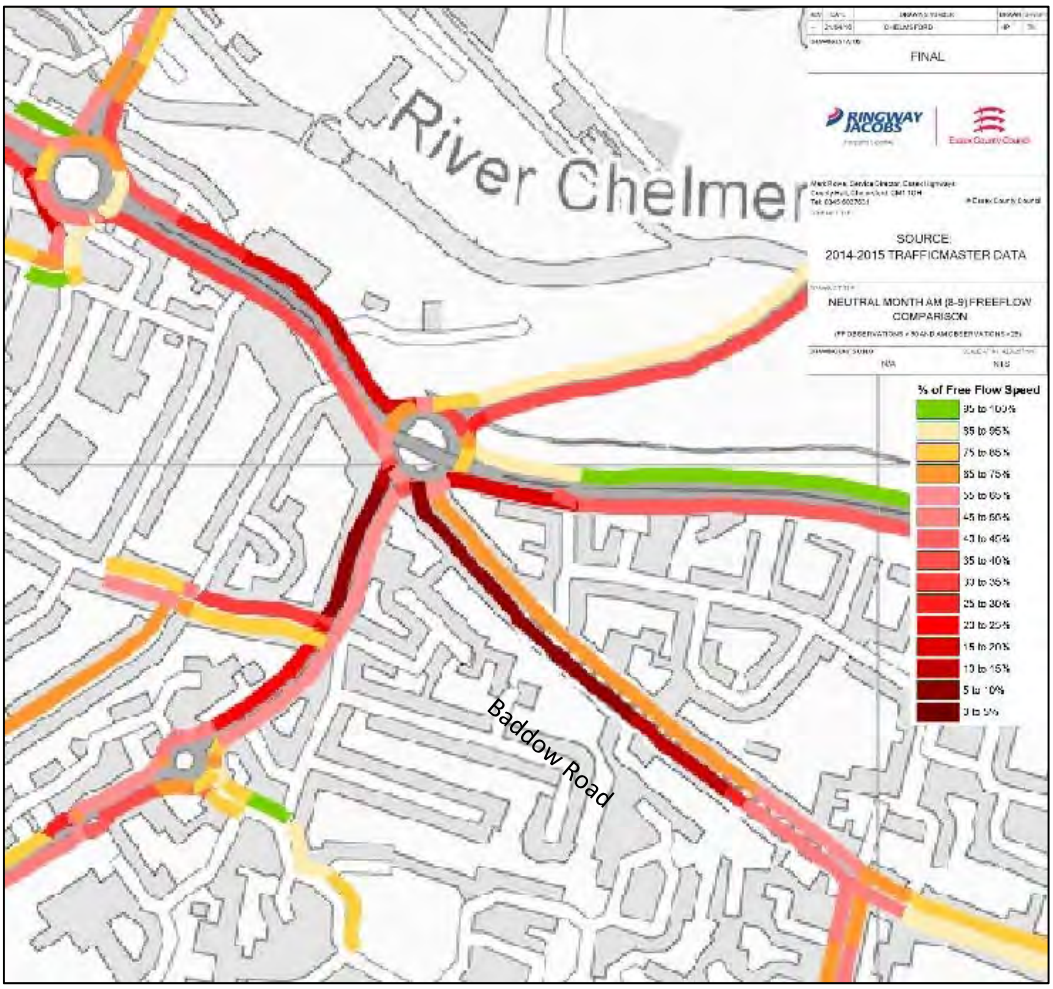

Figure 2: 2014-15 Army & Navy Roundabout AM Peak Traffic Master Congestion Plot

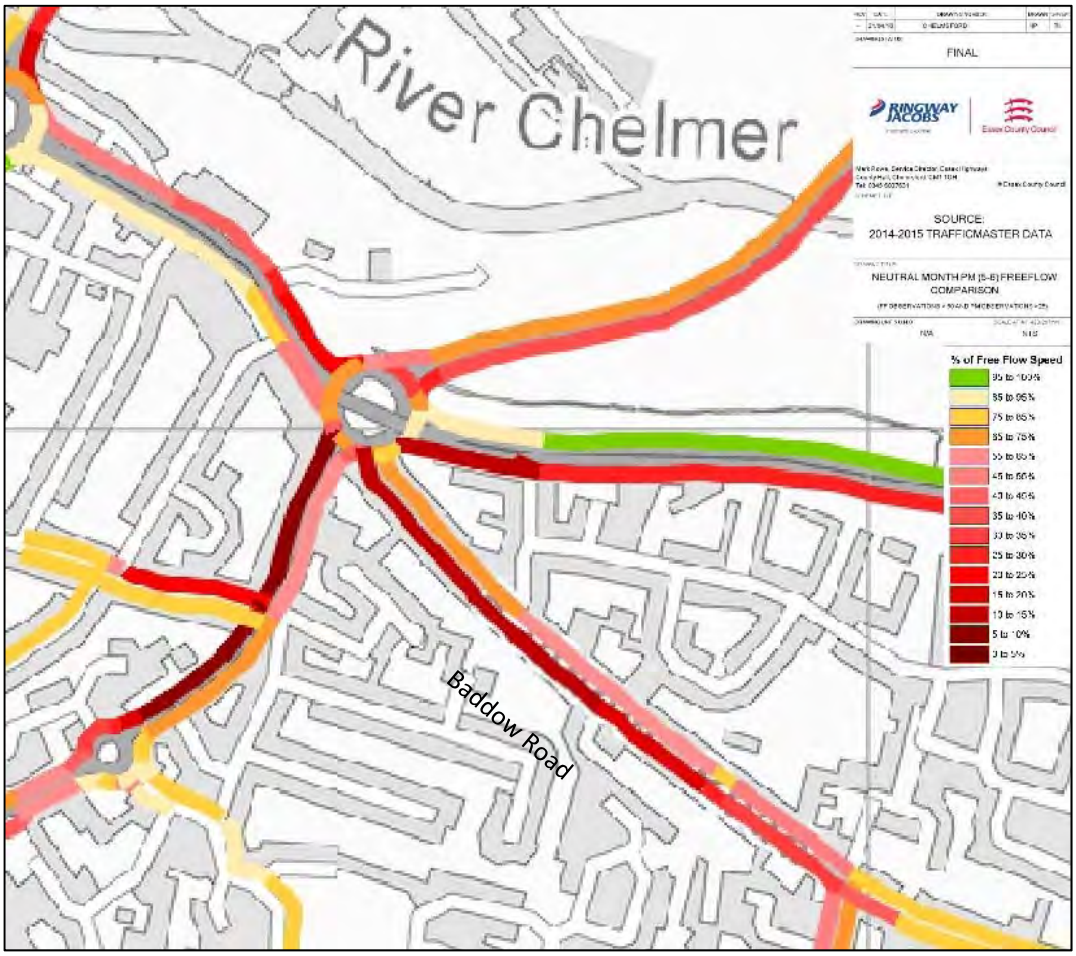

Figure 3: 2014-15 Army & Navy Roundabout PM Peak Traffic Master Congestion Plot

Journey Times

Journey times along the Baddow Road link between the Beehive Lane Roundabout and the Army and Navy Roundabout are shown below and the most significant delay in minutes and seconds is highlighted to be on the AM peak north-westbound section followed by the PM peak north-westbound section. It should be noted that this is an average delay and that sometimes the actual delay is above or below this level.

Table 2: Journey Time Delay Baddow Road AM/PM Peak (2014/15 Traffic Master data)

Route (between Beehive Lane Roundabout and the Army and Navy)	Length (m)	Free Flow Journey Time (sec)	Free Flow Journey Time (min:sec)	Average Journey Time (min:sec)	Delay (min:sec)
Baddow Road North-westbound (8:00-9:00)	666	57	00:56	07:30	06:33
Baddow Road North-westbound (17:00-18:00)	666	57	00:56	06:13	05:16

Traffic Flow Data

Traffic flows on Baddow Road have been analysed for the period January 2016 to December 2016 and the average vehicle flows are shown below:

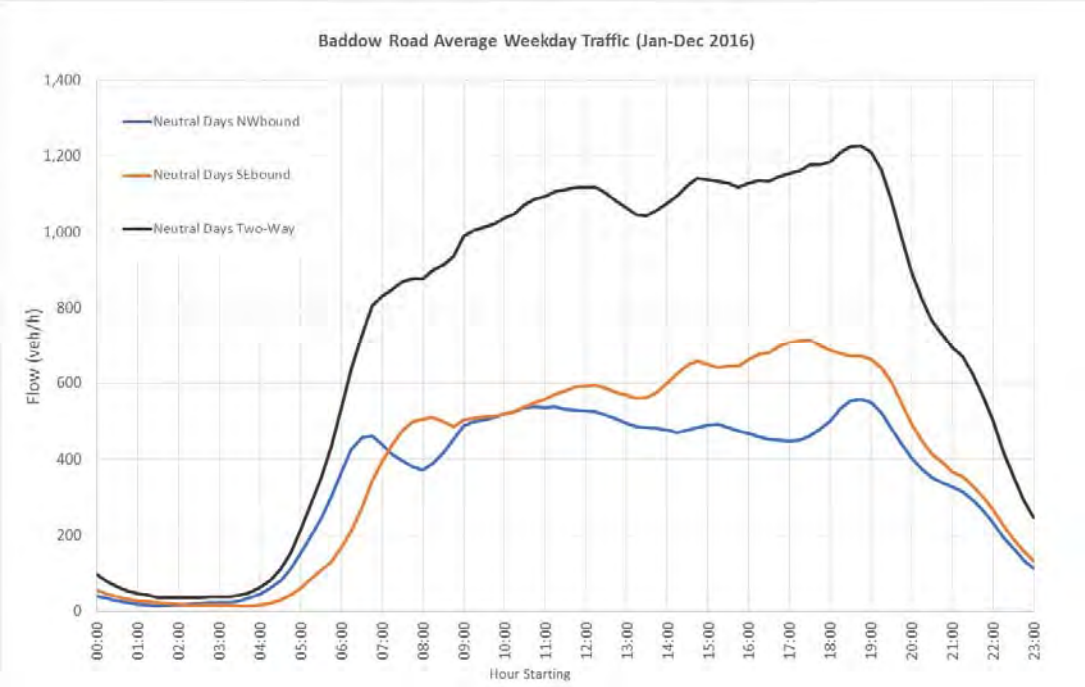

Figure 4: Average weekday traffic flow on Baddow Road (Jan16-Dec16)

A link flow comparison on Baddow Road between Meadgate Avenue and the Army and Navy junction has been carried out to provide an indication of recent peak hour traffic flows on the corridor. The data used for comparison are the 5-day average (Monday to Friday) link counts for the month of October from 2011 through to the most recent counts from 2016.

