

## Document Control Sheet

Document prepared by:

Katie Slatter  
Transport Planner

Transport Planning  
Victoria House  
Chelmsford  
CM1 1JR

E: [REDACTED]  
W: [www.essex.gov.uk/highways](http://www.essex.gov.uk/highways)

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## 1 Introduction

The purpose of this Technical Note is to set out Essex County Council's (The Council) proposals on a Monitoring and Mitigation Plan for the A12 Chelmsford to A120 Widening Development Consent Order project.

The principle of traffic monitoring, with both pre-opening baseline and post opening surveys, together with a number of control sites to monitor background growth, has been accepted by Highways England on other DCO schemes, as has the provision of reasonable and appropriate mitigation, should monitoring show that there is a significant adverse impact due to the scheme.

The Council is submitting this Technical Note to inform a Monitoring and Mitigation Requirement in the A12 DCO, to ensure that the future monitoring and mitigation strategy covers the appropriate elements.

## 2 Monitoring Methodology

### 2.1 Principles

The aim of the monitoring programme should be to provide good insight of the scheme's operational impacts on the local road network at key locations; through comparison with a baseline collected prior to scheme opening. It should enable unexpected or unanticipated effects to be identified, with reference to the forecast effects.

Key locations should include places where:

- there are reasonable grounds for uncertainty regarding the modelling forecasts, recognising the natural limitations of the modelling
- there are safety concerns as a result of the scheme e.g., proposed changes to speed limits that are not supported by the Council as the local highway authority
- concerns are raised locally about changes to the performance of the highway network caused by the scheme, where there is reasonable justification

It is accepted that there could be a number of contributory factors to changes observed on the local road network. If the evidence suggests that the A12 widening scheme is having a significant impact, National Highways should investigate these changes further and, if necessary, deliver or contribute towards suitable mitigation.

It is expected that National Highways will fully fund the cost of monitoring their scheme, including all surveys of all types, on the basis that the monitoring is essential for understanding the impacts of the scheme and whether the environmental effects are in accordance with those forecasts both within the scheme extents but not limited to beyond the scheme extents.

### 2.2 Proposed Monitoring Locations and Rationale

Table 2-1 below lists the 29 monitoring locations that the Council considers should be monitored as part of the A12 Widening DCO scheme. Their locations are shown in Figures 2.1 to 2.3, below.

The reason for including each monitoring site is indicated in Table 2.1 and explained in more detail in Table 2.2 which follows.

The Council considers the 29 sites to be the minimum number necessary to properly and robustly monitor and assess the impact of the A12 Widening scheme on the local highway network:

**Table 2-1 Proposed Monitoring Locations**

Ref.	Location	Reason		
		Model uncertainty	Safety concern	Local concern
1	B1137 Main Road, Boreham	X		X
2	The Street / Maldon Road (Duke of Wellington) junction, Hatfield Peverel	X		X
3	New Road, Hatfield Peverel	X		X
4	Church Road, Hatfield Peverel	X		X
5	Mowden Hall Lane, Hatfield Peverel	X		
6	Church Road, Boreham	X		
7	Little Braxted Road, Little Braxted			X
8	Braxted Road / Braxted Park Road	X		
9	London Road (De-trunked A12), Rivenhall End		X	
10	B1024 Coggeshall Road, Kelvedon	X		
11	Coggeshall Road, Feering	X		
12	London Road (De-trunked A12), Feering		X	
13	Gore Pit (Blue Anchor) junction, Kelvedon			X
14	B1023 Inworth Road, Inworth (North of new Inworth Road Roundabout)		X	
15	B1023 Inworth Road, Inworth (South of new Inworth Road Roundabout)	X	X	
16	Kelvedon Road, Messing	X		X
17	Oak Road, Tiptree	X		X
18	B1022 Maypole Road, Tiptree	X		
19	B1023 Church Road, Tiptree			X

20	Station Road/North Lane, Marks Tey	X		
21	B1408 London Road, Copford			X
22	School Road, Copford			X
23	Easthorpe Road, Easthorpe	X		X
S1	B1137, between A12 Junction19 & Boreham		X	
S2	B1137, between Damases Ln & Mowden Hall Ln		X	
S3	New Hatfield Peverel to A12 Junction 21 Link Road		X	
S4	Braxted Road, south of new Braxted Road Overbridge		X	
S5	New B1024 Link Road		X	
S6	De-trunked A12, west of London Road Roundabout		X	

