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Southend-on-Sea Borough Council Local Plan Stage 3 - Assessment

September 2021

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1 Introduction

This technical note summarises the spreadsheet-based modelling work carried out to identify at a high-level the indicative traffic flow changes anticipated on the highway network based on new development proposals being examined as part of the local plan.

Mott MacDonald (MM) has been commissioned by Southend-on-Sea Borough Council (SBC) to provide support in respect of the preparation of the Transport Evidence for their emerging Local Plan.

As part of this work MM has produced a spreadsheet analysis tool to assist with this exercise, the specification of which has been discussed in detail with officers of SBC as well as Rochford District Council (RDC) and Essex County Council (ECC). The approach followed, which uses a high-level spreadsheet tool, represents an appropriate and agreed analysis for this stage of the Local Plan process and it is acknowledged that more detailed analyses would need to be undertaken at a later stage based on strategic or operational modelling. The Southend Multi-Modal Model (SoSMMM) is being further developed and is therefore expected to help contribute to this further work, in due course.

Following this introduction, the remainder of the report is structured as follows:

- Chapter 2 of this technical note details the spreadsheet-based modelling approach and its purpose.
- Chapter 3 outlines the model set-up whilst Chapter 4 outlines the forecasting approach and assumptions incorporated for the Do Minimum model.
- Chapter 5 outlines the options tested as defined by Southend Borough Council to align with their emerging local plan and presents the results for each option. It also includes details of the predicted flow level change compared to the Do Minimum for each option at the key junctions included in the model.
- Chapter 6 summarises the findings and presents any key limitations, where relevant, at this stage.

2 Approach

2.1 Purpose

This technical note has been prepared by Mott MacDonald (MM) on behalf of Southend Borough Council (SBC) as part of the preparation of Transport Evidence for their emerging Local Plan.

The intention is to illustrate the potential impact of development allocations proposed by SBC within the Local Plan on the transport network. The main focus was given to the highway network at a junction level but potential changes on other modes and the environment are also outlined.

A spreadsheet model has been developed using MS Excel to provide an initial analysis tool. This technical note outlines the methodology used and assumptions made to develop the spreadsheet modelling tool to help identify at a high-level the likely areas of traffic flow changes on the highway network under different development assumptions, which may lead to transport issues in the SBC area. It has been agreed that this approach represents an appropriate and proportionate method at this stage of the Local Plan process and the associated limitations are presented, where appropriate, recognising that further work will be required in due course. In particular, this is expected to likely include strategic or operational modelling at a later stage and in this regard it is recognised that the SoSMMM is currently being updated.

The model area also includes the Rochford District Council area and the process of the spreadsheet model tool development incorporated inputs for both local authority areas. Although the focus of this report is Southend, commentary therefore includes the adjacent Rochford area, where appropriate.

2.2 Study Area and Junction Choice

Several criteria were considered when selecting the junctions to be included in the spreadsheet model tool. These can be summarised as follows:

- Reliable and recent turning count data availability;
- Junctions that are key to connecting the area in a wider context; and
- Major junctions of interest along the modelled corridors for Southend and Rochford
  - either because they carry high levels of traffic at present
  - or are anticipated to be significantly impacted by future developments

The final study area was discussed in detail with SBC, RDC as well as ECC, prior to the assessment work being undertaken.

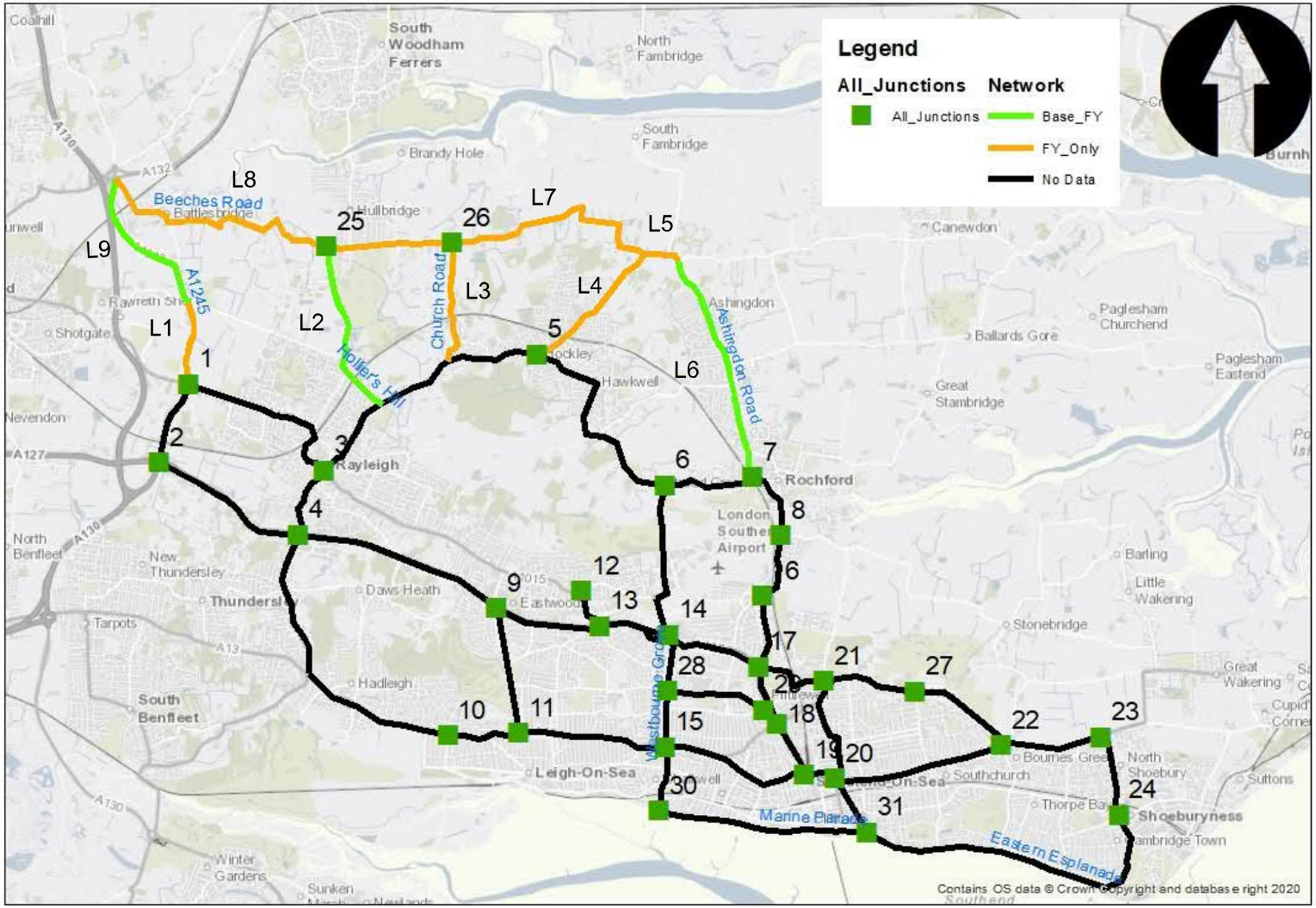
Figure 2.1 shows the network considered in the spreadsheet model, covering both Southend and Rochford, while a list of the junctions and their method of control are shown in Table 2.1.

It is apparent that the majority of junctions in Southend are either close to development clusters or important access junctions towards the two arterial roads, namely the A127 and A13. In the Rochford area, due to the limited availability of junction turning data, several connecting roads have been included to help supplement the network. This ensures that the best possible coverage is included in the assessment. For those shown in orange no base data was available and only full forecast development generated traffic volumes can be calculated within the spreadsheet model tool instead of the percentage increases.

Table 2.1: Spreadsheet model junctions

ID	Location	Method of Control
J1	Carpenters Arms Roundabout, Rayleigh	Roundabout
J2	Fairglen Interchange, northbound circulatory, Rayleigh (one-way)	Roundabout
J3	A129 Crown Hill/High St	Mini Roundabout
J4	A129/A127	Roundabout
J5	B1013 Main Rd / Spa Rd / Southend Rd, Hockley	Mini Roundabout
J6	Hall Road / Cherry Orchard Way	Mini Roundabout
J7	Hall Rd / Ashingdon Rd / West St, Rochford	Mini Roundabout
J8	Southend Rd / Sutton Rd, Rochford (Anne Boleyn roundabout)	Roundabout
J9	A127 Southend Arterial Rd / The Fairway	Signalised – 3 way
J10	A13 London Road / Thames Drive	Signalised – 4 way
J11	A13 London Road / Eastwood Rd	Signalised – 4 way
J12	A1015 Rayleigh Rd / White House Rd, Leigh	Mini Roundabout
J13	A1015 Rayleigh Rd / A127, Leigh	Signalised – 4 way
J14	B1013 Nestuda Way / A127 Prince Ave, Southend	Roundabout Signalised
J15	A1158 Westbourne Grove / A13 London Rd	Signalised – 4 way
J16	Rochford Road/Southend Road/A1159 Airport Roundabout	Roundabout
J17	A1159 Manners Way - A127 Prince Ave (Cuckoo Corner), Southend	Roundabout Signalised
J18	A127 Victoria Ave/ B1015 Junction, Southend	Signalised – 4 way
J19	Queensway / Victoria Ave	Signalised – 3 way
J20	Queensway / A13 Roundabout / A1160	Roundabout
J21	A1159 Eastern Avenue / Sutton Rd	Roundabout
J22	A13 Southchurch Boulevard / Thorpe Hall Ave, Southend	Roundabout
J23	A13 / Poynters Lane	Roundabout
J24	A13 / Delaware Rd / Caulfield Rd / Elm Road	Roundabout
J25	Hullbridge Road / Watery Lane / Lower Road	Priority
J26	Lower Road / Church Road	Priority
J27	Eastern Avenue / Garon Park / Royal Artillery Way/ Hamstel Road	Roundabout
J28	A1158 Westbourne Grove / Kenilworth Gardens / Prittlewell Chase	Signalised – 3 way
J29	Prittlewell Chase / Fairfax Drive	Priority
J30	Chalkwell Avenue / Chalkwell Esplanade	Priority
J31	Marine Parade / Eastern Esplanade / A1160 Southchurch Avenue	Signalised – 3 way

Figure 2.1 Map of junctions and links



Source: MM

3 Base Model

3.1 Data Sources

The primary source of count data used for the spreadsheet base model tool aligns with the data collected for the development of the Southend-on-Sea Multi Modal Model (SoSMMM) with the majority of turning counts being the Manual Classified Turning Count (MCTC) counts. Of the 28 junctions with turning data, 24 are from SoSMMM. These were all collected between March and October 2018. Using data from such a consistent source ensures an enhanced model set-up and provides greater assurance for forecasting.

However, to ensure the spreadsheet model area had good model coverage, a further four sites were used, these were sourced from ECC's 'dolphins' database, which is the Essex wide traffic data collection site. These were turning counts collected between March and October during 2017 .

Although there were few turning counts available within the Rochford area, base model data was available for three links including Hollier's Hill, A1245, and Ashingdon Road. These were incorporated into the model as they were included in the Better Queensway (BQ) strategic model and the forecast traffic distributions could be calculated.

3.2 Factors

As most of the data was collected in 2017 and 2018, growth factors derived from the Department for Transport (DfT) industry standard TEMPro database for both Southend-on-Sea and Rochford for the weekday AM and PM periods were used to create a consolidated 2019 base model. The average of the origin and destination factors was used consistently across all junctions.

Table 3.1 TEMPro growth factors

		AM			PM		
Level	**Name**	**Origin**	**Destination**	**Average**	**Origin**	**Destination**	**Average**
2017 - 2019	Rochford	1.0182	1.0253	1.0218	1.0220	1.0179	1.0200
	Southend-on-Sea	1.0229	1.0265	1.0247	1.0250	1.0226	1.0236
2018 - 2019	Rochford	1.0090	1.0125	1.0108	1.0110	1.0089	1.0100
	Southend-on-Sea	1.0113	1.0131	1.0122	1.0120	1.0112	1.0117

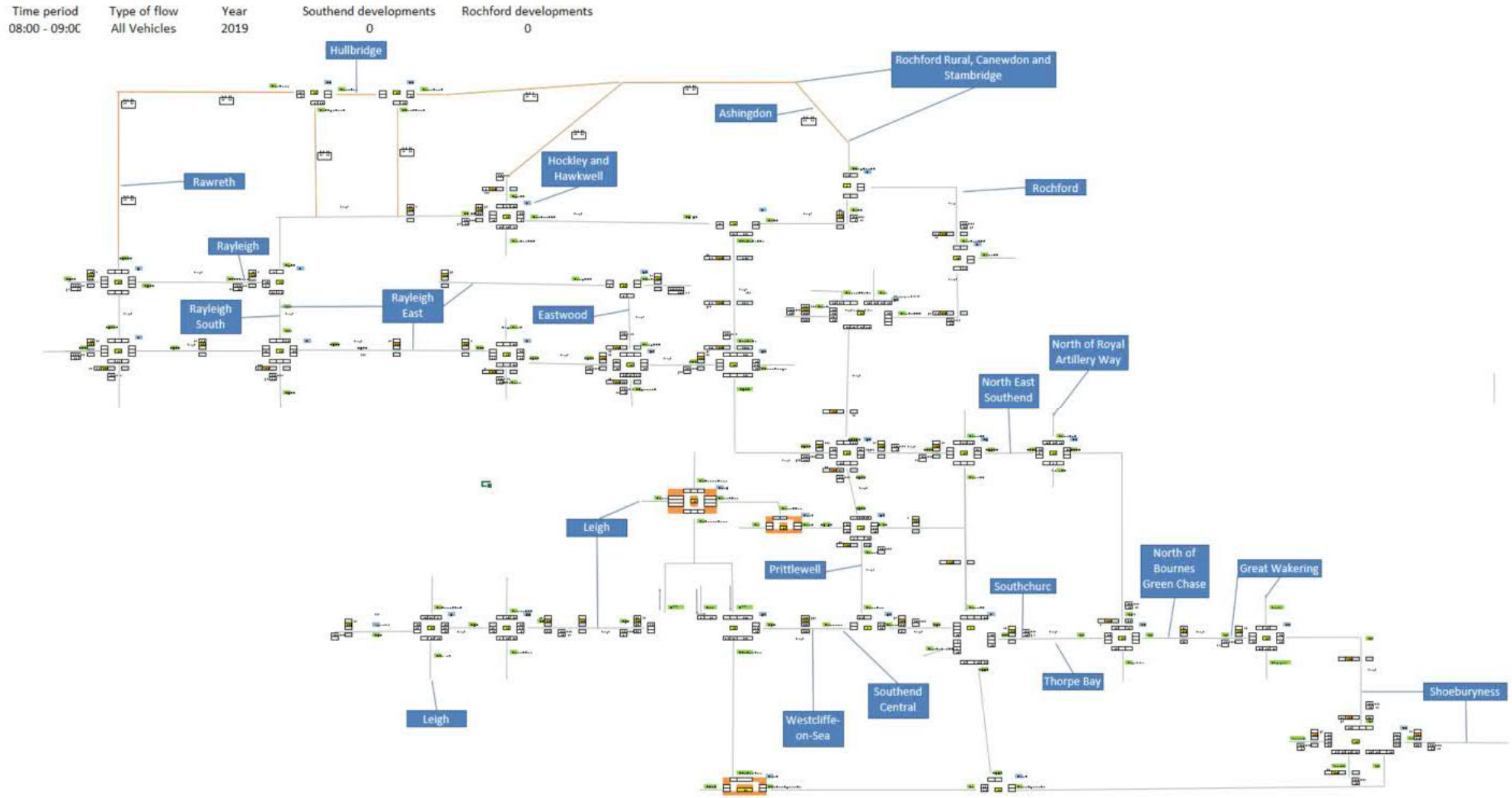
3.3 Model Set-up

The count data was processed and factored in tabular format and cumulated into one main dataset. In order to allow a better visual presentation, the stick-diagram network shown in Figure 3.1 was set up.

