London Southend Airport & Environs Joint Area Action Plan

Modelling Assessment Report

Southend Borough Council/Essex County Council/Rochford District Council

April 11 2013

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1. Introduction

1.1. Background

Atkins was commissioned by Southend-on-Sea Borough Council and Essex County Council to develop a comprehensive forecast of travel conditions in Southend and the southern area of Rochford district. The background to this work is proposals to develop land at and surrounding the London Southend Airport (LSA) into new employment provision through a series of business parks. LSA has planning permission to expand its passenger operations up to 2 million passengers per annum (MPPA). The airport began operating regular passenger services in April 2012 with a passenger throughput in 2012 of approximately 0.6 MPPA.

It is recognised that this growth in passenger numbers represents a significant opportunity to increase the level of employment locally. Evidence from comparable locations such as Bournemouth, suggest that airports act as hubs for a number of industries which in turn leads to the creation of employment opportunities. In response to this Southend-on-Sea Borough Council (SBC) and Rochford District Council (RDC) have jointly developed the Southend Airport and Environs Joint Area Action Plan (JAAP). The JAAP sets out the proposals for the area and seeks to quantify the opportunities and challenges generated through the proposed employment provision linked to the growth of the airport.

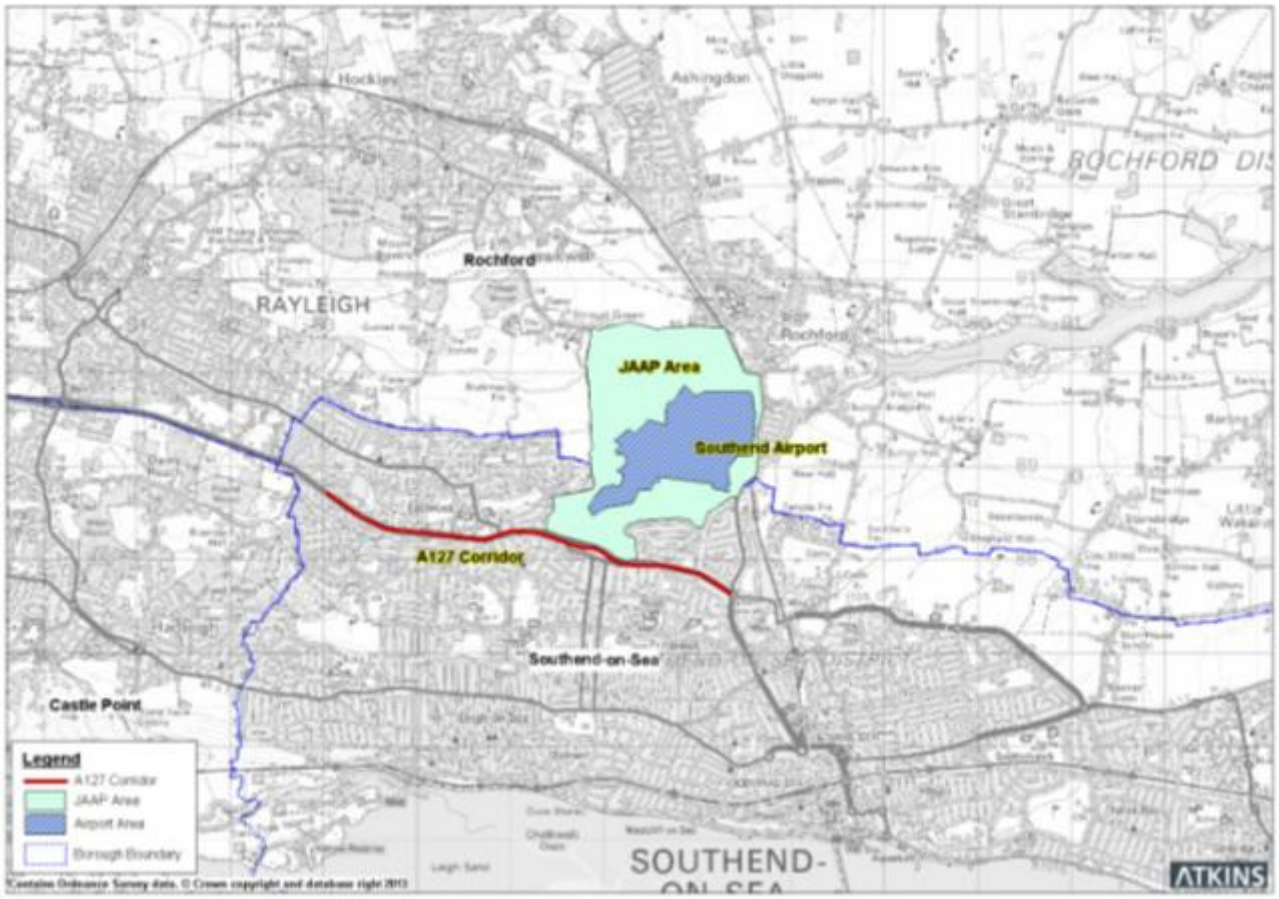
This document provides an assessment of the modelling with the objective of providing evidence for the travel conditions in a future year assuming all development is realised. For instance the assessment will determine if increased demand will result in unacceptable levels of highway congestion. The assessment is multi modal and therefore considers highway and public transport provision in a future year through the use of a model designed to consider traveller responses to changes in travel cost. This model is the Southend-on-Sea multi modal model (SoSMMM). SoSMMM is a comprehensive trip forecasting tool developed in line with industry best practice (Department for Transport – Transport Analysis Guidance (WebTAG)). The modelling reflects a 2021 forecast year which was identified as being in line with the predicted planning horizon for the majority of JAAP led developments and the airport reaching its capacity of 2 MPPA.