- Site 1 will establish whether the proposed speed limit reductions between Junction 19 and Hatfield Peverel have been successful in limiting predicted traffic growth on this road.
- Sites 2 to 7 will monitor the key alternative routes to Junction 19 from Maldon District – effectively forming a cordon around Main Road Boreham. These sites, in conjunction with additional data from the Council’s permanent counters on the A414 and B1019, will establish whether the changes in traffic distribution predicted in the A12 Widening DCO Transport Assessment have occurred, in reality, or whether there have been significant unexpected consequences of the new A12 junction arrangements in Hatfield Peverel. It is important to monitor turning movements at Site 2 as they will play an important role in identifying the impact of the A12 Widening scheme.
- Sites 7, 13, 16, 17, 19, 21, 22 & 23 are sensitive locations where local concerns have been raised about the impact of A12-related traffic flow changes. It is important to monitor whether these changes are in line with expectations, or significantly different.
- Sites 9, 12, 14 & 15 are locations where the Council has concerns that non-compliance with the proposed speed limits (if the DCO scheme remains unchanged) could lead to a greater risk of collisions and/or increased traffic flows, potentially leading to worse environmental impacts than those forecast in the A12 Widening DCO Transport Assessment and Environmental Statement.
- Sites 8 & 15 are on the two key competing traffic routes to the A12 from Tiptree. There is a possibility that, with the natural limitations of the strategic traffic modelling, the predicted future year journey times on these routes could differ from those forecast by the model. This might result in significantly different percentages of A12-bound traffic on the routes.
- Sites 10 & 12 are again on two parallel competing routes, but this time to the new A12 Junction 24 from the north. As per Sites 8 & 15, the predicted future year journey times on these routes could differ from those forecast by the model and proportion of A12-bound traffic on each route could differ, leading to a change in the proportion of traffic on each route.

- Sites 16, 17, 18 are competing routes to the new A12 Junction 24 from the east and, as such are particularly subject to modelling uncertainty, as are Sites 20 and 23.
- Sites S1 to S6 are locations where the Council has specific concerns about potential non-compliance with the proposed speed limits, if the DCO scheme remains unchanged. Traffic flow monitoring is not specifically required at these locations, as either non-compliance is the main concern or traffic flows are already being monitored nearby,

Figure 2-1 Proposed Monitoring Locations in Boreham and Hatfield Peverel (sites 1-6)



Figure 2-2 Proposed Monitoring Locations in Witham, Kelvedon, Tiptree and Messing (sites 7-19)



Figure 2-3 Proposed Monitoring Locations in Marks Tey, Copford and Easthorpe (sites 20-23)





Table 2-2 Rationale for Monitoring Locations

Ref	Location	Rationale
1	B1137 Main Road, Boreham	Driver response to delay at The Street/Maldon Rd Jn may differ from that modelled – could lead to higher traffic flows on Main Rd
2	The Street / Maldon Road, Hatfield Peverel	Expectation from model is 80% turning right from Maldon Road. If significantly different, could indicate other routes are more attractive. If queueing and delay is worse than expected, could potentially be a cause of traffic increases on other routes.
3	New Road, Hatfield Peverel	Alternative route to Main Rd from Maldon Rd – could see unexpected flow increase
4	Church Road, Hatfield Peverel	Alternative route to Main Rd from Maldon Rd – could see unexpected flow increase
5	Mowden Hall Lane, Hatfield Peverel	Alternative to Maldon Rd/Main Road route (to Junction 19) – could see unexpected flow increase
6	Church Road, Boreham	Alternative to Maldon Rd/Main Road route (to Junction 19) – could see unexpected flow increase
7	Little Braxted Road, Little Braxted	Local concerns regarding potential increase in HGVs – could be greater than model forecasts
8	Braxted Road / Braxted Park Road	Main alternative to Inworth Road route to A12 from Tiptree. Modelled journey times for the two routes are close and balance of flows using routes could be different in reality
9	London Road (De-trunked A12), Rivenhall End	ECC safety concern regarding potential excess speeds on de-trunked sections
10	B1024 Coggeshall Road, Kelvedon	Parallel Corridor with Coggeshall Road Feering – could see unexpected flow increase
11	Coggeshall Road, Feering	Parallel Corridor with Coggeshall Road Kelvedon – could see unexpected flow increase
12	London Road (De-trunked A12), Feering	ECC safety concern regarding potential excess speeds on de-trunked sections
13	Gore Pit (Blue Anchor) junction, Kelvedon	Local concerns regarding potential impact of scheme on sensitive junction – need to take account of any background growth due to local developments
14	B1023 Inworth Road, Inworth (north of the A12)	The Council's safety concern regarding potential excess speeds on approach to new Inworth Rd roundabout.
15	B1023 Inworth Road, Inworth (south of the A12)	The Council's safety concern regarding potential excess speeds on approach to new Inworth Rd roundabout. Also, increase in flow on Inworth Rd may differ from modelled, due to unexpected use of alternative Braxted Road route.