The values shown for each turning movement or link can be selected in a master tab allowing the selection of different time periods, vehicles or Passenger Car Units (PCUs) and different years via drop-down menus.

The network diagram also shows blue labels for cluster loading points that are used for adding forecast trips.

Figure 3.1 Illustration of spreadsheet model with cluster loading points



The cluster names are to illustrate the loading points onto the network. Many of the distances and directions of roads are distorted for the simplicity of the creation of the model and as such are not to scale.

4 Forecasting

4.1 Development assumptions

Development lists including Do Minimum and Do Something developments were provided by SBC and RDC, identifying those schemes with 'committed' status that should therefore be expected to be delivered during the Do Minimum scenario or come forward later, as part of the Local Plan proposals, through the Do Something scenario. The dwellings included in the modelling totalled 421 developments: 259 in Rochford and 162 in Southend. Varying levels of detail were provided for the developments and while the Rochford developments only include housing sites, Southend developments include housing and employment proposals.

In order to feed these details into the spreadsheet model consistently, further details were required. These included:

- Definition of Do Minimum (DM) and Do Something (DS) developments;
- Definition of forecast year (2028 or 2038);
- Clarification of development type for employment;
- Classification of development locations as Urban, Sub-urban or Rural; and
- Allocation to clusters.

The resultant set of assumptions were provided to SBC and RDC for their approval, prior to the completion of the assessment. In summary, the below were confirmed as part of this process.

Southend-on-Sea

- Developments include housing and commercial
- Developments that have had their planning permission granted are assumed to be committed and hence go into the DM model (26 developments), all others go into the DS.
- If a development is forecast to be delivered partially before 2028 with the residual after 2038, then the trips are split according to that proportion.
- Otherwise, the trips are split according to the information provided by Southend-on-Sea Borough Council

Rochford

- All developments are housing
- All DM developments are in the 2028 model as they are all scheduled to be built by financial year 2028-2029.
- For housing developments of more than 15 dwellings the assumption is that 35% of them will be affordable, otherwise it is assumed that none of them are affordable.
- The DS developments are split between 2028 and 2038 based on the information provided to us by Rochford District Council.

4.2 Trip Calculation

TRICS trip rates were derived to convert the development details into highway vehicle trip volumes. The rates used are shown below in Table 4.1 and Table 4.2. Destination trip rates represent the arrivals while origin rates are used to calculate the trips departing.

Table 4.1 Employment trip rates for vehicles (per 100sqm unless stated otherwise)

	A1	A2	A3	B1A	B1B	B1C	B8	C1 (Rooms)	D1	D2 (per ha)	Sui Generis (per ha)
AM destination	2.64	1.33		1.33	1.42	0.21	0.17	0.21	2.37	10.53	10.53
AM origin	2.30	0.15		0.15	0.16	0.05	0.05	0.32	1.50	8.03	8.03
PM destination		0.12	0.40	0.12	0.12	0.05	0.04	0.24	0.34	29.98	29.98
PM origin		1.09	0.26	1.09	1.126	0.20	0.15	0.19	0.34	27.72	27.72

The majority of developments are proposed as residential dwellings.

The residential rates vary depending on location, with fewer trips typically generated in urban areas than in rural locations with less accessibility to alternative transport modes.

Affordable and private residential trip rates were extracted for mixed housing including houses and flats and are shown in Table 4.2.

Table 4.2 Residential Trip Rates by type of location (vehicle trips per dwelling)

		Residential - Private				Residential - Affordable			
SBC/RDC defined areas	**TRICS definition**	**AM Dest**	**AM Orig**	**PM Dest**	**PM Org**	**AM Dest**	**AM Orig**	**PM Dest**	**PM Org**
Urban	Town Centre	0.025	0.200	0.250	0.075	0.063	0.102	0.074	0.063
Suburban	Edge of Town Centre and Suburban Area	0.124	0.349	0.341	0.199	0.144	0.229	0.300	0.229
Rural	Edge of Town	0.138	0.386	0.352	0.172	0.144	0.284	0.205	0.140

Although the rates for sub-urban and rural do not vary significantly it highlights car user trips are significantly higher in these areas when compared to developments in urban areas.

As mentioned, a series of development cluster locations were identified by SBC and RDC for the purposes of the assessment. The categorisation of each cluster to the different types of residential area were provided by SBC and RDC and summarised in Table 4.3

Table 4.3 Cluster to type of area

Cluster	Type of Area
Rochford	
Rayleigh	Urban
Hullbridge	Suburban
Great Wakering	Suburban
Rayleigh East	Urban
Hockley	Suburban
Rochford	Suburban
Barling Magna	Rural
Ashingdon	Suburban
Hawkwell	Suburban
Canewdon	Rural
Stambridge	Rural
Rawreth	Rural
Rayleigh South	Urban
Hockley & Hawkwell	Suburban
North of Bournes Green Chase	Rural
Rochford Rural and Canewdon	Rural
Stambridge & Pagelsham	Rural
North East Southend	Rural
North of Royal Artillery Way	Rural
Southend-on-Sea	
Eastwood	Suburban
Leigh North	Urban
Leigh South	Urban
North East Southend	Urban
North Of Bournes Green Chase	Rural
North Of Royal Artillery Way	Rural
Prittlewell	Urban
Shoeburyness	Suburban
Southchurch	Urban
Southend Central	Urban
Thorpe Bay	Suburban
Westcliff-on-Sea	Urban

As the employment specifications were provided by overall land use classification, the trip rates were combined to calculate an average trip rate representative of the identified use(s) as shown in Table 4.4.

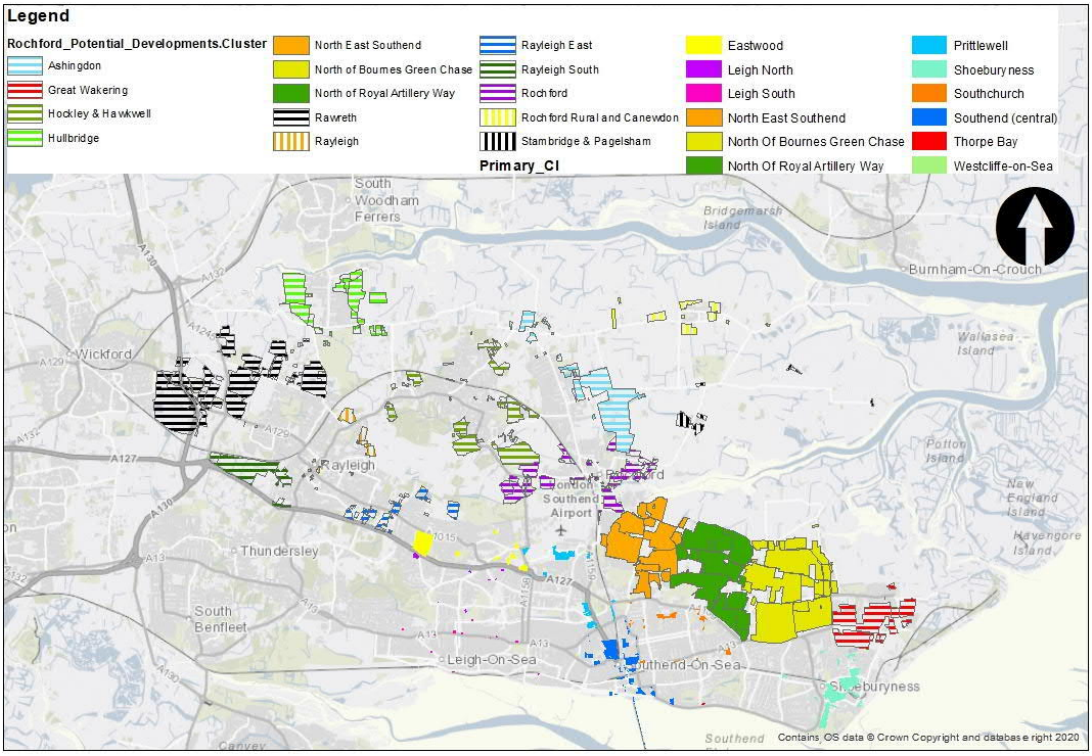
Table 4.4 TRICS categories for land use classifications

Southend Employment code	Description and TRICS code used	
A1	Supermarket 01_A	Local Shops 01_I
A2	Office 02_A	Business Park 02_B
A3	Restaurants 06_B	
B1A	Office 02_A	Business Park 02_B
Ent B1B	Business Park 02_B	
B1C	Industrial Unit 02_C	Industrial Estate 02_D
B8	Warehousing 02_F	
C1 (Rooms)	Hotels 06_A	
D1	Primary education 04_A	Secondary Education 04_B
D2	Leisure Centre 07_C	
Sui Generis	Leisure Centre 07_C	

4.3 Clusters

The development locations by cluster are shown in Figure 4.1.

Figure 4.1 Map of development and clusters



In the spreadsheet model the development trips are allocated to the model by cluster, rather than a more detailed zonal level. This means all development trips generated by different development sites within a cluster are generally loaded onto the modelled network at the same location. This is a simplification compared to strategic modelling but considered proportionate for this stage.

However, for some clusters with developments spread over a wider geographical area the clusters were broken down further, with loading locations applied on different sides of modelled junctions, where appropriate.

4.4 Distributions

For each cluster a trip distribution was selected from a zone in this area from the Southend Better Queensway (BQ) strategic SATURN model. These distributions were extracted for AM and PM, by origin and destination.

At the same time the census journey to work (JTW) data was extracted for the corresponding Middle Super Output Area (MSOA). Both distributions were compared to ensure they aligned well.

In some cases, manual adjustments were made to the strategic model distribution to improve the match to the JTW data.

Generally, the clusters stayed entirely within the boundaries of Southend-on-Sea/Rochford; apart from for North East Southend. This cluster covers an area which would have development extending across both authorities. In order to model the assumed access locations in more detail the North East Southend area was therefore broken down into three areas: North East Southend, North of Bournes Green Chase and North of Royal Artillery Way.

4.5 Distribution Adjustments

The aligned distributions from the BQ model and JTW data allowed the proportions of flows to be calculated for each cluster at each turning movement in the model.

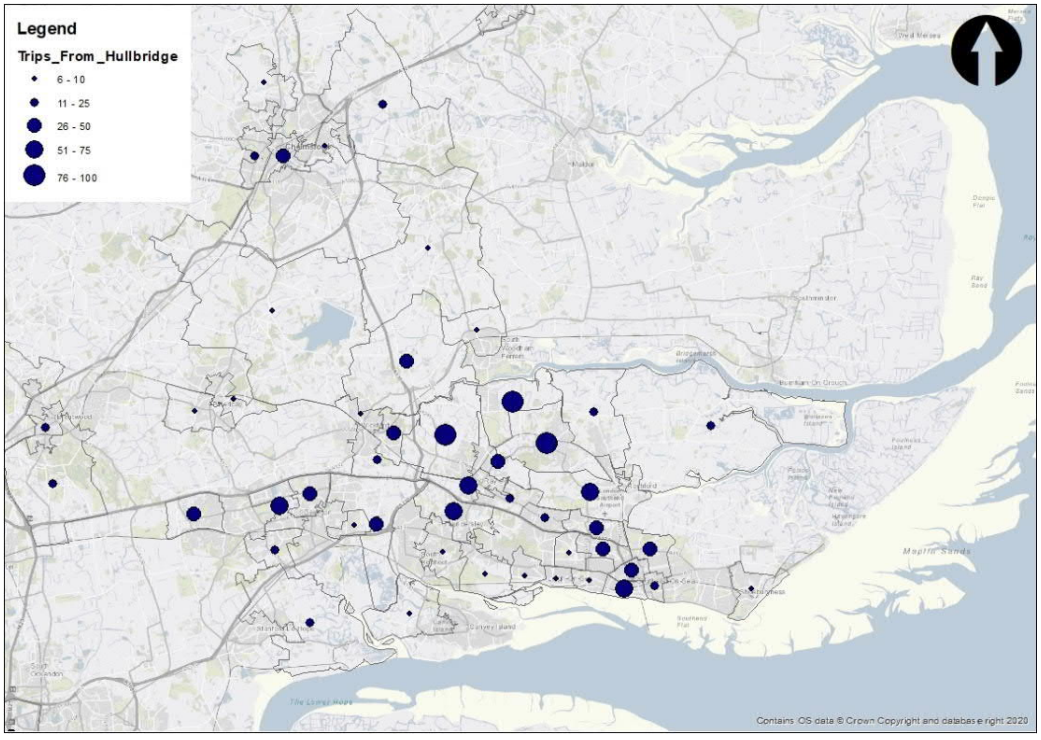
For some clusters, the equivalent BQ zone had no trips and there was no corresponding MSOA data, and so some clusters were combined. This is the case for the following clusters:

- Shoeburyness
- Great Wakering

Other clusters in the BQ model had insufficient trips travelling west representing a mismatch to the MSOA data. For example, in the BQ model the distribution for Hullbridge did not contain many trips towards the west or north. However, the JTW data showed a greater proportion of trips with destinations in those directions. Therefore, corresponding volumes of trips were added through junctions 1 and 2 to represent trips that will be present as a result of further developments in Hullbridge.