Table 3: Traffic flows between 2011 and 2016 on Baddow Road between Meadgate Avenue and Army and Navy junction

BADDOW ROAD, NW OF MEADGATE AVE)	Average weekday Traffic count for October (vehs)						
	2011	2012	2013	2014	2015	2016	Ave.
Baddow Road North-westbound (8:00-9:00)	320	349	330	263	402	362	**338**
Baddow Road South-eastbound (8:00-9:00)	484	540	443	416	472	480	**473**
Baddow Road north-westbound (17:00-18:00)	406	492	472	412	482	441	**451**
Baddow Road south-westbound (17:00-18:00)	753	780	758	659	696	722	**728**

This comparison indicates that flows in 2016 in both peak hours on this link are represented by the 6-year average of the peak hour flows on this link. In general, the highest flows for the month of October were in 2012 and the lowest in 2014. Overall, while flows change from year to year there is no evidence of significant peak hour traffic growth on this corridor over the last 6 years. This lack of growth indicates that the route may be at capacity in these time periods.

Traffic Flow Distribution per arm on the Army and Navy Roundabout

Traffic flows for the Army and Navy Roundabout from June 2016 have been tabulated (Table 4) with the largest individual movements highlighted in red. It should be noted that the flow on Baddow Road for the AM and PM peak roundabout entry is higher than both 2016 yearly average and the 6-year average. This means that this analysis is recording a percentage for the AM/PM peak which is higher than the yearly figure so is robust.