Ref	Location	Rationale
16	Kelvedon Road, Messing	Local concerns regarding potential impact of scheme on Messing Village
17	Oak Road, Tiptree	Local concerns regarding potential impact of scheme on residential road
18	B1022 Maypole Road, Tiptree	Key alternative route to Kelvedon Road and Oak Road – could see unexpected flow increase
19	B1023 Church Road, Tiptree	Local concerns regarding potential impact of scheme centre of Tiptree
20	Station Road/North Lane, Marks Tey	Alternative route to new Junction 25 – could see unexpected flow increase
21	B1408 London Road, Copford	Local concern regarding impact of increased traffic
22	School Road, Copford	Local concern regarding impact of increased traffic
23	Easthorpe Road, Easthorpe	No proposal within DCO to physically prevent through traffic, therefore impact of 'Local Access Only' signage needs to be monitored
S1	B1137, between A12 Junction 19 & Boreham	The Council's concerns regarding potential non-compliance with proposed speed limit (if DCO scheme remains unchanged)
S2	B1137, between Damases Lane & Mowden Hall Ln	
S3	New Hatfield Peverel to A12 Junction 21 Link Road	
S4	Braxted Road, south of new Braxted Road Overbridge	
S5	New B1024 Link Road	
S6	De-trunked A12, west of London Road Roundabout	

### 2.3 Type of Monitoring and Metrics to be Measured

The key metric to be considered is traffic/transport flows. This provides the basis by which any localised delays and or network performance issues which are noted following scheme opening may be identified. Other traffic/transport-related metrics to be measured include vehicle speeds and queue lengths/congestion.

Air quality does not need to be measured as part of this monitoring programme as it is understood it is to be agreed separately in consultation with the relevant city and district authorities. However, there may be a benefit in co-locating traffic and air quality monitoring, nonetheless, for example to understand if changes in air quality are likely to be a result of changing traffic flows or other factors.

Generally, the data that is collected should be suitable for developing a suitable traffic model if this is later decided to be necessary, for example to test the impact of a mitigation measure and to be undertaken during neutral months.

Table 2-3, below, shows the count types proposed, based on the rationale of why monitoring is required at each location. This includes:

- Continuous Link Counts – permanent inductive loops or VivaCity sensors that continually monitor traffic flows
- Scheduled Link Counts – programmed Automatic Traffic Count (ATC) or LINK (video) surveys
- Scheduled Junction Counts – Programmed Junction (video) surveys
- Queue/Delay Surveys – use of GPS Journey Time data
- Speed Surveys – use of GPS Journey Time data, or ATC Surveys

Video surveys are required for junction surveys, or to provide greater/ more accurate information regarding vehicle types (e.g., HGVs).

Table 2-3 Count Type at each proposed monitoring location.

Ref	Location	Count Type / Frequency				
		Continuous Link Count	Scheduled Link Count	Scheduled Junction Count	Queue/ Delay Surveys	Speed Survey
1	B1137 Main Road, Boreham	VivaCity				GPS
2	The Street / Maldon Road, Hatfield Peverel	VivaCity		Video	GPS	
3	New Road, Hatfield Peverel		ATC			ATC
4	Church Road, Hatfield Peverel		ATC			ATC
5	Mowden Hall Lane, Hatfield Peverel		ATC			ATC
6	Church Road, Boreham		ATC			ATC
7	Little Braxted Road, Little Braxted		ATC & Video			ATC
8	Braxted Road / Braxted Park Road	Loop	ATC			ATC
9	London Road (De-trunked A12), Rivenhall End		ATC			ATC
10	B1024 Coggeshall Road, Kelvedon		ATC			
11	Coggeshall Road, Feering		ATC			
12	London Road (De-trunked A12), Feering		ATC			ATC
13	Gore Pit (Blue Anchor) Junction, Kelvedon		ATC	Video	GPS	