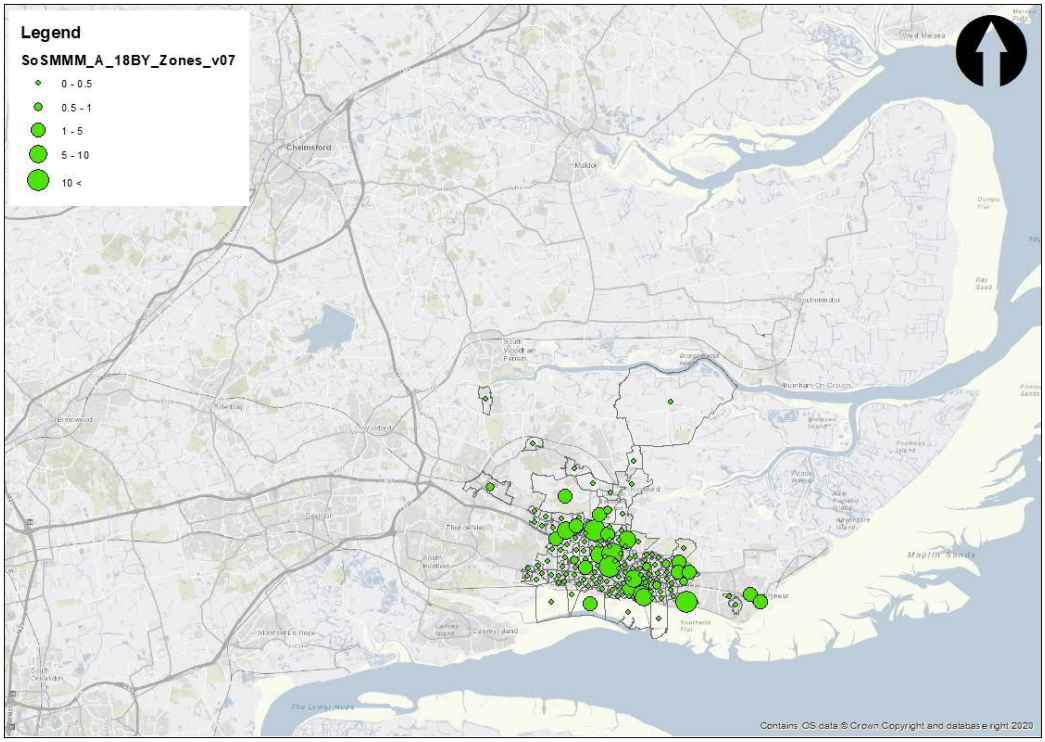
Figure 4.2 and Figure 4.3 show the example of the JTW and BQ model distributions for Hullbridge prior to the manual alignment.

Figure 4.2 : Commuting trips from Hullbridge AM (JTW data)



The JTW data shows commuting trips from Hullbridge have destinations across Southend and Rochford as well as further west and north.

Figure 4.3 : Trips from Hullbridge AM (BQ model)



The zones in Figure 4.3 : Trips from Hullbridge AM (BQ model) show the distribution from the strategic model, which was set up with focus on Better Queensway and hence did not include the trips to the west and north. This would have been outside of the Better Queensway study area.

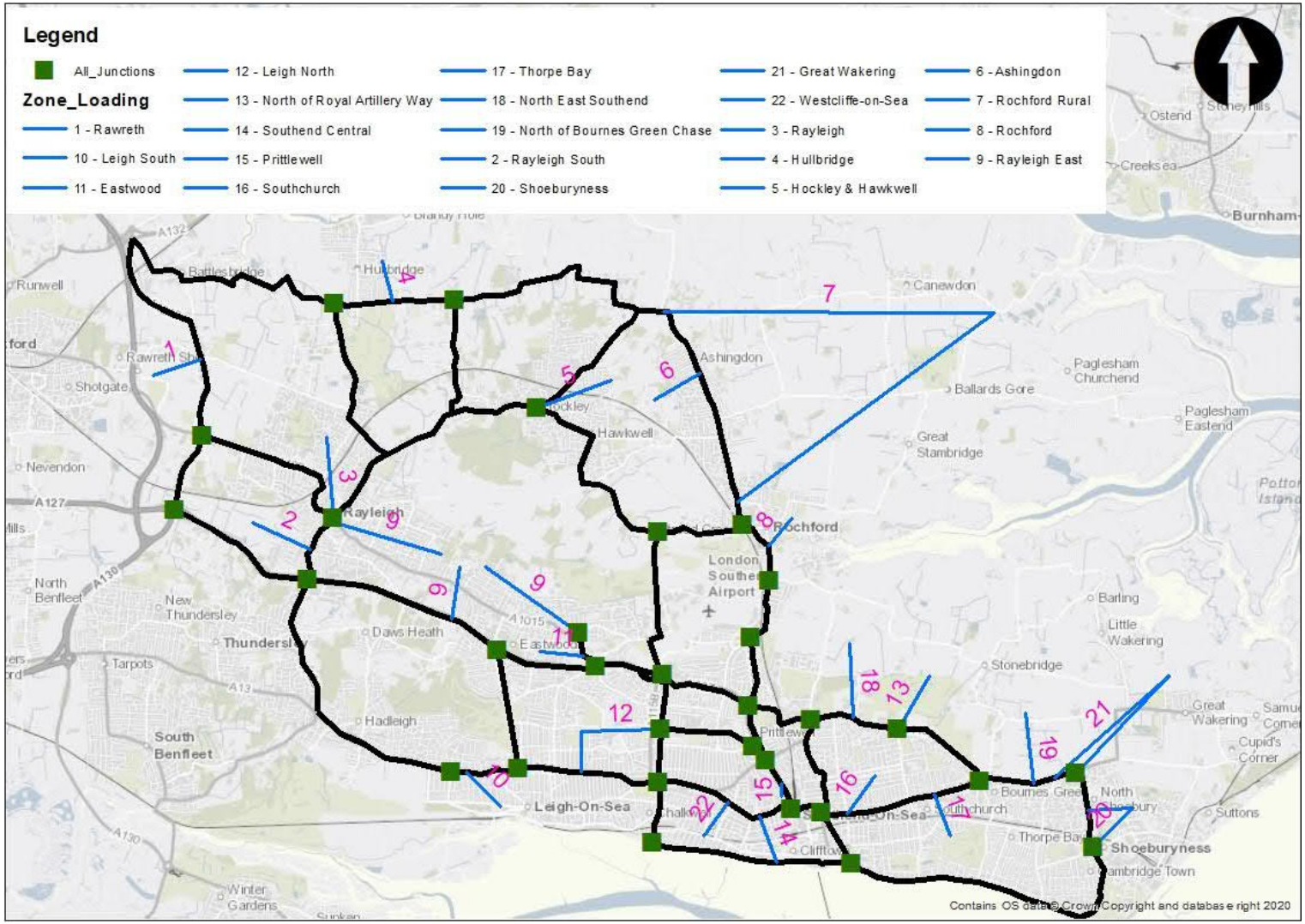
These manual adjustments for trips outside the model area were made to the following clusters:

- Hullbridge
- Rawreth
- Rayleigh (including Rayleigh south and Rayleigh East)

The following clusters were also manually adjusted to the BQ distributions to address issues where the zone with the most representative distribution would not have loaded onto the network at the cluster loading point:

- Hockley and Hawkwell
- Royal Artillery Way

Figure 4.4 Cluster Loading Diagram



4.6 Forecast Trips

For each cluster the calculated forecast trip volumes based on the selected developments were multiplied by the proportions defined by the distributions. This generated trips for all applicable junction turning movements.

For some junctions in the Rochford area, which are represented by external nodes in the BQ model, it was not possible to extract turning movements. Therefore, to establish the required proportions for the distributions the incoming and outgoing junction movements were used as an approximation. A similar approach was employed for large roundabouts modelled with separate nodes for each approach in the BQ model.

4.7 Dynamic TEMPro Factors

Although Do Minimum development details were provided by SBC and RDC it is vital to ensure that trip volumes for the Do Minimum align with TEMPro forecast levels to ensure a consistent comparison against the Do Something (with local plan developments) scenarios.

Base and future year trips were extracted using TEMPro v7.2. The Do Minimum total trip volume for Southend was then factored up to the future year TEMPro hourly trip volume for the AM and PM peaks. The same process was carried out for the Rochford area.

5 Development Options

5.1 Proposed Options

SBC provided three options for testing with the model. These represent different cluster combinations. A summary of the number of dwellings for each option and forecast year, as well as the number of employment sites, is shown in Table 5.1. These are considered additional to the developments specified for the Do Minimum and include windfalls.

Table 5.1 Summary of clusters provided by Southend-on-Sea Borough Council

	Option A			Option B			Option C		
Cluster	2028 dwellings	2038 dwellings	Com-mercial sites	2028 dwellings	2038 dwellings	Com-mercial sites	2028 dwellings	2038 dwellings	Com-mercial sites
Eastwood	73	133	1	133	299	1	133	299	1
Leigh	435	801	17	435	807	17	435	807	17
North East Southend AoS	0	0	1	0	0	1	1,546	1,859	1
North of Royal Artillery Way	0	0	1	0	0	1	1,896	2,440	1
North of Bournes Green Chase	0	0	1	0	0	1	1,088	2,962	1
Prittlewell	941	1,071	3	1,192	1,555	3	1,192	1,555	3
Shoeburyness	373	798	2	394	1,289	2	394	1,289	2
Southchurch	425	815	2	425	1,138	2	425	1,138	2
Southend (central)	3,214	4,874	18	3,334	5,659	18	3,334	5,659	18
Thorpe Bay	50	90	0	50	90	0	50	90	0
Westcliff-on-Sea	434	834	5	434	834	5	434	834	5
Total	**5,945**	**9,416**	**49**	**6,397**	**11,671**	**49**	**10,927**	**18,932**	**49**
% increase to previous option				**7.6%**	**29.6%**		**70.8%**	**62.2%**	

In order to model these options, factors were calculated based on the Do Minimum trip volumes to add the defined additional local plan volumes appropriately to the spreadsheet model. These factors were confirmed with SBC.

5.2 Result Analysis

5.2.1 Red – Amber – Green Indicator

In order to analyse the forecast results a Red – Amber – Green (RAG) indicator approach was used to identify the levels of trip increases compared to the Do Minimum at each junction or link represented in the spreadsheet model. An additional category was added resulting in the following set-up:

- 0%-5% - Green
- 5%-10% - Yellow
- 10%-20% - Orange
- >20% - Red

The trip volumes compared are for the total flows across all approaches at each junction rather than focusing on the average or worst performing turning movements. This means that for some junctions with only one particular approach showing a high flow level increase the overall junction flow level increase may show as less significant.

This output therefore provides a useful comparison across the study area, which can be viewed side-by-side for each of the options appraised. However, it is recommended that more detailed junction modelling is carried out for any junction showing a significant flow increase to ensure the junction operates well and liaison with officers and ECC should be utilised to help inform this process.

Additional to the figures showing categories of the percentile increase, a summary table is provided for each option showing the actual flow increase the RAG is based on. This enables a more detailed judgement to be formed about the significance of the potential impact. Table 5.2 summarises the flow levels for the base year and the 2038 Do Minimum. This shows a flow increase in a range between 200 and 900 trips per junction on average by 2038.