Table 4: Army and Navy Roundabout 2016 Traffic Flows AM peak and Percentage Entry and Exit for radial arms

Army and Navy Roundabout June 2016 Junction Count	Entering from Traffic Count (Vehs)	Entering from %	Exiting to Traffic Count (Vehs)	Exiting to %
A1060 Parkway	1,098	18%	1238+ 1547 flyover	44.5%
A138 Chelmer Road	1,447	23%	1168	19%
A1114 Baddow Bypass	1,076 + 1,547 flyover	42%	951	15%
B1009 Baddow Road	453	7%	433	7%
A1114 Van Diemans Road	625	10%	909	14.5%

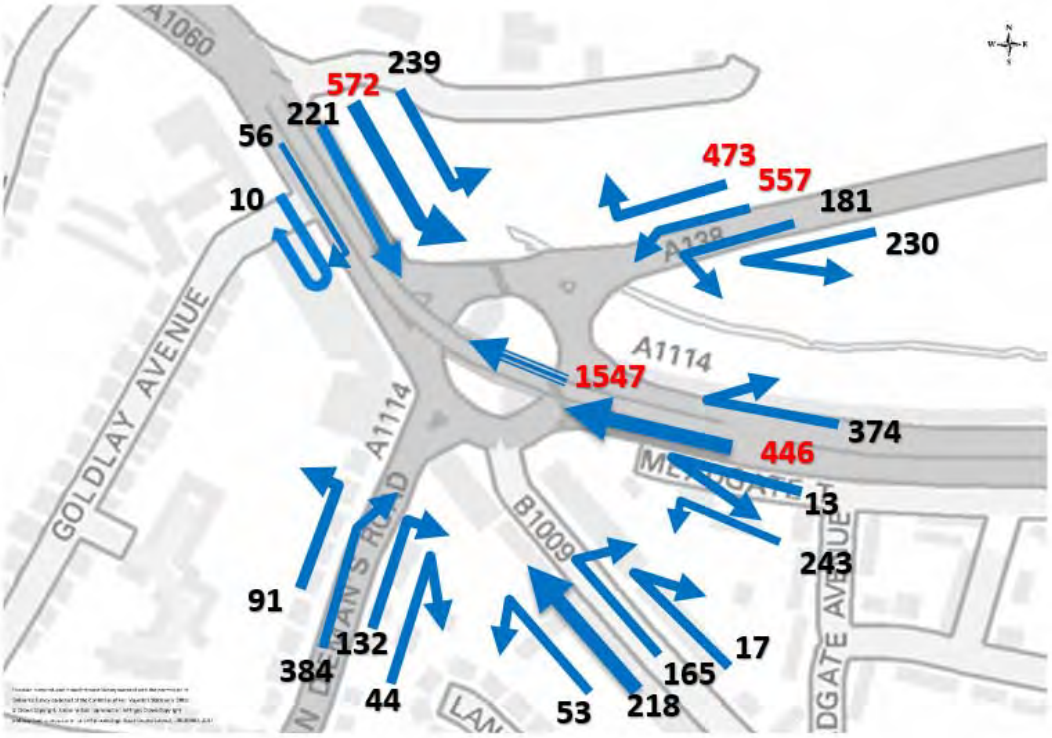

Figure 5: June 2016 Parkway AM Peak Traffic Flows Army and Navy Roundabout

RINGWAY JACOBS | Essex County Council

In this assessment Baddow Road accounts for 7% of the total traffic flow entering the Army and Navy Roundabout. The predominant flow in the AM peak is from the Baddow Bypass accounting for 42% of the total flow entering the Army and Navy Roundabout. Of this the movements through to Parkway both via the flyover and the main circulatory carriageway from Baddow Bypass account for 32% of the total traffic flow movements.

Table 5: Army and Navy Roundabout 2016 Traffic Flows PM peak and Percentage Entry and Exit for radial arms

Army and Navy Roundabout June 2016 Junction Count	Entering from Traffic Count (Vehs)	Entering from %	Exiting to Traffic Count (Vehs)	Exiting to %
A1060 Parkway	1,322 + 1,343 flyover	42%	1317	21%
A138 Chelmer Road	1,367	22%	1652	26%
A1114 Baddow Bypass	1,089	17%	667 + 1343 flyover	32%
B1009 Baddow Road	501	8%	650	10%
A1114 Van Diemans Road	723	11%	716	11%