14	B1023 Inworth Road, (north of proposed Inworth Rd roundabout)		ATC			ATC
15	B1023 Inworth Road, (south of proposed Inworth Rd roundabout)	Loop				ATC
16	Kelvedon Road, Messing		ATC & Video			ATC
17	Oak Road, Tiptree		ATC& Video			ATC
18	B1022 Maypole Road, Tiptree		ATC			ATC
19	B1023 Church Road, Tiptree		ATC			ATC
20	Station Road/North Lane, Marks Tey		ATC			
21	B1408 London Road, Copford		ATC			
22	School Road, Copford		ATC			
23	Easthorpe Road, Easthorpe		ATC			
S1	B1137, between A12 Junction 19 & Boreham					ATC
S2	B1137, between Damases Lane & Mowden Hall Ln					ATC
S3	New Hatfield Peverel to A12 Junction 21 Link Road					ATC
S4	Braxted Road, south of new Braxted Road Overbridge					ATC
S5	New B1024 Link Road					ATC
S6	De-trunked A12, west of London Road Roundabout					ATC

## 2.4 Frequency of Monitoring

The frequency of monitoring the impact of the scheme is proposed for before main construction works begin and subsequently one year and three years post opening date. The different survey types have different recommended monitoring requirements, as set out below:

- **VivaCity & GPS** – continuously collected.
- **ATC Survey (Classified counts)**: 2-week ATC survey in neutral month, **two times a year**
- **ATC Survey (Speed)**: 1-week ATC survey in neutral month, **two times a year**
- **Video Survey** (link or junction): 3-day video survey in neutral month, **two times a year** (for classified counts).

At continuous counters, at least three neutral months' data should be collected prior to the start of construction and continue for five years post opening.

At ATC sites, at least one count should be carried out in a neutral month prior to construction (and continue as scheduled for three years post opening)

## 2.5 The Need for Continuous Counters in Key Locations

Continuous counters are important to verify nearby short-term counts against, to allow for seasonal variations, capture impact of network incidents, provide additional information on weekend traffic etc. They also allow the impact of incidents on the A12 to be captured. Should future modelling be required, continuous data can be used to adjust short-term counts to neutral day averages.

Total direct cost for the installation of a continuous counter is approximately £8,000 and £400 per year operating annual cost. A 14-day survey by tube counters costs £580 and accompanying video survey to provide accurate classification £370 per day, excluding cost of data processing and presentation.

ECC have been rolling out the use VivaCity sensors across Essex, and there are currently around 100 across the network. A significant advantage over inductive loop counters is that these capture not only road vehicle traffic but also pedestrians and cyclists. They capture a variety of vehicle classes more accurately, while accuracy is not affected by slow moving vehicles in congested conditions. VivaCity sensors are dependent on external power supply and in cases where only vehicle traffic is to be detected, in relative free flowing conditions, and where no lamp columns are available, inductive loop counters may still be the only option. Costs of the two options are almost identical and VivaCity sensors can usually be installed and maintained with no or only light traffic management.

The Council has processes and agreements in place for the procurement, installation, operation, maintenance, as well as data access and processing of data for its own VivaCity sensor sites. Based on the number of installations in place, the Council qualifies for bulk discount on additional sensors and annual licence and data management costs. If necessary the Council would

be content to arrange for installations and add the VivaCity sensors (or inductive loop counters) required for the A12 monitoring to its existing portfolio, subject to National Highways funding.

### 3 Identifying the impact of the A12 scheme

#### 3.1 Investigation Principles

When reviewing the data gathered in the monitoring programme, there will need to be:

- Thresholds at which impacts that differ from those predicted in the A12 Widening DCO Transport Assessment require further investigation.
- Sufficient data to identify whether the A12 widening scheme is a material contributor to those impacts.

If the monitoring reveals that there have been significant changes in traffic flow, speeds or collisions on the network that are not in line with those predicted in the Transport Assessment, these impacts should be investigated to establish whether mitigation is appropriate. The thresholds to be used and the data requirements required to identify the specific impacts of the A12 Widening DCO Scheme are outlined below.