In response to the growth outlined within the JAAP a number of proposed infrastructure improvements have already been identified. The JAAP submission document sets out a number of objectives for transport within the study area:

- Ensuring good connectivity to the development area by all modes of transport, with appropriate improvements to sustainable transport and the highway network; and
- Minimise traffic impacts and congestion.

To achieve the above a number of improvements have been proposed. This includes increasing capacity at individual highway junctions, new bus corridors and a multi modal interchange at the airport to link the railway station, the airport terminal, hotel and employment related to these locations with the wider bus network. The proposals are considered within this assessment in conjunction with the long standing aspiration to reduce congestion and improve reliability along the A127 corridor at recognised bottlenecks. Figure 1 provides an overview of the study area, displaying the JAAP site, airport, and the A127 corridor. It is shown that the site extends across areas of Southend Borough and Rochford District.

Figure 1. Study Area



1.2. Modelling Assessment

This assessment combines the most recent planning estimates for land use development (by development quantum) outlined within the JAAP document coupled with forecasts for the airport to reach 2MPPA. A number of proposed housing sites within Rochford District are also included as these are expected to contribute to traffic volumes within the study area. This data is translated into travel demand within the model using industry standard approach of combining trip rates for new development coupled with the use of TEMPRO (Trip End Presentation Programme) estimates for the background growth in trip ends within the model study area. TEMPRO is a national database released by the Department for Transport (DfT) and provides a reference that all large scale modelling assessments should adhere to.

The assessment assumes a single land use scenario for 2021 with all JAAP development realised and the LSA reaching capacity. This development is tested under two infrastructure scenarios which are outlined below:

- A 'do minimum' (DM) scenario: Existing highway and public transport provision, and
- A 'do something' (DS) scenario: The above but including a number of specific proposals:
    - Proposals to increase public transport provision through additional bus routes and supporting infrastructure including a new proposed interchange at Southend Airport
    - Improvements to increase capacity at a number of highway junctions at locations in close proximity to the airport, and
    - Improvements to increase capacity at key junctions along the A127 corridor which is the primary access route to and from the JAAP site/LSA.

The key outputs from the assessment will be to identify the following:

- Responses by travellers in 2021 due to increased congestion on the choice of mode, time of day for travel, and destination;
- The likely patronage of proposed bus routes within the study area, and
- Highway capacity constraints with development realised and evidence to demonstrate the effectiveness of the proposals.