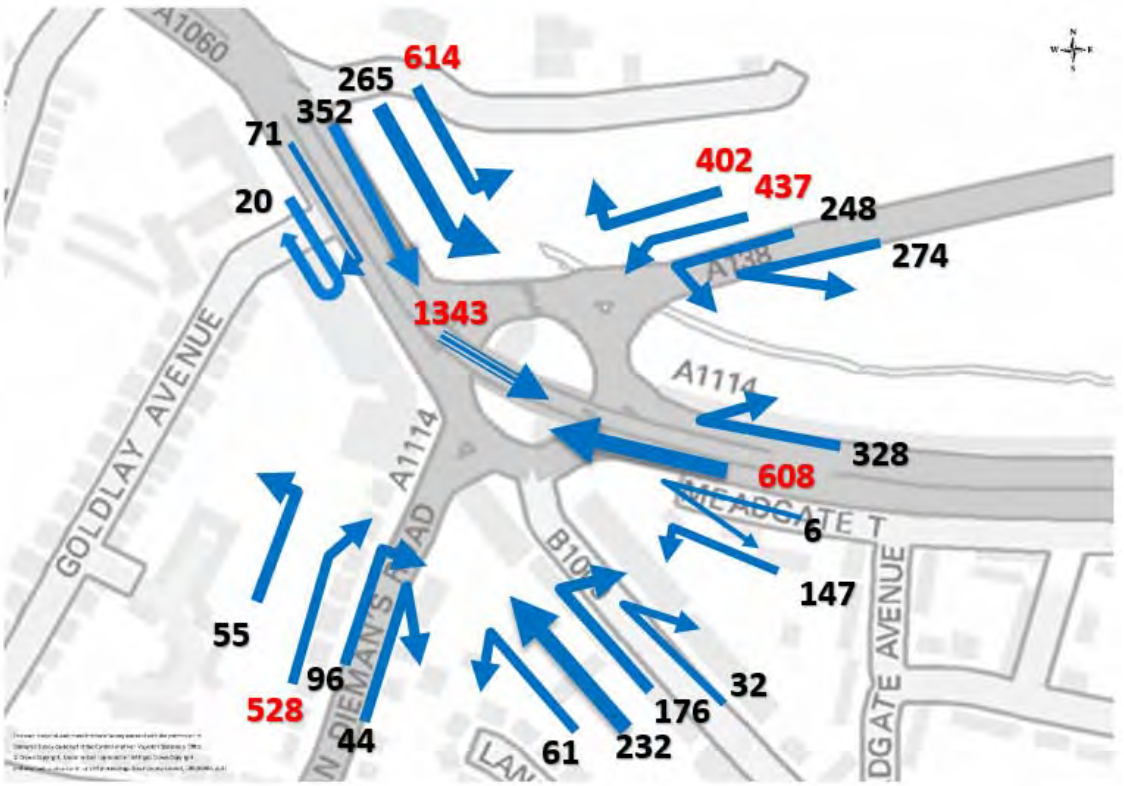

Figure 6: June 2016 Parkway PM Peak Traffic Flows Army and Navy Roundabout

Traffic flows for the Army and Navy Roundabout in the PM peak hour, show that the predominant flow in the PM peak is from Parkway accounting for 42% of the total flow entering the Army and Navy Roundabout. 32% of exits from the roundabout are onto Baddow Bypass and 26% onto Chelmer Road.

The movement through to Baddow Bypass both via the flyover and the main circulatory carriageway from Parkway accounts for 25% of the total traffic flow movements.

Baddow Road accounts for 8% of the total traffic flow entering the Army and Navy Roundabout.

Baddow Road Redistribution

In 2014 ECC commissioned a new strategic model of Chelmsford which has been built in VISUM and a micro-simulation model of the Chelmsford City Centre area built in VISSIM. A test was run using the newer VISUM model to analyse the likely patterns of traffic redistribution in the AM and PM peak hours resulting from the Baddow Road bus gate. Similarly to the older SATURN model, VISUM showed traffic transferring to Baddow Bypass and Van Diemans Road with the remainder of traffic dissipating over a wider area for example accessing the A12 via Junction 18 or travelling via Wood Street and New London Road.

As a result of this updated modelling, a slightly higher level of increase was seen directly onto the Baddow Bypass and therefore these figures were used to inform the reassignment of traffic in the VISSIM model.

Table 6: 2014 VISSIM model outputs showing predicted average delay (seconds per vehicle) at the Army & Navy roundabout with and without Baddow Road bus gate

Approach	Average Delay without closure		Average Delay with closure		Predicted change in Average Delay	
	am	pm	am	pm	am	pm
Essex Yeomanry Way	136	192	139	184	3	-8
Baddow Road	354	92	148	33	-206	-59
Van Diemens Road	275	207	263	60	-12	-148
Parkway	44	123	43	110	-1	-13
Chelmer Road	34	32	37	31	3	-1

When additional traffic is added to Essex Yeomanry Way (Baddow Bypass) with Baddow Road closed to general traffic north-west bound, VISSIM modelling suggests that the queue increases but with no significant impact upon average delay because of the altered traffic flow patterns at the roundabout allowing vehicles to access the roundabout more quickly.

As expected, Baddow Road, with only buses and cycles in a north-westbound direction, has no significant queuing or delays inbound, providing a fast and reliable route for buses which is also likely to benefit the air quality on this corridor (which is currently registered as an AQMA).

Modelling also suggests that while the Baddow Road bus gate does not have a significant impact on the throughput of Van Diemans Road in the AM peak period, the changes in flow patterns on the roundabout are likely to lead to a significant reduction in delays during the PM peak period. The most recent modelling suggests that Parkway and Chelmer Road are not likely to be significantly affected by the closure of Baddow Road.

Appendix 3 – Individual Consultation Comments – Baddow Road

Comments regarding the scheme included:

- *'Baddow Road is currently very busy only during the AM peak, and therefore the proposal should not be introduced for a 24 hours per day'*
- *'The bus lane would make access to the Doctors' surgery in Baddow Road difficult for local people'*
- *'The proposals will not meet the objectives if the current price of bus fares is not reviewed. It is felt that the main impediment to bus use is the high cost rather than lack of journey time reliability.'*

Of those that agreed to the scheme with caveats, comments included:

- *'I broadly agree with on Baddow road, but the problem will just shift to Loftin Way instead, ten into Miami roundabout and new London road as people are forced to find new routes.'*
- *'Good idea in principle. There is little mention of issues arising from re-assignment of traffic.'*
- *'Great idea. But only for buses in mornings and afternoon rush hour. And ensure bus fares are affordable then people will use them.'*
- *Understand the easing of traffic at the Army and Navy but it could put a huge amount more pressure on the Great Baddow area especially near the Vineyards area (where more housing is being built too) and on New London Road.'*
- *'Any improvement to improve timekeeping and reliability of public transport is to be welcomed. However, I don't see real improvement to traffic flow until the flyover is made two-lane.'*

Comments received disagreeing with the scheme included:

- *'Buses should not be given priority on Baddow Road. Cars will be forced to go alternate routes through residential areas, past schools (Moulsham/Beehive Lane) and past children walking to school which increases risk to them. Traffic on Baddow Road is not an issue off peak.'*
- *'You are making local residents drive further and as a result moving the congestion elsewhere. I also believe this will create more pollution in the process as traffic will back on the bypass instead.'*
- *'This roundabout can be horrendous but I really do not see the logic of just making it possible for buses to turn into Baddow Road, I use this road regularly for Billericay and taking a bus is not practical. This will cause more traffic on other roads. Something needs to be done here but making it bus only I don't see is the answer.'*