#### 3.2 Traffic Flow Thresholds

The following thresholds from other projects/guidance are considered useful as background information for the A12 Widening DCO Monitoring and Mitigation Plan:

- Transport for London’s Silvertown Tunnel project monitoring and mitigation strategy classifies +/- 7% variance from 24hr weekday modelled flows as a “red alert” threshold requiring mitigation.
- DfT guidance on transport assessment suggests that 30 two-way peak hour trips can be considered a threshold for assessment (i.e., the impact is noticeable)
- The Council’s draft Transport Assessment Guidance (in line with Cambridgeshire’s) requires a TA for developments generation greater than 60 two-way peak hour trips

Taking account of the above, the following mechanism is considered appropriate for identifying impacts that require further investigation:

*Traffic Flow Threshold Investigation Mechanism:*

1	For each monitoring location, calculate modelled opening year <i>change</i> in traffic flow
2	Add modelled change to observed pre-construction flow to create ‘adjusted forecast flow’ (AFF).
3	Compare observed post construction flow (PCF) with AFF
4*	Threshold* for investigation has been reached, if: a) AM or PM peak PCF is more than 120 vehicles (2-way) higher than equivalent AFF, <b>and.</b>

b) 24-hour weekday PCF is at least 10% higher than equivalent AFF
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\*Threshold a) prevents small increases on low flow roads from triggering mitigation unnecessarily. Threshold b) ensures that relatively low increases on high flow roads do not trigger mitigation.

### 3.3 Traffic Speed, Delay and Collision Thresholds

Thresholds for changes in traffic speed, delay and collisions are more difficult to define than those for traffic flow. However, it will be important to monitor changes in these criteria, as the opening of the scheme could have unanticipated impacts in the vicinity of the scheme that National Highways should investigate, for example, instances where:

- Traffic speeds are observed to be significantly higher than the A12 DCO Widening scheme speed limit.
- Observed queuing behaviour is creating significant additional delay to side roads or disrupting access to properties.
- A significant increase in collisions has occurred at a location where available data indicates a pattern which would correlate with other thresholds (i.e., increases in side-swipe collisions at junctions where delays on certain arms or turns have also increased).

Whether a threshold has been reached will need to be agreed on a case-by-case basis, through discussion and agreement between The Council and National Highways.

### 3.4 Identifying Material Contribution of A12 DCO Scheme

Where unanticipated post-opening changes in traffic flow, speed, delay or collisions are identified, it will be important to identify whether the A12 scheme itself is a material contributor to those impacts. Changes are likely to be due to one (or a combination) of three factors:

- a) Traffic which can be traced back to major development sites (either those in Local Plans or stand-alone applications which have been consented) or an absence of expected traffic due to delays in site construction and occupation.
- b) General background growth associated with changes in travel patterns precipitated by evidenced, high-level trends (for example, changes in fuel prices / uptake of cleaner vehicle technologies); or
- c) Changed patterns of movement resulting from the scheme.

Once the extent of changes to traffic conditions at monitoring locations is known, it should be possible to estimate whether a), b) or c), above, is the most likely cause (and/or the biggest contributor) of the change, using available national and local data.