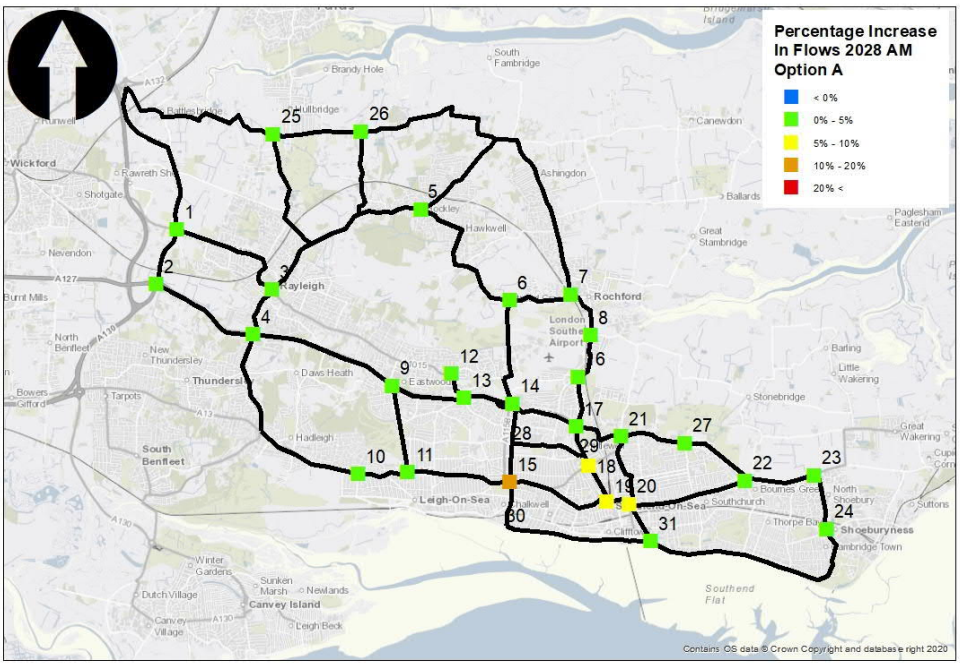
Table 5.2: Base and 2038 DM Flows

Junction	Base AM Flow 2019	Base PM Flow 2019	DM AM Flow 2038	DM PM Flow 2038	DM minus Base AM	DM minus Base PM
1	3,612	3,907	3,947	4,260	335	353
2	6,285	5,963	6,850	6,496	565	533
3	1,331	1,429	1,532	1,753	201	324
4	3,771	3,800	4,193	4,170	422	370
5	2,232	2,829	2,621	3,213	389	384
6	1,947	1,866	2,391	2,403	444	537
7	2,056	2,268	2,629	2,937	573	669
8	2,621	2,652	3,326	3,527	705	875
9	6,122	6,392	6,815	7,229	693	837
10	1,919	1,960	2,125	2,204	206	244
11	2,110	2,170	2,318	2,405	208	235
12	1,995	2,758	2,258	3,183	263	425
13	4,614	5,007	5,207	5,719	593	712
14	4,682	5,163	5,262	5,841	580	678
15	2,207	2,238	2,482	2,462	275	224
16	2,214	2,787	2,631	3,397	417	610
17	3,821	4,127	4,329	4,801	508	674
18	2,804	2,888	3,142	3,296	338	408
19	2,431	2,857	2,585	3,308	154	451
20	1,807	2,160	2,011	2,529	204	369
21	3,915	4,041	4,548	4,705	633	664
22	3,908	3,513	4,539	4,133	631	620
23	1,977	2,132	2,281	2,518	304	386
24	1,708	1,733	2,039	2,045	331	312
25	1,334	1,282	1,567	1,472	233	190
26	1,176	980	1,448	1,296	272	316
27	3,440	3,481	3,999	4,037	559	556
28	-	-	39	26	-	-
29	-	-	36	36	-	-
30	-	-	31	31	-	-
31	1,816	1,747	2,009	1,939	193	192
Link1	-	-	75	81	-	-
Link2	1,130	1,119	1,219	1,205	89	86
Link3	-	-	-	-	-	-
Link4	-	-	20	26	-	-
Link5	-	-	124	150	-	-
Link6	1,180	1,601	1,373	1,842	193	241
Link7	-	-	-	-	-	-
Link8	-	-	69	71	-	-
Link9	1,744	1,843	1,854	1,955	110	112

5.3 Option A

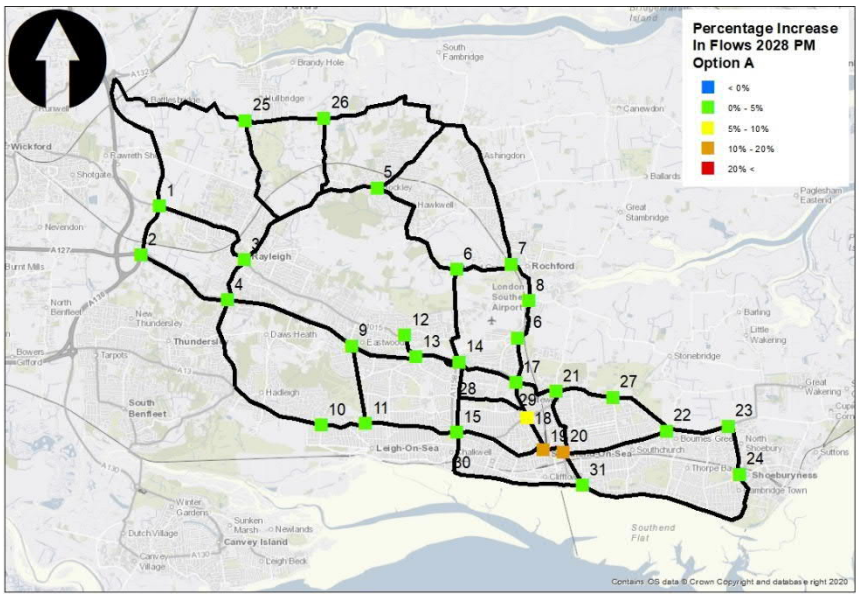
The results for Option A show that in 2028 the majority of junctions showing a significant increase compared to the Do Minimum are those located in the centre of Southend, Prittlewell and to the west at Jct 15 (A1158 Westbourne Grove / A13 London Rd). This is due to the large number of additional dwellings proposed in Southend central and the adjacent Prittlewell area generating about 900 additional origin trips in the AM peak. The remainder of additional trips do not increase the total junction trip levels by more than 5% compared to the DM as they are spread across the Southend area.

Figure 5.1: Option A 2028 AM



In the PM peak 2028 the proportionally greatest increase is forecast for junctions 19 and 20 (Queensway / A13 Roundabout / A1160) in the town centre with increases up to 20%. However, as in the AM peak the remainder of the junctions assessed show proportionally lower levels of increase.

Figure 5.2 Option A 2028 PM



Traffic flows based on Option A in 2038 show that in the AM and PM there are forecast to be increases of over 10% for most of the key junctions in Southend Central and Prittlewell. Jct 24 (A13 / Delaware Rd / Caulfield Rd / Elm Road) also shows a significant increase compared to the DM traffic volumes. Jct 15 (A1158 Westbourne Grove / A13 London Rd) shows an increase of over 20% in the AM peak. Further the junctions in and west of Rochford also show increases above 5% in both peak periods. These results align with the further increases in dwellings at Southend central, Shoeburyness and Southchurch over this second 10-year period. During the PM peak increases forecast are also significantly greater than for 2028 as similar trip volumes return to the new dwellings.

Figure 5.3 Option A 2038 AM

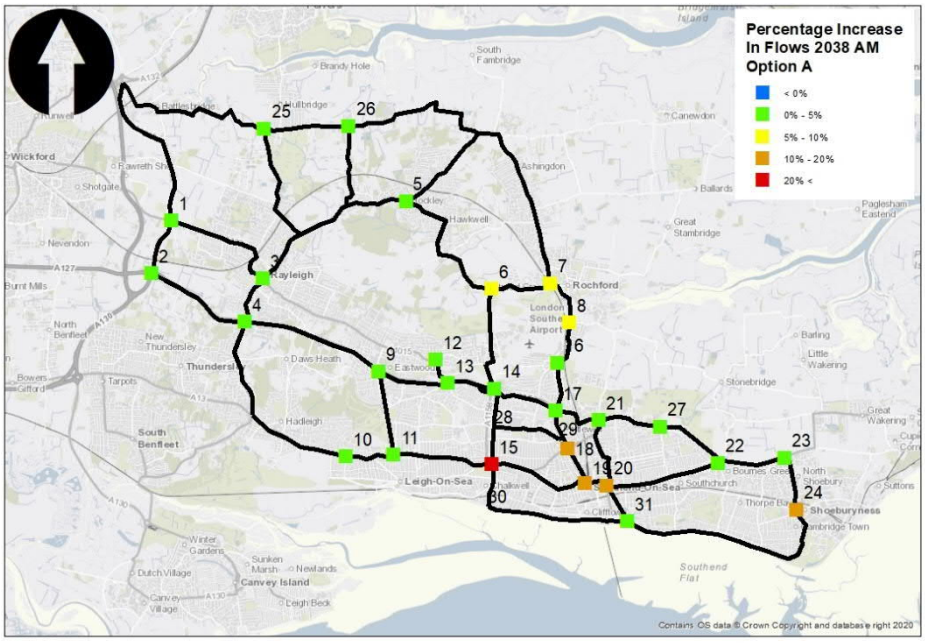


Figure 5.4 Option A 2038 PM

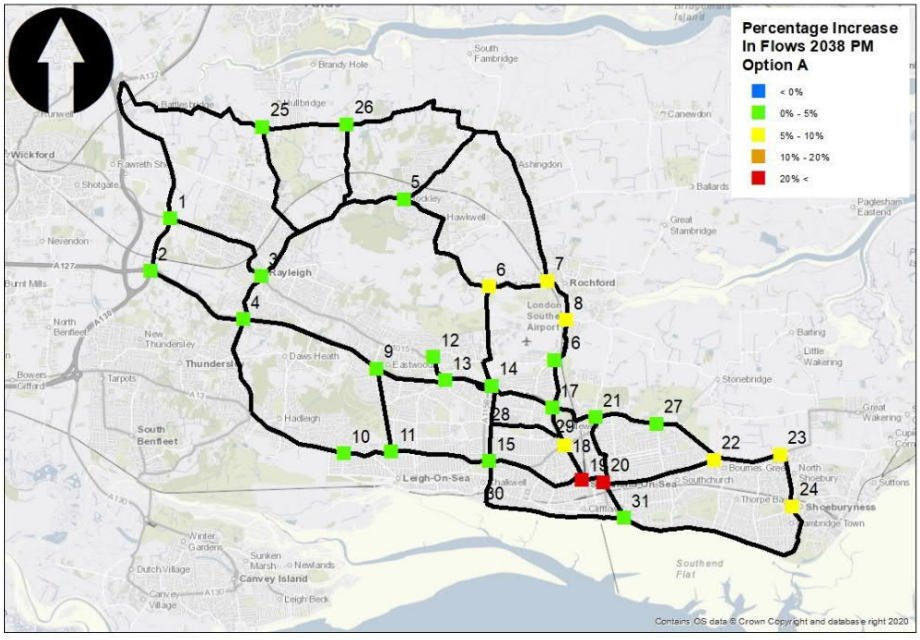


Table 5.3 Option A Flow Summary

Jct/ Link	DM AM Flow 2028	DM PM Flow 2028	DM AM Flow 2038	DM PM Flow 2038	Flow Difference (DS-DM) 2028 AM	Flow Difference (DS-DM) 2028 PM	Flow Difference (DS-DM) 2038 AM	Flow Difference (DS-DM) 2038 PM
1	3,784	4,063	3,947	4,260	8	14	16	27
2	6,565	6,194	6,850	6,496	14	54	32	109
3	1,472	1,681	1,532	1,753	8	12	14	23
4	4,023	3,979	4,193	4,170	4	58	10	109
5	2,518	3,069	2,621	3,213	30	24	59	48
6	2,296	2,307	2,391	2,403	68	64	144	128
7	2,527	2,820	2,629	2,937	116	75	222	153
8	3,196	3,389	3,326	3,527	150	115	270	226
9	6,553	6,917	6,815	7,229	-253	-278	-492	-501
10	2,045	2,109	2,125	2,204	-96	-85	-176	-157
11	2,231	2,300	2,318	2,405	-91	-110	-185	-208
12	2,175	3,050	2,258	3,183	-63	-82	-128	-156
13	5,007	5,474	5,207	5,719	-163	-139	-318	-248
14	5,060	5,588	5,262	5,841	-144	-89	-271	-156
15	2,390	2,354	2,482	2,462	303	33	538	-18
16	2,538	3,262	2,631	3,397	19	-77	0	-160
17	4,153	4,595	4,329	4,801	94	116	177	221
18	3,025	3,156	3,142	3,296	202	175	346	288
19	2,483	3,170	2,585	3,308	189	503	507	887
20	1,935	2,424	2,011	2,529	151	336	377	611
21	4,360	4,500	4,548	4,705	-23	-33	7	23
22	4,330	3,948	4,539	4,133	18	41	155	218
23	2,170	2,401	2,281	2,518	6	49	84	226
24	1,930	1,949	2,039	2,045	67	47	213	196
25	1,505	1,407	1,567	1,472	11	9	29	21
26	1,392	1,246	1,448	1,296	22	14	49	32
27	3,819	3,856	3,999	4,037	-44	-49	-17	32
28	38	26	39	26	21	46	50	93
29	34	35	36	36	57	45	102	84
30	26	30	31	31	34	44	86	95
31	1,927	1,853	2,009	1,939	-18	-7	-22	5
Link1	75	81	75	81	1	5	1	11
Link2	1,168	1,149	1,219	1,205	0	1	0	1
Link3	-	-	-	-	-	-	-	-
Link4	20	26	20	26	2	0	4	-1
Link5	122	150	124	150	12	5	28	13
Link6	1,318	1,760	1,373	1,842	12	5	28	13
Link7	-	-	-	-	-	-	-	-
Link8	67	71	69	71	11	6	27	15
Link9	1,776	1,862	1,854	1,955	-	3	-	6

Table 5.3 shows the additional flow at each link or junction compared to the Do Minimum scenario for 2028 and 2038.

The largest increase in flows are junctions 19 and 20 in central Southend.