- *'You cannot make this a bus gate without creating another route into town that does not take cars through an already congested residential area and already busy road, i.e. Loftin Way/Gloucester Avenue.'*
- *This will only push more traffic onto other routes, it will not solve the problem. Until the price of public transport comes down, this will not encourage more people to use it.'*
- *'I have used Baddow Road now for 25years at all times mainly in rush hour and there has not been any major problems. This would be a waste of time and money to make this into a bus route only from Gt. Baddow. Get to the real problem and build a two lane flyover.'*
- *'The problem with Baddow Road traffic build up at peak is caused by the inability to exit onto the roundabout, and additional school traffic. The Army & Navy roundabout traffic flow is the problem, the roundabout itself is fundamentally flawed in design and requires real investment.'*
- *'This doesn't solve the problem, it moves it to a parallel road, and then adds to pollution levels as we would be driving for longer.'*

Comments received disagreeing with the benefits of the scheme included:

- *'Will cut off resident's access to city centre, pushing more traffic through the rest of Great Baddow and put more pressure on an already busy bypass and flyover.'*
- *'The bus gate would only help the residents along Baddow Road but would negatively affect the residents of Meadgate because all traffic would have to drive along Meadgate and Longmead Avenue causing a vast increase in traffic along these roads.'*
- *'Increased traffic in a densely populated area, such as Meadgate which will be the inevitable result will increase pollution and worsen health.'*

Comments received regarding other impacts of the scheme included:

- *'Not allowing cars will increase congestion elsewhere. Where will traffic go when it is diverted off the a12 following accidents etc.'*
- *'Essentially you are making local residents drive further and as a result moving the congestion elsewhere. I also believe this will create more pollution in the process as traffic will back on the bypass instead.'*
- *'This proposal (the Baddow Road Bus Gate), if put into effect, would lead to a huge displacement of traffic onto alternative routes which are already congested at busy times.'*
- *'This is a ridiculous scheme causing untold inconvenience to the residents of this historic road. think again! Forcing residents to travel extra miles and produce greater volume of carbon emissions is simply to get to their houses is not at all environmentally friendly.'*
- *'If implemented not only would it impact on the residents of Moulsham Lodge by massively increasing traffic which would be diverted from Baddow Road, but would create more danger for school's shops and residents trying to cross what will become a major road.'*

- *'Closing the road will only cause confusion and dangerous traffic in other areas, people will either divert through Tile Kiln or the Bypass. Moving the traffic isn't a solution.'*

A number of comments were received suggesting alternative proposals to the scheme including:

- *'Dual carriageway bridge would ease a lot of the issues.'*
- *'An underpass between Van Diemans Road and the bridge and /or a two-way flyover is what is needed.'*
- *'The problem is more often caused by cars stopping where they're not supposed to so the road is reduced to one lane. The congestion could be eased if this was tackled and if you moved the bus stop to where the road is wider rather than in the midst of the queue.'*

Comments received regarding the flyover included:

- *'We still need a two-way flyover. How many people need to die on the current flyover before this becomes a priority?'*
- *'The flyover needs to be dualled and the roundabout itself needs to be made larger.'*
- *'Surely funding should be put in place to build a new two-way flyover.'*
- *'Surely the two-way flyover is by far the better option even given the cost.'*
- *'The only real solution is a two-way flyover and a restriction on new developments without improved infrastructure.'*
- *'The only solution is to build a two-way flyover, of course this is far from a cheap solution - but perhaps more attention should be given to the voices of the residents who pay the council tax!'*

Comments received regarding the flyover being made two-way as a discounted option included:

- *'Other options need to be considered for the Army and Navy such as the sequencing of the traffic lights which often causes more queuing than it prevents. Long term the flyover should be made two-way.'*
- *'New 2 lane Flyover that can take traffic in and out of Chelmsford at the same time is essential - In a growing City like Chelmsford the flyover is no longer (Debateable it ever was if I'm honest) up to the job and two-way would stop all the accidents.'*
- *'The only viable solution is to make the flyover two way which should have been done years ago.'*

Some respondents made other comments about the scheme, including regarding congestion, traffic displacement, flyover, HGVs, speed, access to the GP surgery, traffic control measures, community severance, negative comments on current infrastructure, safety, pollution, bus service, impact of growth, two-way flyover, park and ride and current public transport costs.

Army & Navy Roundabout Improvements: Baddow Road Bus Gate (Volume 4 & 5)

Description of code	Number of responses
Congestion will be displaced to other areas/roads	122+183
Scheme overall - Disagree	90+158
Benefits - Disagree	64+84
Installation of a 'bus gate' between Meadgate Avenue and Army & Navy roundabout - Disagree	58+59
Other impacts	41+48
Scheme overall - Suggestion	39+39
Alternative proposal	32+43
Flyover preferred to proposed scheme	30+55
Other	27+38
Hours of operation - Disagree	20+17
Scheme overall - Agree	15+11
Discounted option - Replace flyover with a two-way structure - comment	13+11
Scheme overall - Agree with caveats	11+8
Flyover - General comment	11+18
Installation of a 'bus gate' between Meadgate Avenue and Army & Navy roundabout - suggestion	8+13
Hours of operation - Suggestion	6+6
Other cost comment	6+9
Discounted option - Full signalisation of roundabout - comment	5+2
Impacts - Agree	4+6
Benefits - Agree with caveats	3+1
Impacts - Disagree	3+5
Installation of a 'bus gate' between Meadgate Avenue and Army & Navy roundabout - Agree with caveats CCGP	2+1
Benefits - Agree	2+2
Installation of a 'bus gate' between Meadgate Avenue and Army & Navy roundabout - Agree	1+4
Complementary Measures - Gt Baddow High School cycleway - Comment	1
Complementary Measures - Parkway Corridor Improvements - Comment	1
Length of trial period - Correct	1
Trial period - Suggestion	1
Other Benefits	1+1

Costs - Acceptable	1
Costs - Not sufficient	1
Costs - Too expensive	3+3
Complementary Measures - Gt Baddow to City Centre Cycleway - Comment	2
Trial period - Suggestion	2
Discounted option - Full signalisation of roundabout - Comment	2
Installation of a 'bus gate' between Meadgate Avenue and Army & Navy roundabout - Agree with caveats	1
Benefits - Agree with caveats	1
Stated 'No comment'	1
Total	**621+832**

Appendix 4 – Stakeholder and Group Consultation Comments – Baddow Road

Petition opposing Baddow Road Bus Gate

One petition was received during the consultation, signed by 1628 people. The petition stated the following:

‘‘Don't implement the proposed Baddow Road Bus Gate. Look for a more sustainable and long term solution such as a two lane flyover. Do not cut the residence from Baddow Road off from Chelmsford.