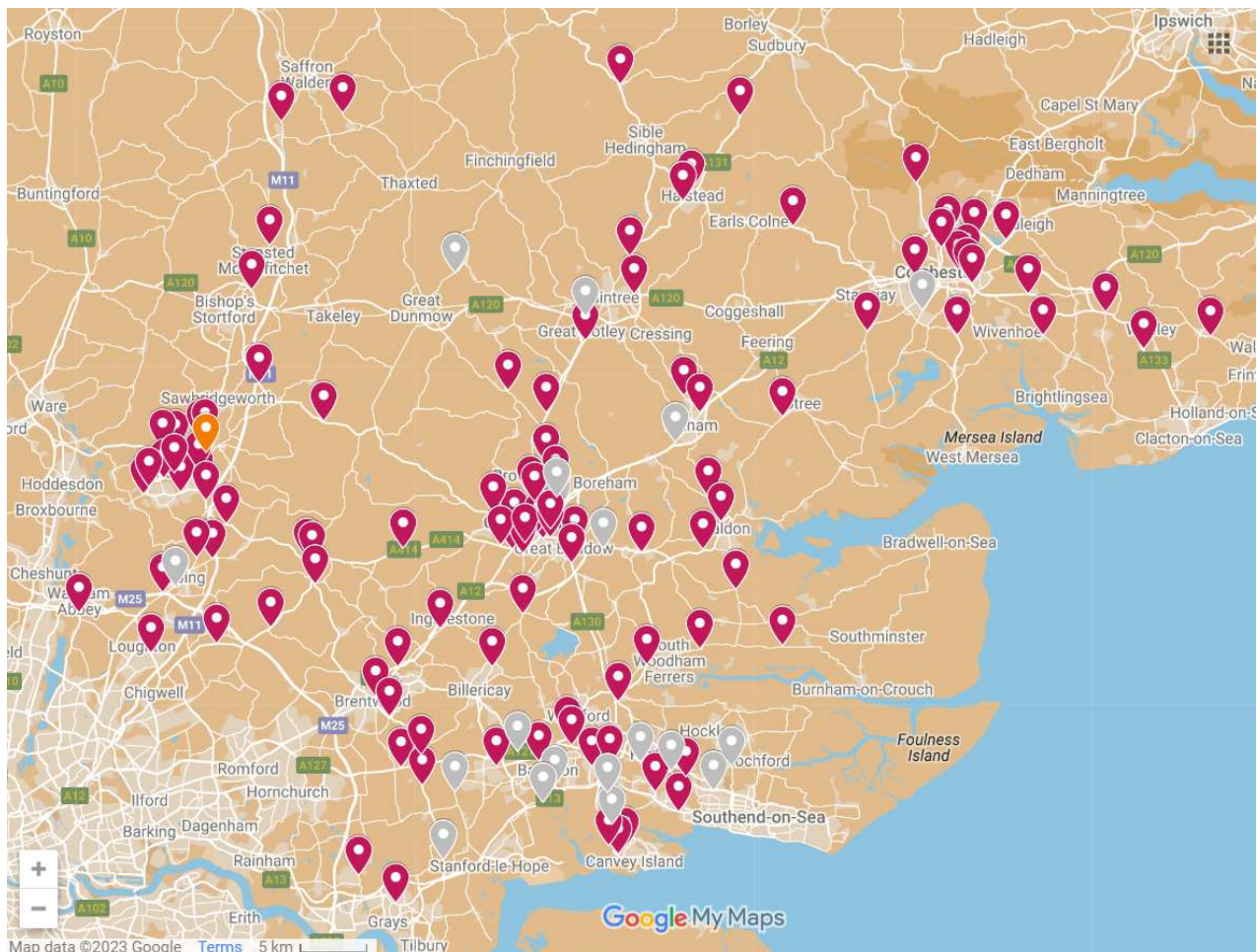
The location of the monitoring sites listed in Table 2-1 will, in large part, enable traffic flow changes on competing corridors to be compared. However, the use of control sites will also be key.

### 3.5 Control Sites

Control sites should be used to monitor background growth and general changes in travel behaviour across the wider highway network. This data can then be used to ascertain whether changes in traffic in the vicinity of the A12 are broadly similar to those seen elsewhere, or particularly affected by the A12 Widening DCO scheme itself. The Council has a range of permanent traffic monitoring sites across the county of Essex and is happy to share and make available data collected from an appropriate sample of these sites with National Highways.

Figure 3-1 shows the location of ECC’s continuous counter sites.