5.4 Option B

Figure 5.5 Option B 2028 AM

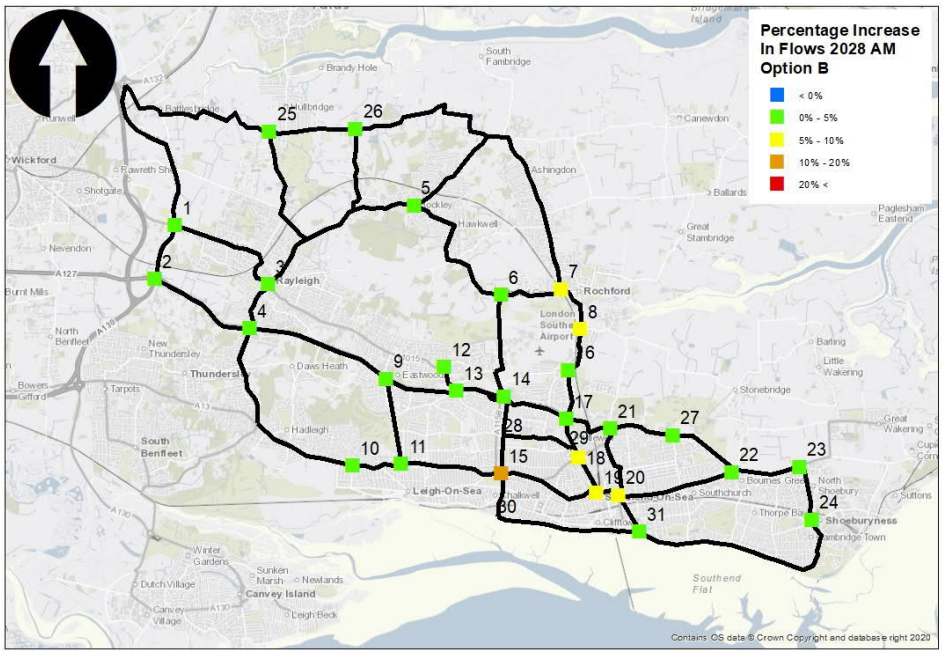
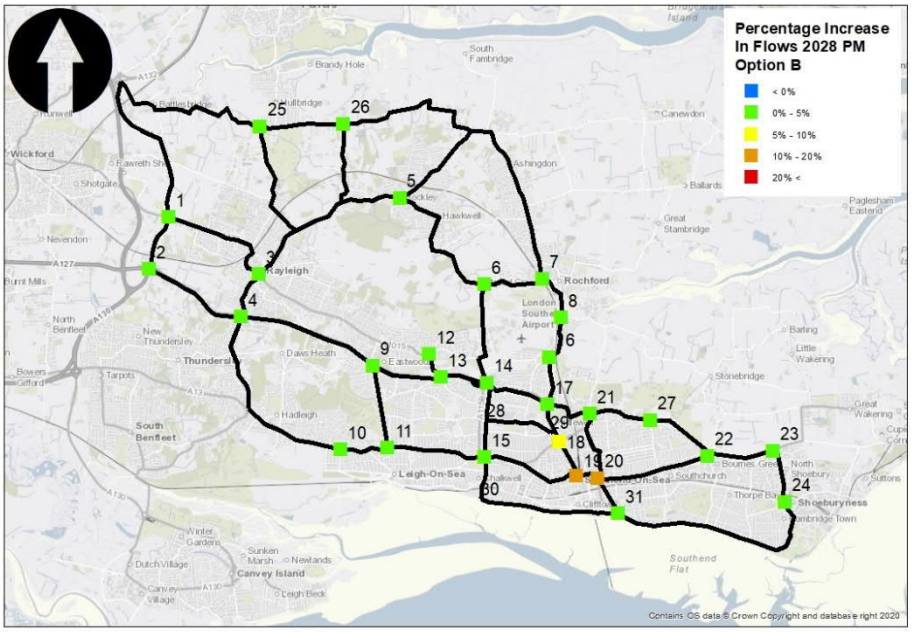


Figure 5.6 Option B 2028 PM



The number of additional dwellings proposed with option B by 2028 only increases by 7% and the results align showing no change for the PM peak, while the AM indicates junctions 7 (Hall Rd / Ashingdon Rd / West St, Rochford) and 8 (Southend Rd / Sutton Rd, Rochford) in Rochford forecast with increases between 5% and 10%.

Figure 5.7 Option B 2038 AM

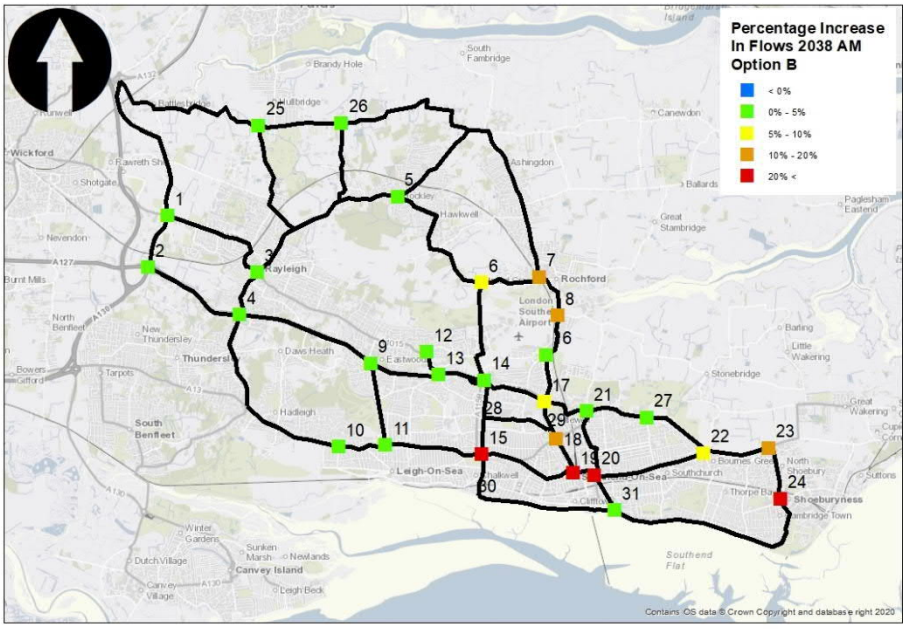
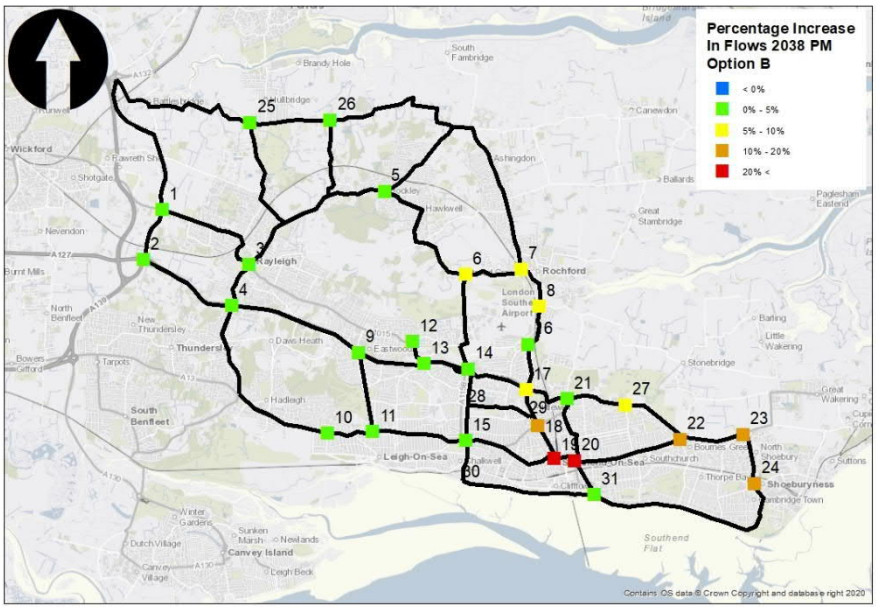


Figure 5.8 Option B 2038 PM



The impact of an additional 30% of dwellings in Option B compared to Option A by 2038 shows further junctions reach the 20% increase of flows threshold in the AM peak, particularly near the loading points for the Central, Prittlewell and Southchurch clusters, which all show significant volumes of additional dwellings. Large volumes of additional dwellings are forecast for Shoeburyness resulting in significant flow increases for junctions 22 (A13 Southchurch Boulevard / Thorpe Hall Ave) to 24 (A13 / Delaware Rd). The flow distributions and DM volumes vary between AM and PM leading to slightly different impacts for junctions 15 (A1158 Westbourne Grove / A13 London Rd) and 22 (A13 Southchurch Boulevard / Thorpe Hall Ave). Junctions 6 (Hall Road / Cherry Orchard Way) to 8 (Southend Rd / Sutton Rd, Rochford) in Rochford are indicated as having flow increases above 5% in both time periods.

Table 5.4 Summary Table Option B

Jct/ Link	DM AM Flow 2028	DM PM Flow 2028	DM AM Flow 2038	DM PM Flow 2038	Flow Difference (DS-DM) 2028 AM	Flow Difference (DS-DM) 2028 PM	Flow Difference (DS-DM) 2038 AM	Flow Difference (DS-DM) 2038 PM
1	3,784	4,063	3,947	4,260	13	18	32	44
2	6,565	6,194	6,850	6,496	21	61	59	158
3	1,472	1,681	1,532	1,753	11	17	24	38
4	4,023	3,979	4,193	4,170	5	61	16	128
5	2,518	3,069	2,621	3,213	33	27	83	68
6	2,296	2,307	2,391	2,403	74	72	191	181
7	2,527	2,820	2,629	2,937	130	81	299	217
8	3,196	3,389	3,326	3,527	172	127	367	320
9	6,553	6,917	6,815	7,229	-240	-260	-424	-396
10	2,045	2,109	2,125	2,204	-94	-85	-167	-147
11	2,231	2,300	2,318	2,405	-89	-107	-179	-203
12	2,175	3,050	2,258	3,183	-40	-56	-62	-72
13	5,007	5,474	5,207	5,719	-151	-119	-251	-129
14	5,060	5,588	5,262	5,841	-135	-72	-209	-24
15	2,390	2,354	2,482	2,462	334	68	674	55
16	2,538	3,262	2,631	3,397	41	-65	64	-119
17	4,153	4,595	4,329	4,801	130	152	358	453
18	3,025	3,156	3,142	3,296	242	201	483	398
19	2,483	3,170	2,585	3,308	219	536	665	1,104
20	1,935	2,424	2,011	2,529	171	356	498	782
21	4,360	4,500	4,548	4,705	-11	-20	177	230
22	4,330	3,948	4,539	4,133	32	55	422	519
23	2,170	2,401	2,281	2,518	12	59	236	487
24	1,930	1,949	2,039	2,045	75	55	422	405
25	1,505	1,407	1,567	1,472	12	10	45	32
26	1,392	1,246	1,448	1,296	25	15	71	48
27	3,819	3,856	3,999	4,037	-36	-38	171	269
28	38	26	39	26	23	48	64	100
29	34	35	36	36	65	50	135	109
30	26	30	31	31	36	45	123	130
31	1,927	1,853	2,009	1,939	-12	-4	40	61
Link1	75	81	75	81	1	6	2	15
Link2	1,168	1,149	1,219	1,205	0	1	1	3
Link3	-	-	-	-	-	-	-	-
Link4	20	26	20	26	2	0	6	-1
Link5	122	150	124	150	13	6	39	21
Link6	1,318	1,760	1,373	1,842	13	6	39	21
Link7	-	-	-	-	-	-	-	-
Link8	67	71	69	71	11	6	43	23
Link9	1,776	1,862	1,854	1,955	-	4	-	9

The largest increase in flows is forecast at junctions 19 and 20.

5.5 Option C

Option C includes the highest level of potential development growth with an additional 70% of dwellings in 2028 and 60% in 2038 compared to Option B. All of the additional dwellings are proposed at the greenfield sites north of Royal Artillery Way and the North East Southend sites. This is reflected in the results showing between 10% and 20% increases already in 2028 for the eastern end of the A13 and the Royal Artillery Way/Eastern Avenue junction as well as Marine Parade for AM and PM peak.

Figure 5.9 Option C 2028 AM

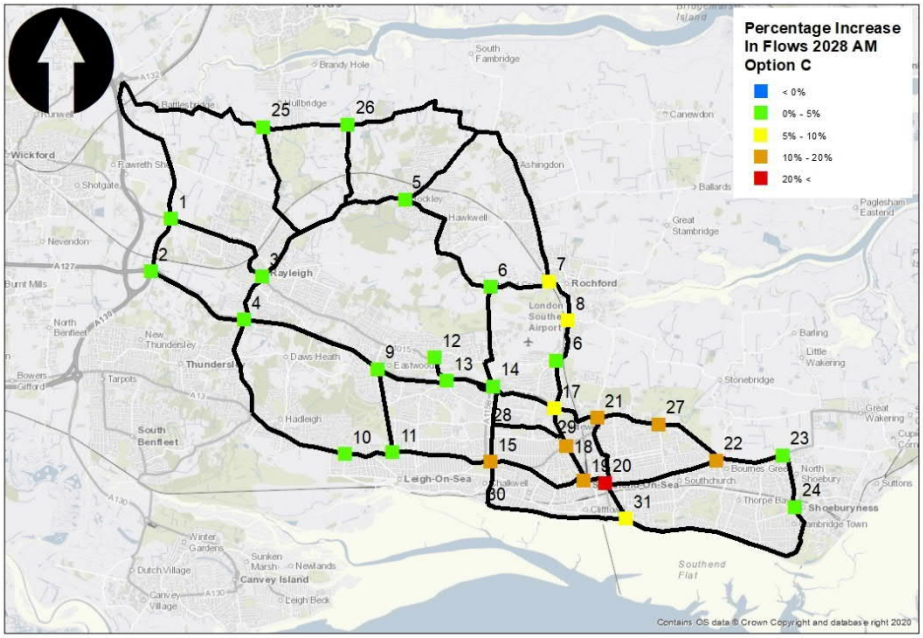
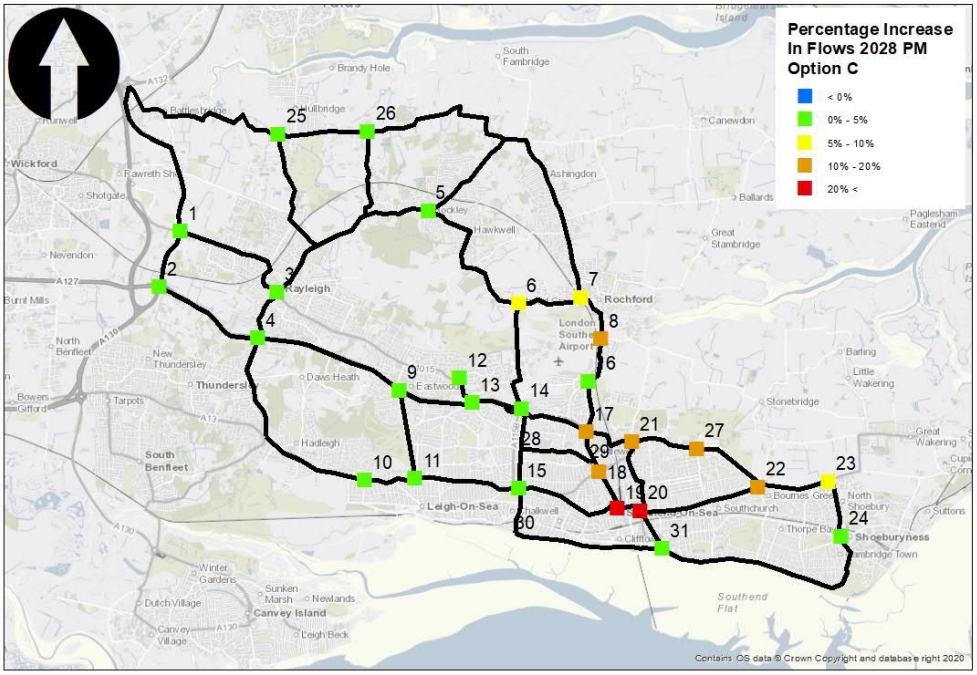


Figure 5.10 Option C 2028 PM



By 2038 the 20% traffic flow growth threshold is reached at most junctions in the centre of Southend, east along the A1159 and the A13. Although junction 16 (Rochford Road/Southend Road/A1159) flow increases remain within the 5% growth level many of the main access points to the Southend Airport are affected by the additional trips from the proposed developments. This could lead to delays accessing the airport location

and consequently have implications for any potential future airport expansion. However, more detailed strategic or junction modelling should be carried out to identify the true impact on journey times and junction operation.