“#NoToBaddowBusGate’’

15 Responses were received to a campaign in respect of the Baddow Road Bus Gate. The campaign suggested that respondents used text from the following:

> *“I am writing to express my concern at the proposed Baddow Bus Gate proposals as part of the Chelmsford City Growth Package.*
>
> *I consider that implementing a permanent 24hr bus gate will not improve the movement of traffic around Great Baddow. You will be forcing drivers to take longer routes through Gt. Baddow village to use the bypass which is already congested and can take in excess of 10 minutes to travel down in busy times, alternatively, drivers will be forced to take a route through Moulsham Lodge up to the congested Wood St. junction.*
>
> *Vehicles that come down Baddow Road that are unaware of the closure will be forced to travel through Meadgate, this would see heavy vehicles navigating an already congested road flanked by parked cars and passing a school.*
>
> *This seems to be very much a knee jerk reaction to the pollution levels as it will not improve the overall levels of the area, just move it or be added to by noisy and polluting bus engines. If you put on 50 busses an hour, I would not be able to use them as none of them are a viable option for my work.*
>
> *As a resident on the lower end of Baddow Road, this directly affects me yet we have not been directly notified of any proposals by ECC.*
>
> *Stopping cars exiting on to the Army and Navy from Baddow will not improve the queues on the bypass as they get held up by the traffic lights for the bus lane.*
>
> *Perhaps taxis should be banned from using the bus lane?*
>
> *Lots of traffic from Baddow Road is not travelling into town, yet most of your explanations seem to be insistent that it is. Many are travelling across town or to Springfield.*
>
> *Perhaps the cycle ways need to be improved, none of them were improved during the massive disruption to the Army and Navy underpass.*

Wherever possible, outside of work and for recreation, we walk or cycle into town.

I note that permission has been given for houses to be built on the Manor Farm site thus increasing the traffic that will be using the bypass, clearly the pollution caused by this development doesn't apply!

The only solution is to build a two-way flyover, of course this is far from a cheap solution but perhaps you need to start listening to the residence who pay the council tax!"

Sutherland Lodge Surgery Patients Representation Group

A response was also received from the Sutherland Lodge Surgery Patients Representation Group. The Group advised of the location of the Surgery, in the middle of the affected section of Baddow Road. Around 11500 patients are registered at the Surgery, with 300 or more patients and staff accessing every weekday, with those with mobility impairments still needing to access by car.

They propose that if other patients were to be encouraged to access the Surgery by bus rather than car, then there could be an advantage to moving the current bus stops on either side of Baddow Road closer to the Surgery premises at 115 Baddow Road.

The group stated that whilst the primary purpose of the proposal, to reduce air pollution from slow moving traffic, should be supported, depending on the routes selected for diversion the pollution might not be prevented but merely transferred (e.g. existing traffic bottlenecks in Loftin Way and Gloucester Avenue).

Chelmsford City Council - Baddow Road Bus Gate

The City Council does not support this scheme. They are concerned that the wider impact is not yet fully understood, particularly in terms of diverted car journeys through Great Baddow village and potentially through the Moulsham Lodge Estate. They suggest that it is likely to lead to an undesirable knock-on effect through Baddow Village and the Moulsham Lodge Estate and may worsen queuing times and congestion on the Baddow Bypass.

Great Baddow Parish Council - Baddow Road Bus Gate

The Parish Council object to the proposals for the bus gate.

They feel that restriction should not be 24/7 as congestion only occurs at peak times and that the proposal is inconveniencing many residents of Great Baddow unnecessarily.

The Council suggest that the journey time improvements described in Baddow Road would be negated by the extra traffic displaced onto Wood Street, impacting a larger number of buses.

The Council suggest that air quality on Baddow Road could be tackled by other measures and believe that the scheme will transfer air quality problems to other areas.

The Council raised a concern that assumptions made for modelling the effects of this proposal have not been made public, such as the number of people who may switch to cycling or using public transport and the effects of re-routed traffic on the centre of Great Baddow and the Baddow bypass.

The Council suggests that vehicles taking a route through the Moulsham Lodge or Tile Kiln residential roads will add to the already congested Wood Street and that this would be harmful to local residents.

The Council believe that traffic held up at the entrance to the Army and Navy roundabout from the bypass is due to traffic coming from Parkway and Chelmer Road, and congestion on the roundabout is caused by traffic having to stop at the crossing lights on Van Diemans Road.

They suggest that vehicles that have to access the Army and Navy via Baddow village and the bypass may have to travel up to three miles extra on each journey, increasing pollution, particularly in the evening rush hour.

The Council noted that it is proposed that heavy goods vehicles are re-directed up Meadgate Avenue and commented that, as this is a designated quieter residential area route for cyclists, it is not acceptable to direct heavy goods vehicles and cycles to share the same road space.

They note that the 40 bus does not access Baddow Road until Meadgate Avenue, and so would gain little benefit from the proposal. They also suggest that until fare and ticketing structures between Regal Busways and First Essex Buses are reviewed, this would hinder increased bus use.

The Council identify that heavy-duty vehicles (HDVs) have been found to be contributing much of the traffic-related air pollution, with over 80% of HDVs being public service vehicles (PSVs), and that this would negate much of the claimed benefit of the bus gate.

The Council suggest that waiting times from Van Diemans Road on to the Army and Navy roundabout would see limited improvement, as most of the delay, especially in afternoons, is from traffic exiting Baddow bypass and stopping traffic exiting Van Diemans Road. The Council feels that this traffic will increase.