Figure 3-1 ECC Continuous Counter sites in Essex

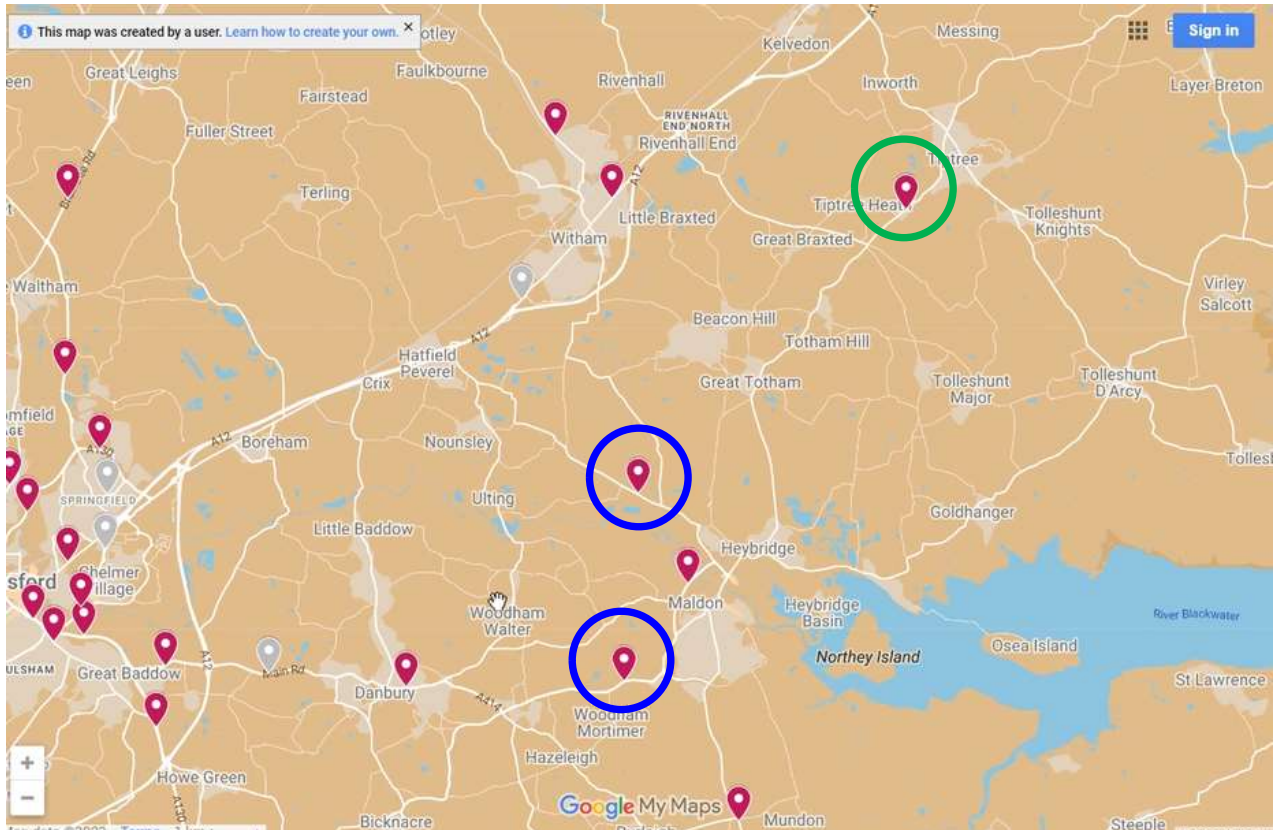


Data from selected continuous counters can be used to enable differentiation of the impacts of the scheme from those attributable to other unconnected changes to the network such as background

growth. Data from the blue circled counts shown on Figure 3-2, below, could be used to establish whether background growth from developments in Maldon is as expected, as this could have an impact on The Street / Maldon Road junction in Hatfield Peverel where there are concerns over queueing at this junction and subsequent impact on alternative routes.

Data from the green circled site could help to assess the impact of A12 Widening DCO scheme on Tiptree.

**Figure 3-1 Map of existing Continuous Counter sites in the vicinity of the A12 scheme**



#### 4 Sharing and Interpretation of data

The Council will share and make available data from its continuous traffic counters with National Highways on a regular basis (potentially every two months, if required), via downloads or appropriate file sharing software.

National Highways should provide the Council with data from the proposed monitoring sites on a similarly regular basis – both in summary form and as full outputs for each site.

National Highways should produce Post Opening Monitoring & Evaluation Reports (POPE), one- and three-years post opening.