The majority of junctions in Rochford remain between 10% and 20% increase levels, while Junction 31 (Marine Parade/ Eastern Esplanade) also shows increases of this magnitude.

Figure 5.11 Option C 2038 AM

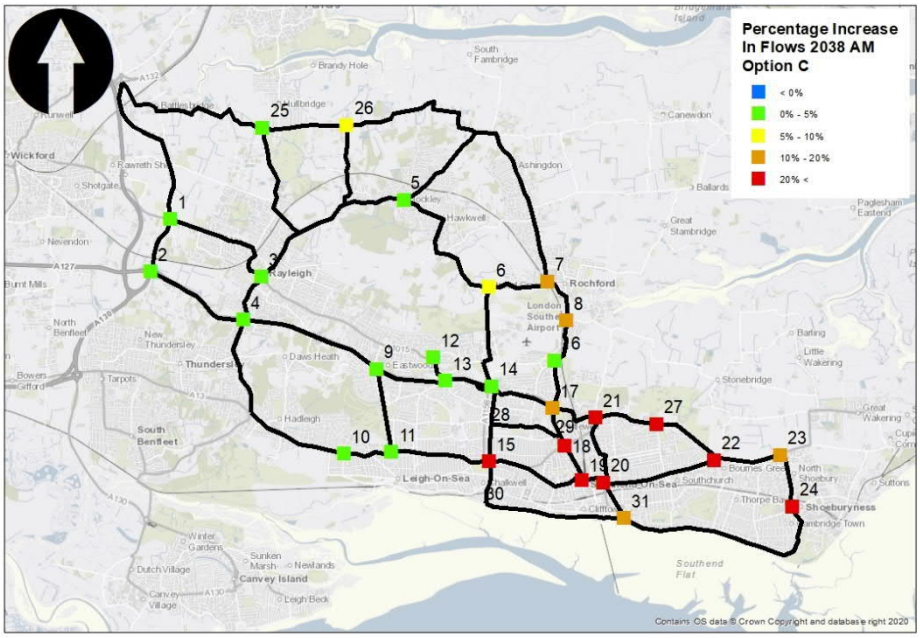


Figure 5.12 Option C 2038 PM

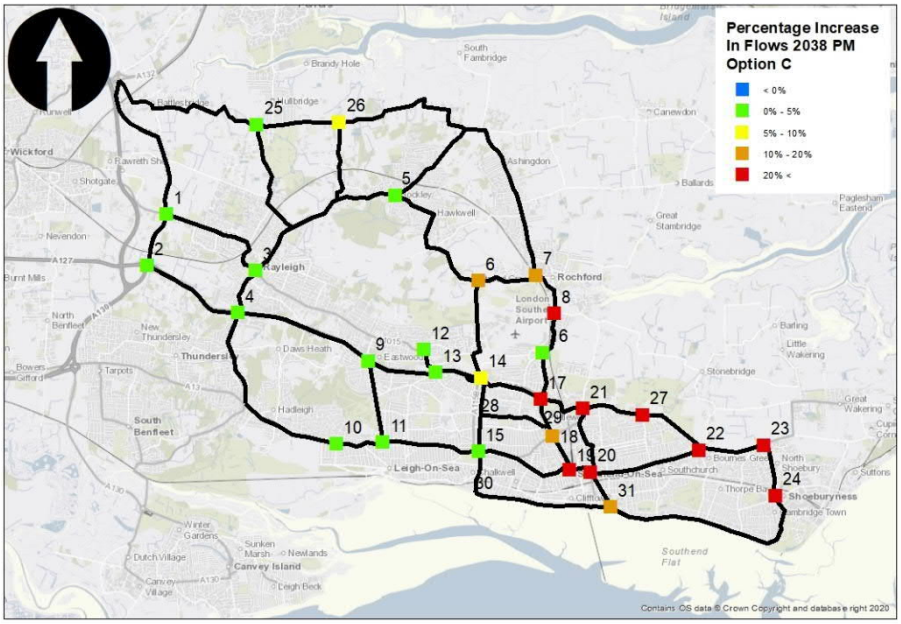


Table 5.5 Summary Table Option C

Jct/ Link	DM AM Flow 2028	DM PM Flow 2028	DM AM Flow 2038	DM PM Flow 2038	Flow Difference (DS-DM) 2028 AM	Flow Difference (DS-DM) 2028 PM	Flow Difference (DS-DM) 2038 AM	Flow Difference (DS-DM) 2038 PM
1	3,784	4,063	3,947	4,260	25	36	64	84
2	6,565	6,194	6,850	6,496	66	121	169	275
3	1,472	1,681	1,532	1,753	33	32	51	56
4	4,023	3,979	4,193	4,170	39	91	65	187
5	2,518	3,069	2,621	3,213	35	50	87	106
6	2,296	2,307	2,391	2,403	98	143	231	294
7	2,527	2,820	2,629	2,937	199	234	402	439
8	3,196	3,389	3,326	3,527	300	420	578	812
9	6,553	6,917	6,815	7,229	-113	-77	-191	-68
10	2,045	2,109	2,125	2,204	-78	-38	-144	-85
11	2,231	2,300	2,318	2,405	-75	-104	-159	-199
12	2,175	3,050	2,258	3,183	-36	-48	-54	-58
13	5,007	5,474	5,207	5,719	-13	74	1	215
14	5,060	5,588	5,262	5,841	-41	179	-21	422
15	2,390	2,354	2,482	2,462	354	75	707	65
16	2,538	3,262	2,631	3,397	60	-33	95	-66
17	4,153	4,595	4,329	4,801	405	558	864	1,181
18	3,025	3,156	3,142	3,296	427	361	812	605
19	2,483	3,170	2,585	3,308	353	685	853	1,316
20	1,935	2,424	2,011	2,529	387	768	801	1,320
21	4,360	4,500	4,548	4,705	466	593	1,120	1,261
22	4,330	3,948	4,539	4,133	560	696	1,691	1,840
23	2,170	2,401	2,281	2,518	54	139	295	587
24	1,930	1,949	2,039	2,045	91	68	447	421
25	1,505	1,407	1,567	1,472	16	20	52	56
26	1,392	1,246	1,448	1,296	34	41	87	95
27	3,819	3,856	3,999	4,037	472	619	1,228	1,439
28	38	26	39	26	41	54	98	106
29	34	35	36	36	157	108	312	191
30	26	30	31	31	101	116	247	244
31	1,927	1,853	2,009	1,939	104	90	268	214
Link1	75	81	75	81	2	9	5	20
Link2	1,168	1,149	1,219	1,205	0	1	1	3
Link3	-	-	-	-	-	-	-	-
Link4	20	26	20	26	2	0	6	-1
Link5	122	150	124	150	21	20	52	44
Link6	1,318	1,760	1,373	1,842	21	20	52	45
Link7	-	-	-	-	-	-	-	-
Link8	67	71	69	71	14	16	49	48
Link9	1,776	1,862	1,854	1,955	-	4	-	9

The junctions with the largest flow increases are junctions 19 - 22 and 27 which are located in Southend Central and along the Royal Artillery Way corridor.

5.6 Low Growth

In addition to the options presented above, two sensitivity tests were carried out. The first of these was the low growth scenario, which included a 10% reduction of trips compared to Option A.

This represents the potential equivalent of achieving lower vehicle trip rates due to the promotion of alternative sustainable transport modes, such as public transport or micro-modes through policies or development conditions and travel planning.

Although this is a simplistic representation within the spreadsheet modelling applied and careful consideration to travel planning would be required as part of the proposed dwellings in order to achieve this it indicates at which locations flow level changes reduce into a lower category

Figure 5.13 Low Growth Option 2028 AM

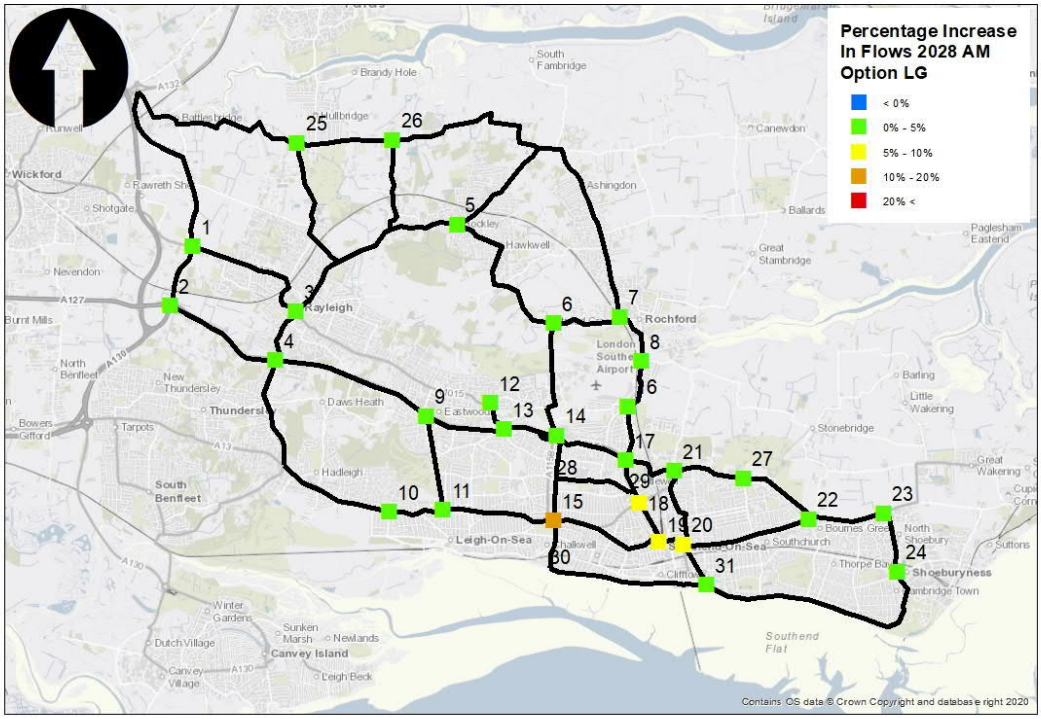
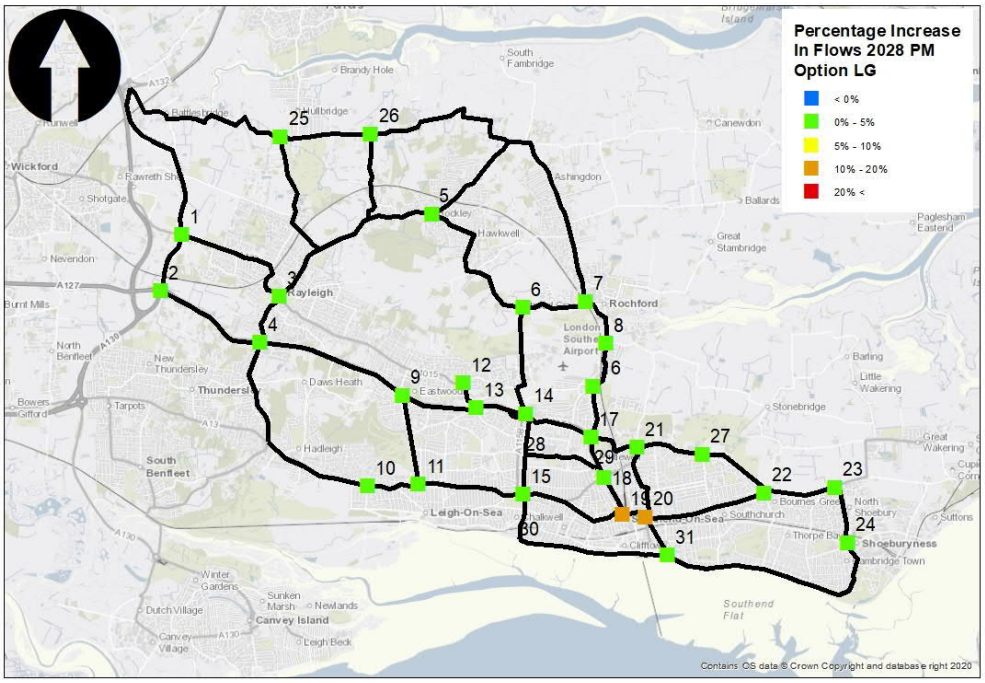
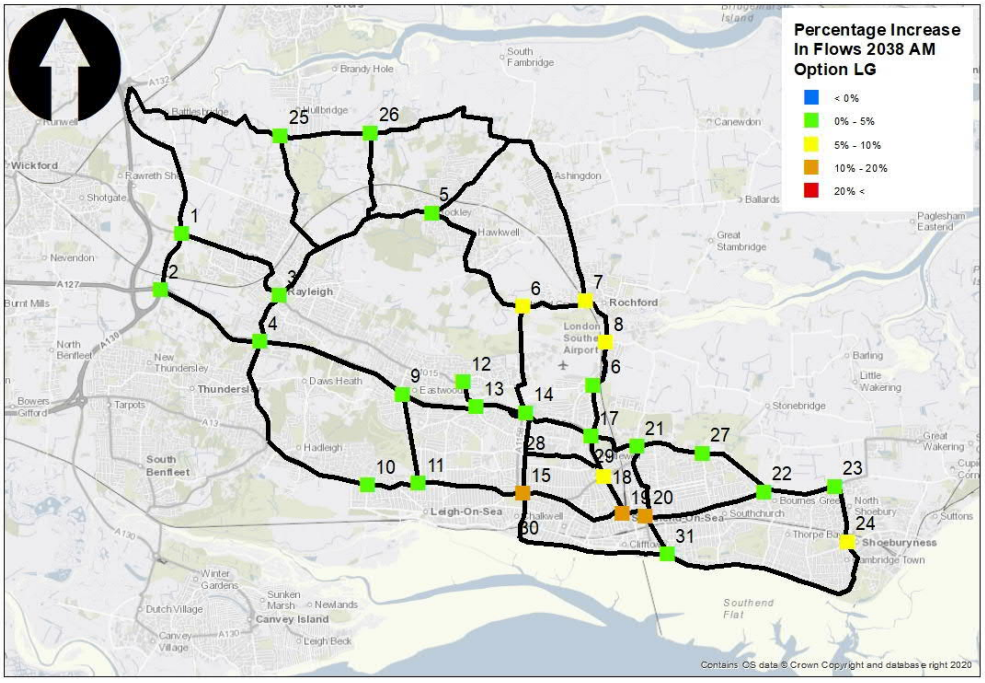