Mid-Essex Business Group - Baddow Road Bus Gate

The group feels that this proposal would be likely to add very considerably to journey times for those no longer able to gain access to the Army and Navy roundabout from Baddow Road. They comment that displaced traffic would add to congestion on the alternative routes which traffic would be forced to use. As such, they do not favour this proposal.

First Essex Buses Limited - *Army & Navy Roundabout Improvements: Baddow Road Bus Gate*

First welcome the proposal to introduce the 'bus gate' priority measure as they feel it would provide a consistent and improved journey time for buses heading towards Chelmsford City centre in both peaks. However, they note that the redistribution of traffic onto other corridors would also need to be mitigated in order not to disrupt bus services on other corridors, for example by corresponding improvements to New London Road north-bound such as a parking restriction and widened bus lane.

Chelmsford Cycling Action Group *Army and Navy – Baddow Road Bus Gate*

The Action Group feel that this scheme is a beneficial step for buses and should be worth the experiment if it were part of a package (e.g. cheap special offer fares for those that would otherwise use a car). They feel that if it is only seen as a standalone measure it will just displace existing traffic to other roads, increasing air pollution.

J.W. Steele and Son

Strongly disagreed with the proposal for a bus gate on Baddow Road, stating that this will adversely impact business.

MRH (GB) Limited (BP petrol station)

MDJ & Associates responded on behalf of MRH (GB) Ltd regarding the introduction of the bus gate on Baddow Road.

MDJ & Associates, on behalf of their clients, object to the introduction of a bus gate on Baddow Road.

They also suggest that the 'B' road classification of Baddow Road is a clear indication of its intended function to carry both local and commuter traffic including buses and HGVs, minimising the likelihood of traffic using unsuitable local roads in the area. The introduction of a bus gate would, they feel, lead to significant displacement of traffic.

MDJ & Associates stated that no detailed evidence had been provided to support the suggested benefits of the scheme, and raised concerns that the proposed bus gate would have a negative impact on businesses along Baddow Road.

Appendix 5 – Scheme drawings

- B355338A-01-001 General Arrangement Drawing (Preferred Option at Consultation)
- B355338A-00-001 Scheme Overview Drawing (Revised Preferred Option)

Notes

1. Do not scale.

Key

- Proposed bus lane
- Proposed traffic sign

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

DRAWING STATUS

PRELIMINARY

RINGWAY JACOBS integrated expertise

Essex County Council

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

SCHEME TITLE

CHELMSFORD CITY GROWTH PACKAGE BADDOW ROAD BUS GATE

DRAWING TITLE

GENERAL ARRANGEMENT

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
NS	JLE	MPA	CC	CC
DATE	DATE	DATE	DATE	DATE
MAY 17	JUNE 17	SEPT 17	SEPT 17	SEPT 17