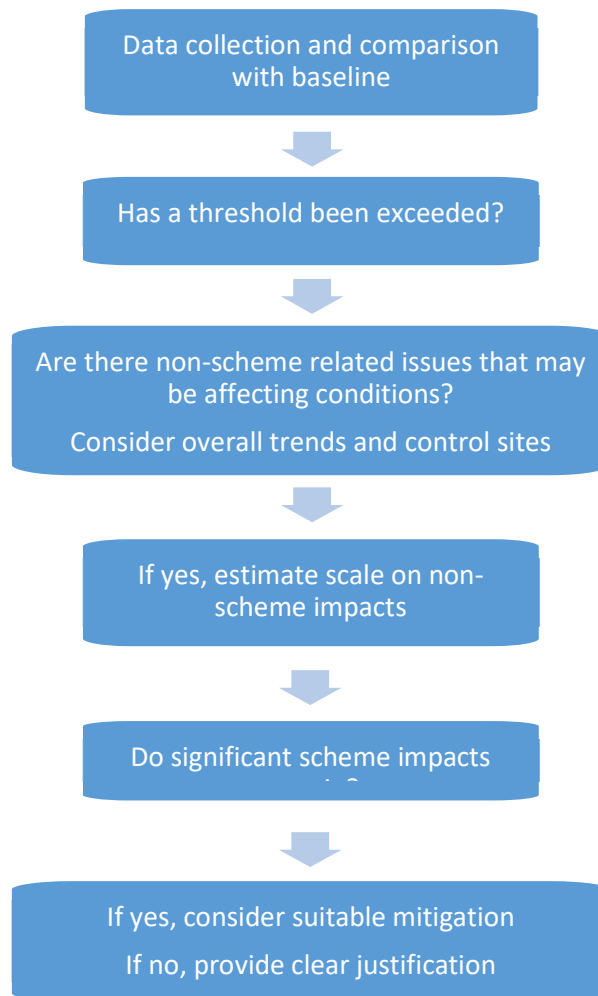
## 5 Post Opening Mitigation

As outlined above, it is accepted that there could be a number of contributory factors to changes observed on the local road network. However, if monitoring suggests that unanticipated traffic changes are having a significant impact on the operation of the local road network, National Highways should investigate these changes further and, if necessary, deliver or contribute towards suitable mitigation.

It is expected that National Highways will fully fund the cost of monitoring their scheme, including all surveys of all types.

Figure 4-1 below, shows a potential process that could be followed by National Highways. The investigation should consider the nature of the impact and its cause.

Figure 5-1 Proposed Monitoring and Mitigation process



If following an investigation of a change National Highways determines that mitigation is not required, it should provide the Council with a clear justification for this.

If National Highways determines that mitigation is justified/required, it should work with the Council to develop the form and type of mitigation required, agree the delivery method and funding for the measures.

For the purpose of providing an indication of the costs of mitigation measures comparable to those that could potentially be required in connection with this scheme, Table 4-2 below shows typical highway improvement scheme costs of previous highways schemes in Essex. The costs have been inflated to 2033 prices using BCIS Civil Engineering inflation estimates, as 2033 is a likely construction date, if measures were to be installed as mitigation for the A120 Widening scheme (which is scheduled to open in 2028), following 3 years of post-opening monitoring.

**Table 5-2 Typical Highway Improvement Scheme Costs**

Scheme	Works	Completion Year	2033 Equivalent Cost* (£M)
Burnt Mill Roundabout, Harlow	Enhancement of entry and circulatory capacity	2014	3.7
Army & Navy Roundabout, Chelmsford	Dedicated left turn filter lane	2015	4.1
A414 Clocktower Junction, Harlow	Capacity improvements including entry/exit width increases	2015	7.4
Eves Corner, Danbury, Spital Road & Limebrook Way roundabouts, Maldon	Part time signals at Eves Corner, capacity improvements at two Maldon roundabouts	2016	5.8
Colchester Zoo Junction, Colchester	Junction safety improvements	2019	0.6
Devil's Head Junction, Brentwood	Junction safety improvements	2020	0.7
Chelmer Valley Bus Lane & Sheepcotes and Nabbots Roundabouts, Chelmsford	New bus lane plus junction capacity improvements at two roundabouts	2020	10.5
New signalised pedestrian/cycle crossing (generic)	Installation of new crossing (no major highway works)	2023	0.3
Signalised Junction Refurbishment (generic)	Refurbishment/renewal of existing Junction (with ped crossings and loop detection)	2023	0.5

\* Scheme costs adjusted to 2033 prices using BCIS Civil Engineering inflation estimates to Q1 2020, then BCIS BCIS (Mar 2023) Road Tender Inflation, post Q1 2020

In light of the above cost estimates, the Council considers it appropriate for National Highways to allow for at least £20 million (at 2033 prices) for potential post opening mitigation measures that may be required in connection with the scheme. The Council would welcome a commitment from National Highways that where it can be clearly justified as necessary (through the monitoring programme) as a result of the A12 Widening scheme in operation, National Highways will work with the Council to deliver and fund proportionate and reasonable measures to mitigate adverse impacts on the local road network.