Figure 5.14 Low Growth Option 2028 PM



In 2028 the AM peak low growth option shows the same flow level increase is forecast as for option A. Although overall flow levels reduce, increases compared to the DM are expected at junctions 15, 18, 19 and 20. In the 2028 PM peak low growth option the percentage increase at junction 18 reduces below 5%, which is an improvement compared to Option A.

Figure 5.15 Low Growth Option 2038 AM



The impact of a 10% growth level reduction is more apparent for the 2038 forecasts where Junction 15 (A1158 Westbourne Grove / A13 London Rd), 18 (A127 Victoria Ave/ B1015 Junction, Southend) and 24 (A13 / Delaware Rd / Caulfield Rd / Elm Road) show a lower level of flow increase in the AM peak. While in the PM peak junction 19 (Queensway / Victoria Ave) and 20 (Queensway / A13 Roundabout / A1160) remain above the 10% flow level increase threshold junctions 6 (Hall Road / Cherry Orchard Way) and 7 (Hall Rd /

Ashingdon Rd / West St, Rochford) in Rochford show a lower increase in flow as well as junction 22 (A13 Southchurch Boulevard / Thorpe Hall Ave). None of the junctions show levels of flow increases above 20%.

Figure 5.16 Low Growth Option 2038 PM

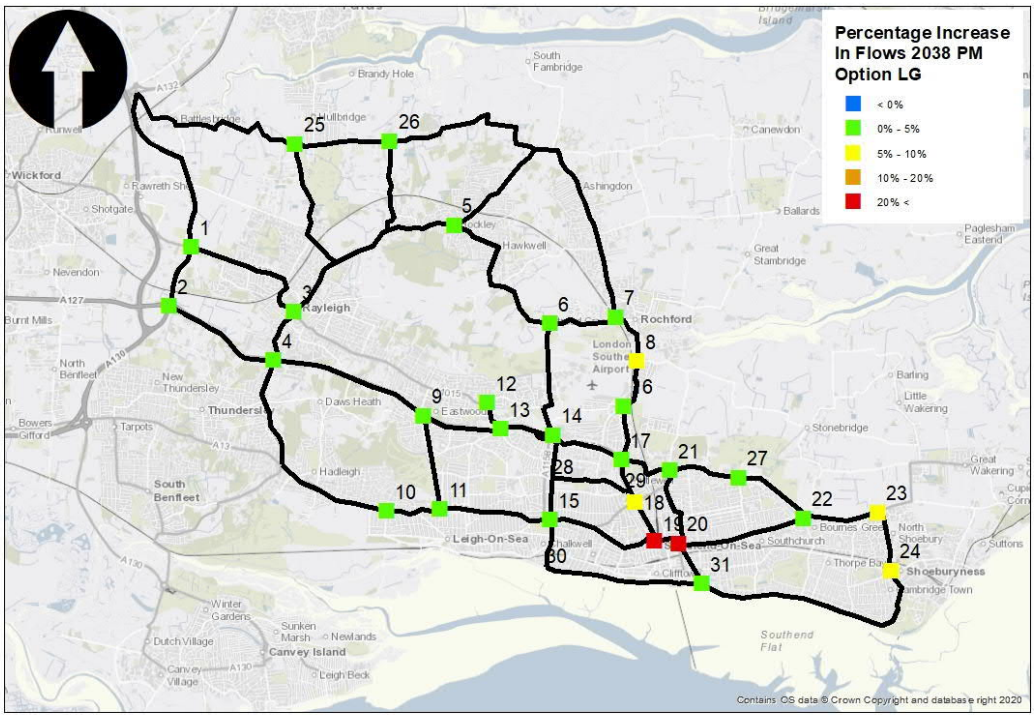


Table 5.6 Low Growth Summary Table

Jct/ Link	DM AM Flow 2028	DM PM Flow 2028	DM AM Flow 2038	DM PM Flow 2038	Flow Difference (DS-DM) 2028 AM	Flow Difference (DS-DM) 2028 PM	Flow Difference (DS-DM) 2038 AM	Flow Difference (DS-DM) 2038 PM
1	3,784	4,063	3,947	4,260	7	12	14	24
2	6,565	6,194	6,850	6,496	13	48	29	98
3	1,472	1,681	1,532	1,753	7	11	13	21
4	4,023	3,979	4,193	4,170	4	52	9	98
5	2,518	3,069	2,621	3,213	27	22	53	43
6	2,296	2,307	2,391	2,403	61	57	130	115
7	2,527	2,820	2,629	2,937	104	67	200	138
8	3,196	3,389	3,326	3,527	135	104	243	204
9	6,553	6,917	6,815	7,229	-259	-288	-503	-521
10	2,045	2,109	2,125	2,204	-96	-88	-177	-163
11	2,231	2,300	2,318	2,405	-93	-111	-187	-211
12	2,175	3,050	2,258	3,183	-67	-90	-135	-170
13	5,007	5,474	5,207	5,719	-170	-155	-331	-278
14	5,060	5,588	5,262	5,841	-153	-111	-290	-197
15	2,390	2,354	2,482	2,462	261	17	462	-41
16	2,538	3,262	2,631	3,397	6	-86	-22	-174
17	4,153	4,595	4,329	4,801	66	80	122	154
18	3,025	3,156	3,142	3,296	167	140	284	228
19	2,483	3,170	2,585	3,308	157	434	433	767
20	1,935	2,424	2,011	2,529	127	288	322	526
21	4,360	4,500	4,548	4,705	-40	-53	-32	-24
22	4,330	3,948	4,539	4,133	-3	16	101	158
23	2,170	2,401	2,281	2,518	-4	32	56	180
24	1,930	1,949	2,039	2,045	52	32	175	158
25	1,505	1,407	1,567	1,472	10	8	26	19
26	1,392	1,246	1,448	1,296	20	12	44	29
27	3,819	3,856	3,999	4,037	-57	-65	-49	-9
28	38	26	39	26	19	41	45	83
29	34	35	36	36	51	41	92	76
30	26	30	31	31	31	40	77	85
31	1,927	1,853	2,009	1,939	-25	-17	-38	-14
Link1	75	81	75	81	1	5	1	10
Link2	1,168	1,149	1,219	1,205	0	1	0	1
Link3	-	-	-	-	-	-	-	-
Link4	20	26	20	26	1	0	4	-1
Link5	122	150	124	150	10	5	25	12
Link6	1,318	1,760	1,373	1,842	11	5	25	12
Link7	-	-	-	-	-	-	-	-
Link8	67	71	69	71	10	5	25	14
Link9	1,776	1,862	1,854	1,955	-	3	-	6

As in options A and B the junctions with the largest increase in flows are 19 and 20 in central Southend.

5.7 High Growth

The second sensitivity scenario comprises a High Growth scenario . This was requested by SBC to represent further potential greenfield site developments for North East Southend for the Rochford area in addition to Option C. This was set up for 2038, when the majority of these developments would come forward.

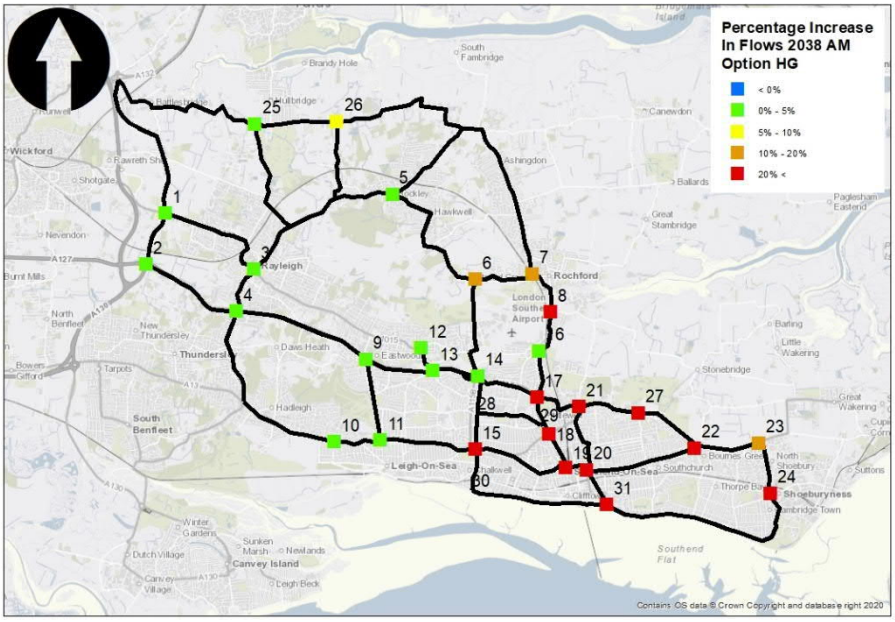
A summary of the dwelling assumptions included in the High Growth scenario are shown below. As the North East Southend cluster is split into three access points for this spreadsheet modelling, as shown in Figure 4.4, the additional dwellings were split equally across the clusters of North East Southend AoS, North of Royal Artillery Way and North of Bournes Green Chase. The increase in dwellings at North East Southend AoS represents a 12% increase overall compared to Option C.

Table 5.7 High Growth dwellings figures

Cluster	Option C Dwellings 2038	High Growth Dwellings 2038	Difference
Eastwood	299	299	0
Leigh	807	807	0
North East Southend AoS	1,859	3,489	1,630
North of Royal Artillery Way	2,440	4,070	1,630
North of Bournes Green Chase	2,962	4,592	1,630
Prittlewell	1,555	1,555	0
Shoeburyness	1,289	1,289	0
Southchurch	1,138	1,138	0
Southend (central)	5,659	5,659	0
Thorpe Bay	90	90	0
Westcliff-on-Sea	834	834	0
Total	**18,932**	**23,822**	**4,890**

The flow increase plots below show that junctions 6 (Hall Road / Cherry Orchard Way) west of Rochford, 17 (A1159 Manners Way - A127 Prince Ave (Cuckoo Corner)) and 31 (Marine Parade / Eastern Esplanade) move into the next flow percentage increase category compared to Option C in the AM peak. This means flow increases are then above 20% for all assessed junctions along Victoria Avenue, Queensway and to the seafront in this peak period.

Figure 5.17 High Growth Option 2038 AM



The PM peak shows flow increases are above 20% for all assessed junctions along Victoria Avenue and Queensway. Flow increases for junctions 2 (Fairglen Interchange), 4 (A129/A127) and 25 (Hullbridge Road / Watery Lane) will move into the 5%-10% category. Due to the majority of developments added in the town centre and the greenfield sites increases above 20% are mainly forecast for central and east Southend areas, with lower percentage increases at the western end of the model.