DRAWING UNITS U.N.O.
DIMENSIONS IN MILLIMETRES
LEVELS IN METRES

SCALE AT A1 (841X594mm)
1:500

DRAWING No.
B355338A-01-001

REV.
-

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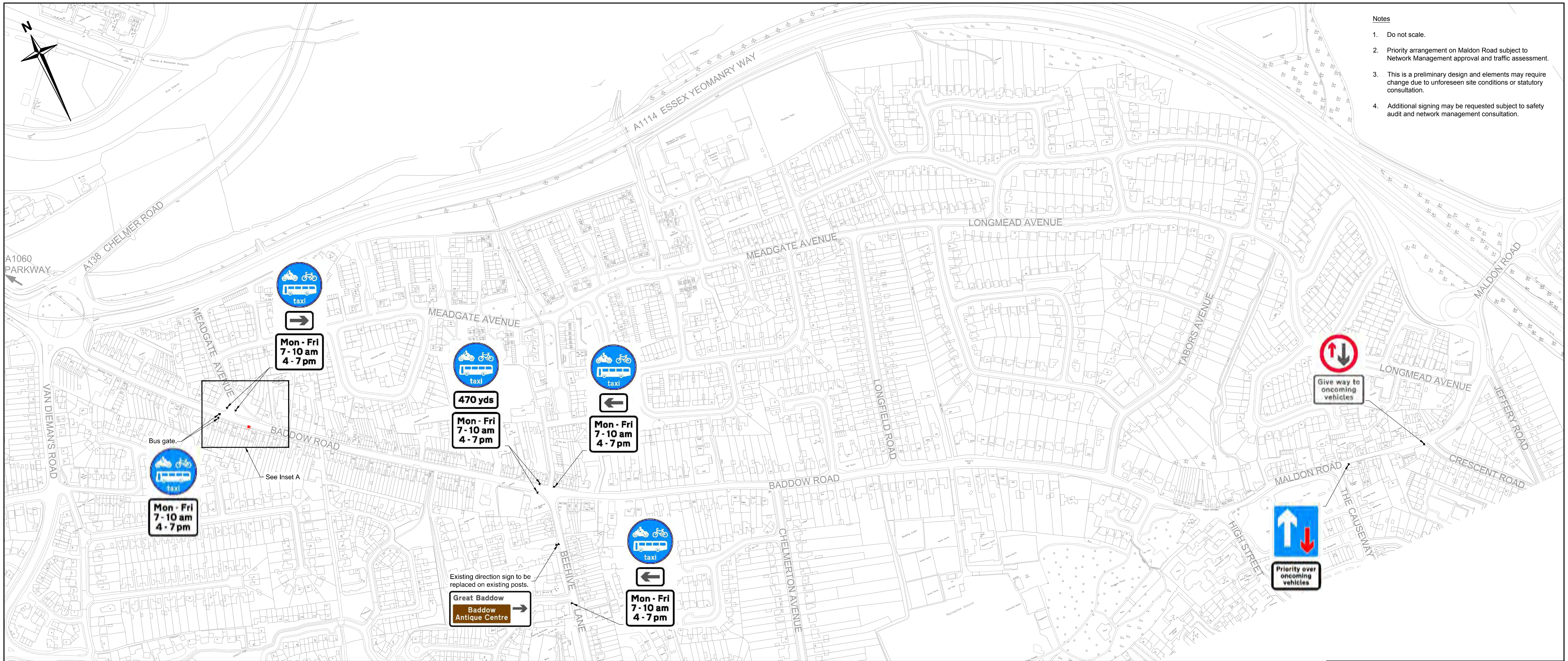
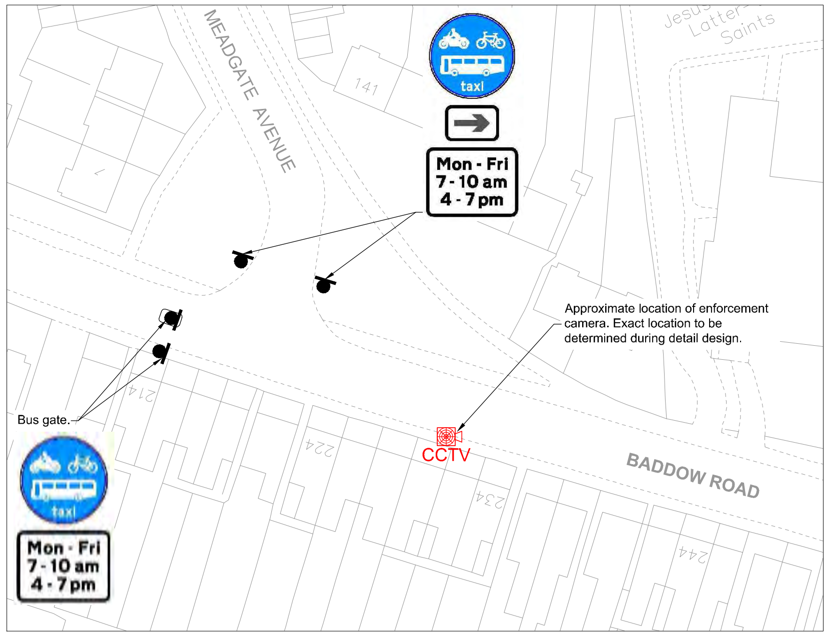
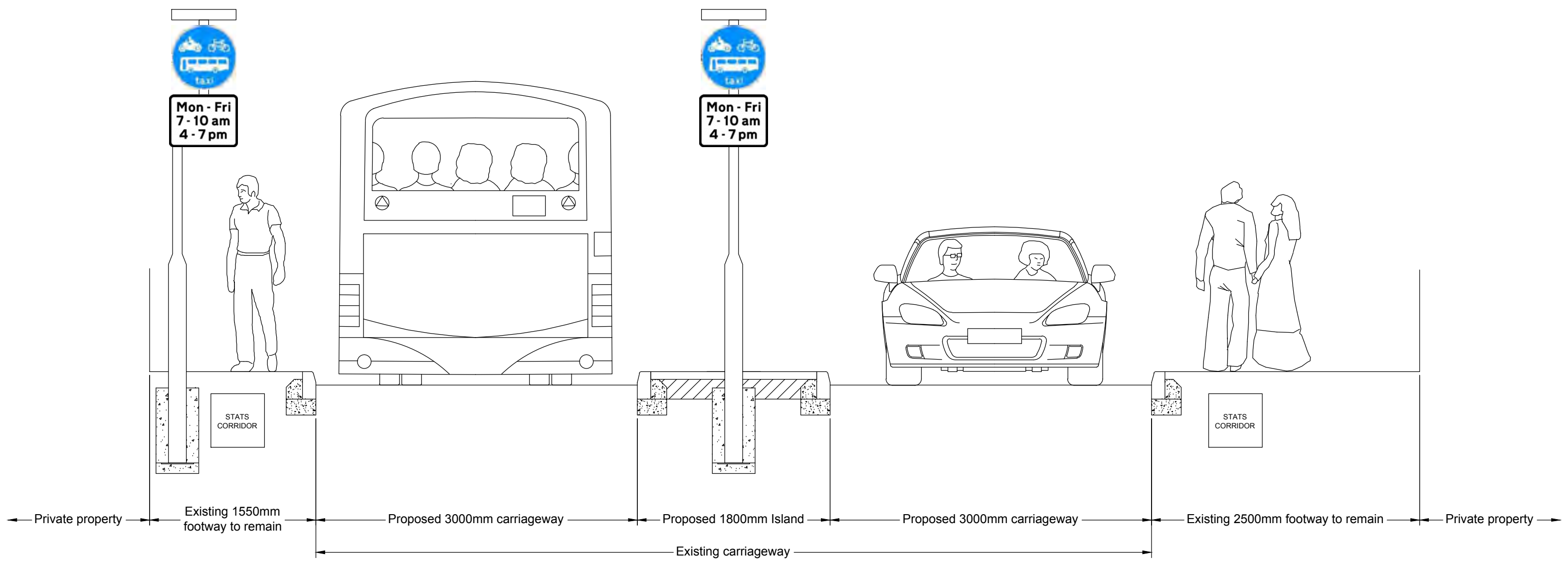


Notes

1. Do not scale.
2. Priority arrangement on Maldon Road subject to Network Management approval and traffic assessment.
3. This is a preliminary design and elements may require change due to unforeseen site conditions or statutory consultation.
4. Additional signing may be requested subject to safety audit and network management consultation.



INSET A
1:500



LOOKING NORTH ON BADDOW ROAD AT START OF RESTRICTION

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

DRAWING STATUS

PRELIMINARY

RINGWAY JACOBS Integrated expertise — Essex County Council

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

SCHEME TITLE

CHELMSFORD CITY GROWTH PACKAGE BADDOW ROAD BUS GATE

DRAWING TITLE

SCHEME OVERVIEW

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
PFW	KJH	MJ	MPA	MPA
DATE SEPT 17	DATE SEPT 17	DATE SEPT 17	DATE SEPT 17	DATE SEPT 17

DRAWING UNITS U.N.O.: DIMENSIONS IN MILLIMETRES, LEVELS IN METRES
SCALE AT A1 (841X594mm): 1:2,500

DRAWING No.: B355338A-00-001
REV.: -