Figure 5.18 High Growth Option 2038 PM

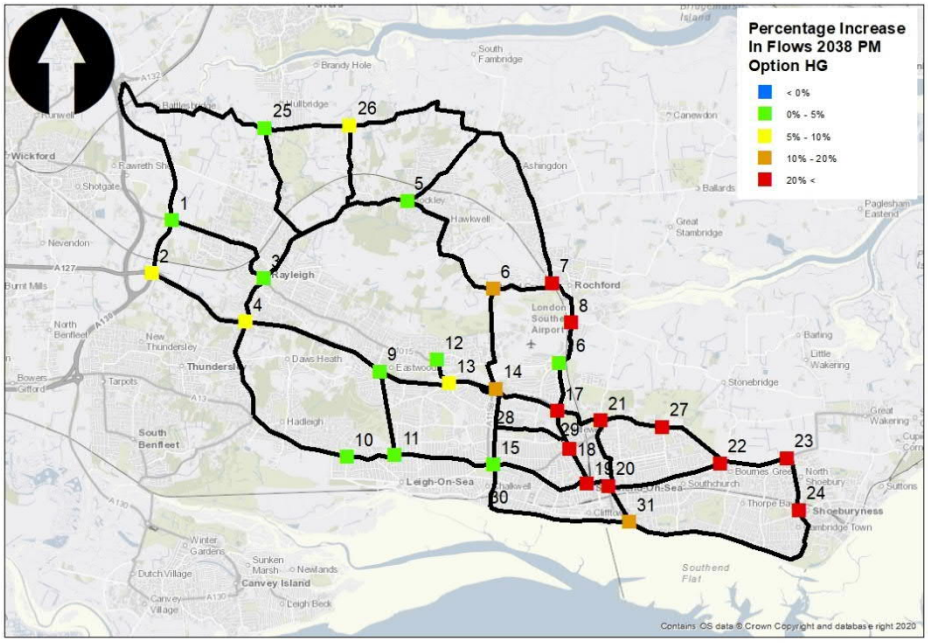


Table 5.8 High Growth Summary Table

Jct/ Link	DM AM Flow 2028	DM PM Flow 2028	DM AM Flow 2038	DM PM Flow 2038	Flow Difference (DS-DM) 2028 AM	Flow Difference (DS-DM) 2028 PM	Flow Difference (DS-DM) 2038 AM	Flow Difference (DS-DM) 2038 PM
1	3,784	4,063	3,947	4,260	25	36	82	107
2	6,565	6,194	6,850	6,496	66	121	231	346
3	1,472	1,681	1,532	1,753	33	32	70	67
4	4,023	3,979	4,193	4,170	39	91	99	225
5	2,518	3,069	2,621	3,213	35	50	90	133
6	2,296	2,307	2,391	2,403	98	143	259	373
7	2,527	2,820	2,629	2,937	199	234	475	599
8	3,196	3,389	3,326	3,527	300	420	720	1,139
9	6,553	6,917	6,815	7,229	-113	-77	-38	137
10	2,045	2,109	2,125	2,204	-78	-38	-126	-43
11	2,231	2,300	2,318	2,405	-75	-104	-141	-196
12	2,175	3,050	2,258	3,183	-36	-48	-48	-49
13	5,007	5,474	5,207	5,719	-13	74	168	432
14	5,060	5,588	5,262	5,841	-41	179	97	702
15	2,390	2,354	2,482	2,462	354	75	735	72
16	2,538	3,262	2,631	3,397	60	-33	114	-33
17	4,153	4,595	4,329	4,801	405	558	1,197	1,643
18	3,025	3,156	3,142	3,296	427	361	1,046	768
19	2,483	3,170	2,585	3,308	353	685	974	1,452
20	1,935	2,424	2,011	2,529	387	768	999	1,677
21	4,360	4,500	4,548	4,705	466	593	1,736	1,953
22	4,330	3,948	4,539	4,133	560	696	2,432	2,635
23	2,170	2,401	2,281	2,518	54	139	334	658
24	1,930	1,949	2,039	2,045	91	68	464	434
25	1,505	1,407	1,567	1,472	16	20	56	70
26	1,392	1,246	1,448	1,296	34	41	98	124
27	3,819	3,856	3,999	4,037	472	619	1,879	2,178
28	38	26	39	26	41	54	127	112
29	34	35	36	36	157	108	433	252
30	26	30	31	31	101	116	321	314
31	1,927	1,853	2,009	1,939	104	90	402	309
Link1	75	81	75	81	2	9	6	24
Link2	1,168	1,149	1,219	1,205	0	1	1	3
Link3	-	-	-	-	-	-	-	-
Link4	20	26	20	26	2	0	6	-1
Link5	122	150	124	150	21	20	61	60
Link6	1,318	1,760	1,373	1,842	21	20	61	60
Link7	-	-	-	-	-	-	-	-
Link8	67	71	69	71	14	16	53	61
Link9	1,776	1,862	1,854	1,955	-	4	-	9

Similar to Option C the junctions with the largest increases in flow are junctions 17, 19 - 22 and 27 in Southend Central and along the Royal Artillery Way corridor.

Although the model has not been set up to represent weekend or holiday scenarios the High Growth scenario can also be interpreted to provide a high-level indicator of the impact of increased traffic demand, including for example, that associated with tourism peaks on the seafront junction. Although the leisure trip distribution is likely to be different at the weekend the table above indicates an increase of 400 trips in the AM peak. This is greater than a 20% increase compared to the DM levels. However, peak holiday season traffic levels could be significantly greater than this and a detailed junction assessment should be carried out to identify the impact on the individual turning movements using traffic flows specifically observed during the seasonal peaks.

5.8 Vehicle Kilometres

The spreadsheet model shows the volume of vehicle trip increases which are forecast at key junctions, as described above, but has also been used to estimate the overall distances travelled by vehicles along the network links shown in Table 2.1 associated with the trips calculated in the model. The total distances for 2038 for each option modelled were calculated for Southend and Rochford separately for the AM and PM peaks.

The results in Table 5.9 and Table 5.10 show that the total percentage increases in Option A and B are only marginally greater compared to the DM, however option C levels increase significantly, with the large volume of trips for the AoS loading onto network sections representing NE Southend, Central and Rochford.

It should be noted that the percentages are impacted by the network coverage and would not show comparative results for similar large development further west within Southend with less network coverage.

However, the values below still provide an indication of the impact of each option on the networks and overall vehicle kilometres driven and provide a further high-level indication of the comparative impacts of the development options being considered.

Table 5.9: 2038 AM Vehicle Kilometres

Location	Base	DM	Option A	Option B	Option C	Low Growth	High Growth
Rochford	58,958	67,814	69,363	70,025	70,973	69,208	71,600
Southend-on-Sea	76,728	87,304	88,581	91,543	100,608	87,698	106,311
Total	135,687	155,117	157,944	161,568	171,582	156,906	177,910
			% Difference to DM				
Rochford	-13%	0%	2%	3%	5%	2%	6%
Southend-on-Sea	-12%	0%	1%	5%	15%	0%	22%

Table 5.10: 2038 PM Vehicle Kilometres

Location	Base	DM	Option A	Option B	Option C	Low Growth	High Growth
Rochford	63,881	73,528	75,070	75,731	77,676	74,915	78,968
Southend-on-Sea	83,729	96,485	98,528	102,641	113,762	97,409	120,813
Total	147,609	170,013	173,597	178,372	191,438	172,324	199,781
			% Difference to DM				
Rochford	-13%	0%	2%	3%	6%	2%	7%
Southend-on-Sea	-14%	0%	2%	6%	18%	1%	25%

5.8.1 PT Journeys

The above analysis is focusing on vehicle trips primarily. In addition, Table 5.11 presents a high-level summary of potential additional total PT trips across Southend based on the total PT trips from each cluster in 2038. The trip calculations followed the same approach as for the vehicle trips but using a more simplistic trip rate approach. The Option values shown in the table only include the additional trips as a result of the potential Local Plan development options (for DM and DS). The same TEMRro growth factor was applied to the DM trips as for the vehicles in order to provide a better comparison of the options.

Table 5.11: Public Transport Trips – Southend 2038

	DM	Option A	Option B	Option C
AM	415	728	840	1,189
PM	195	361	422	605

6 Summary

In order to help inform the development of the Southend-on-Sea Local Plan a spreadsheet model was set up to help consider the forecast changes in traffic volume for three forecast development options . This report has described the model set-up and assumptions made. The acknowledged limitations of this spreadsheet model are also described below.

6.1 Limitations of the Approach

In the spreadsheet model tool, it was only possible to include a selection of the major highway network junctions and links for areas where suitable junction count information was available. Details about other junctions or links not represented in the model cannot be provided from this tool.

The calculated forecast trip volumes are defined based on consistent assumptions for each development type, size and location only. This is a more simplistic approach than using a strategic modelling tool. However, as trip volume assumptions are made consistently the results enable a quantitative comparison between the options to be made, which is useful at the plan making stage and was agreed in advance with the stakeholders.

The distribution assumptions are established based on a generic set of assumptions about local and longer distance trips and the shortest path route. No consideration about junction delays or re-routing has been made in the spreadsheet model. Therefore, additional trip volumes should not be considered as definitive but indicative only as in reality, driver behaviour may contribute to alternatives such as journey re-routing or trip re-timing. It is therefore recommended that subsequent analysis incorporating this additional level of detail is undertaken in order to help inform considerations of the requirements for improvements for links and junctions which may have capacity issues at a later stage.

Loading points are limited to one or two for each cluster. However, in reality particularly for the larger sized new developments, trips are likely to join the network at different locations. This could lead to overestimation of trips at junctions modelled directly next to a loading point. Again, this should therefore be considered in more detail at a later stage including for example, at the planning application stage when detailed Transport Assessment(s) will be required for each development.

Distributions from and to the Southend and Rochford clusters were used from the BQ model and aligned with the JTW data. However, these showed the majority of trips being short distance trips. Despite some manual adjustments to seek to better account for the trips outside the model area to the west and north, the model is still likely to underrepresent these trips, due to the limited input data.

At this spreadsheet model level, no distinctions between different travel purposes have been made and no conclusions about different travel behaviours can be made differentiating commuting, employers' business or other trips.

Overall, the approach represents an appropriate and agreed high-level analysis for this stage of the plan making process, which was discussed in advance with officers of SBC, RDC and ECC.

6.2 Conclusions

The options tested included an incremental increase in dwellings with Option A including the least additional residential units and employment volumes compared to the DM forecast and Option C including the most.

The analysis showed that there are several junctions forecast with vehicle growth greater than 20% in 2038 even if Option A comes forward within the central areas of Southend. Increases above 5% are located along the A1159 east of A127 and along Southend Road towards Rochford. This aligns with the greater volume of residential units proposed in the Southend central and Prittlewell areas. Despite the urban areas being considered with the lowest trip rates per residential unit due to the proximity to public transport and amenities this housing growth is forecast to generate about 900 additional vehicle trips during the peak hours.

The majority of traffic growth for Option B is mainly forecast for Shoeburyness and Southchurch along the A13 and seafront corridor.

Option C then introduces further growth along the North-East Southend corridor generating additional traffic flows onto the adjacent junctions of greater than 20%.

The low growth sensitivity test has shown that achieving lower levels of vehicle use by providing alternative modes can achieve visibly lower levels of vehicle trips on the road network and less pressure at junctions.

On the contrary, the high growth sensitivity test results in additional volumes of trips on the Southend network if the Rochford greenfield site developments proceed in parallel.

Table 6.1 provides a visual summary of the details provided above. It shows that the majority of junctions see small increases of traffic in percentile terms by 2028. As expected, with the incremental option set up, Option C shows the highest increase with flows at two junctions along Queensway increasing by more than 20%.

By 2038 three junctions are forecast to experience traffic flow increases above 20% even with Option A. This increases to 4 junctions with Option B and 11 junctions with Option C, respectively. Overall these increases are forecast at junctions in the centre of Southend and the eastern sections of Southchurch and Shoeburyness.

Table 6.1: Results Summary

		2028				2038				
ID	Location	Op A	Op B	Op C	Low	Op A	Op B	Op C	Low	High
J1	Carpenters Arms Roundabout, Rayleigh	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
J2	Fairglen Interchange, northbound circulatory, Rayleigh (one-way)	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	5-10%
J3	A129 Crown Hill/High St	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
J4	A129/A127	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	5-10%
J5	B1013 Main Rd / Spa Rd / Southend Rd, Hockley	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
J6	Hall Road / Cherry Orchard Way	<5%	<5%	5-10%	<5%	5-10%	5-10%	10-20%	5-10%	10-20%
J7	Hall Rd / Ashingdon Rd / West St, Rochford	<5%	5-10%	5-10%	<5%	5-10%	10-20%	10-20%	5-10%	>20%
J8	Southend Rd / Sutton Rd, Rochford (Anne Boleyn roundabout)	<5%	5-10%	10-20%	<5%	5-10%	10-20%	>20%	5-10%	>20%
J9	A127 Southend Arterial Rd / The Fairway	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
J10	A13 London Road / Thames Drive	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
J11	A13 London Road / Eastwood Rd	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
J12	A1015 Rayleigh Rd / White House Rd, Leigh	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
J13	A1015 Rayleigh Rd / A127, Leigh	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	5-10%
J14	B1013 Nestuda Way / A127 Prince Ave, Southend	<5%	<5%	<5%	<5%	<5%	<5%	5-10%	<5%	10-20%
J15	A1158 Westbourne Grove / A13 London Rd	10-20%	10-20%	10-20%	10-20%	>20%	>20%	>20%	10-20%	>20%
J16	Rochford Road/Southend Road/A1159 Airport Roundabout	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
J17	A1159 Manners Way - A127 Prince Ave (Cuckoo Corner), Southend	<5%	<5%	10-20%	<5%	<5%	5-10%	>20%	<5%	>20%
J18	A127 Victoria Ave/ B1015 Junction, Southend	5-10%	5-10%	10-20%	5-10%	10-20%	10-20%	>20%	5-10%	>20%
J19	Queensway / Victoria Ave	10-20%	10-20%	>20%	10-20%	>20%	>20%	>20%	>20%	>20%
J20	Queensway / A13 Roundabout / A1160	10-20%	10-20%	>20%	10-20%	>20%	>20%	>20%	>20%	>20%
J21	A1159 Eastern Avenue / Sutton Rd	<5%	<5%	10-20%	<5%	<5%	<5%	>20%	<5%	>20%
J22	A13 Southchurch Boulevard / Thorpe Hall Ave, Southend	<5%	<5%	10-20%	<5%	5-10%	10-20%	>20%	<5%	>20%
J23	A13 / Poynters Lane	<5%	<5%	5-10%	<5%	5-10%	10-20%	>20%	5-10%	>20%
J24	A13 / Delaware Rd / Caulfield Rd / Elm Road	<5%	<5%	<5%	<5%	10-20%	>20%	>20%	5-10%	>20%
J25	Hullbridge Road / Watery Lane / Lower Road	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
J26	Lower Road / Church Road	<5%	<5%	<5%	<5%	<5%	<5%	5-10%	<5%	5-10%
J27	Eastern Avenue / Garon Park / Royal Artillery Way/ Hamstel Road	<5%	<5%	10-20%	<5%	<5%	5-10%	>20%	<5%	>20%
J31	Marine Parade / Eastern Esplanade / A1160 Southchurch Avenue	<5%	<5%	5-10%	<5%	<5%	<5%	10-20%	<5%	>20%

Based on the forecast increases at some junctions, it is recommended that more detailed junction modelling is carried out to assess the implications of this growth on the junction capacity. This will vary by junction type, currently available capacity and depend on the distribution of the additional development trips across the approaches.

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