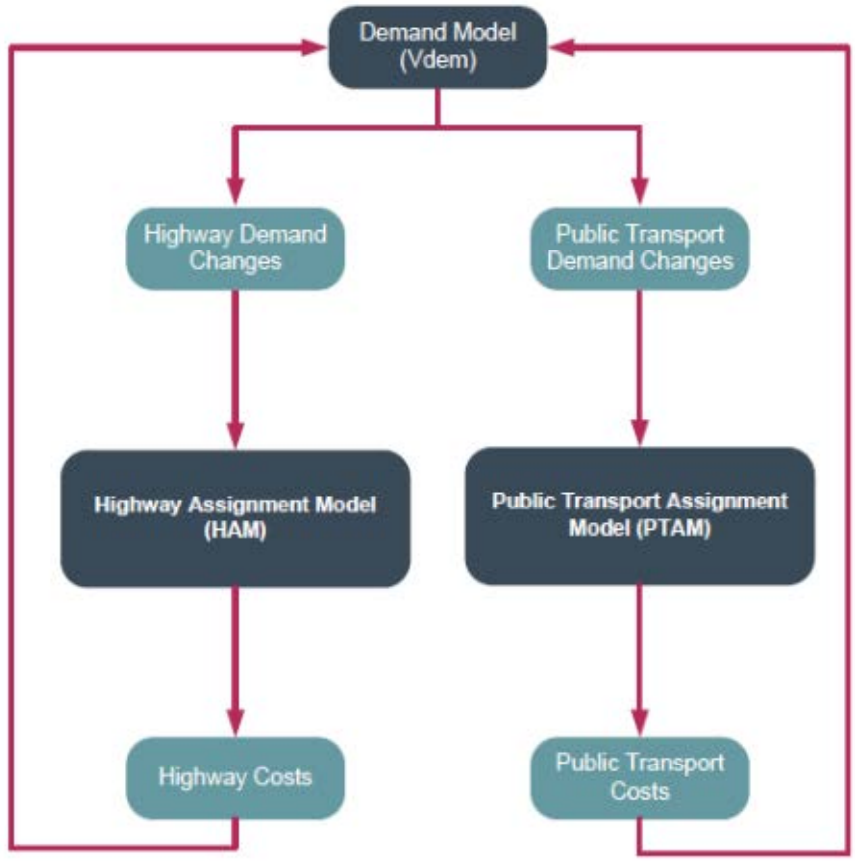
1.3. Model Structure

The Southend model was developed to be representative of highway and public transport conditions during 2009, the model's base year. It is comprised of the following elements:

- an EMME based demand model representing modal switching and redistribution effects,
- a SATURN based highway assignment model to represent the highway network and highway travel demands, and
- an EMME based public transport assignment model representing the public transport network with individual bus, rail and park and ride services.

When used in forecasting mode, highway and public transport generalised costs are transferred to the demand model which in turn calculates revised trip matrices based upon a series of responses, this includes trip frequency, mode choice, time period choice, destination choice and sub mode choice for public transport i.e. bus versus train. Matrices are subsequently passed back to the assignment models with this loop repeated until convergence is reached between supply and demand. The figure below illustrates this procedure.

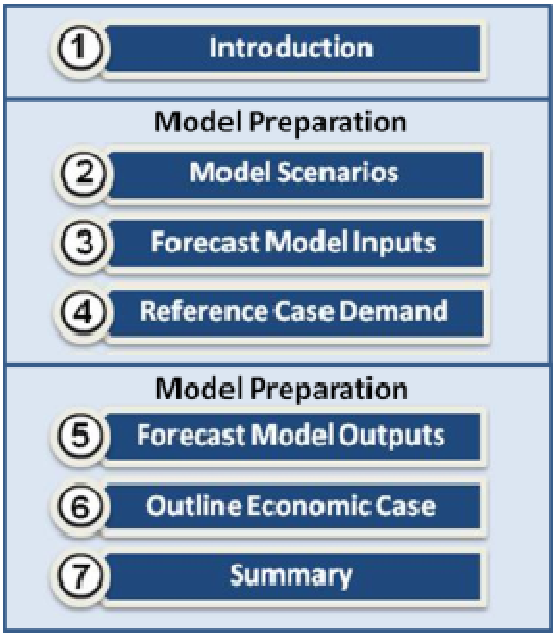
Figure 2. Southend Forecast Model Structure



1.4. Document Structure

Including this section, this document is structured into seven parts. Sections 2 to 4 detail the preparation of the model for this assessment. Section 2 describes the identification of model scenarios. Section 3 discusses the inputs to the model forecast whilst section 4 describes the preparation of the future year matrices. Sections 5 to 7 describe the model outputs, outline economic case and summary of this assessment. Figure 3 provides a summary of this structure.

Figure 3. Report Structure



2. Model Scenarios

2.1. Planning Proposals

Table 1 provides a summary of the proposed land use developments within the study area. These are divided into three distinct elements, the employment land described in the JAAP, housing proposed within the Rochford Local Development Framework (LDF) and development directly attributable to the expansion of the airport. The table displays the estimates of development quantum for each site dividing the JAAP into the three proposed business parks of Saxon, Nestuda Way and the expansion of the existing Aviation Way site.

In general this assessment adopts a 'best case' view for employment assuming all development will be realised when in reality some may not. A standard forecasting approach is to use guidance provided in WebTAG (unit 3.15.5) to allocate a level of certainty and in turn use this information to ascertain a 'likely case' for land use development. As this assessment will not directly underpin the submission of a business case, it was determined that in the first instance all development would be included to assess the 'best case scenario for employment at the development site. Figure 4 provides an overview of the development sites.

Table 1. Proposed Development Sites

Category	Item	Developments	Gross Floor Area (Sq.m) / Dwelling Unit
Business Parks (JAAP)	1	Saxon Business Park	99000 Sq.m
	2	Nestuda Way Business Park	10000 Sq.m
	3	Aviation way Business Park	15000 Sq.m
Rochford Housing Developments (LDF) (by 2021)	4	Rayleigh Housing	550 DU
	5	West Rochford Housing	600 DU
	6	West Hockley Housing	50 DU
	7	South Hawkwell Housing	175 DU
	8	East Ashingdon Housing	500 DU
	9	SW Hullbridge Housing	250 DU
	10	South Canewdon Housing	60 DU
Airport Expansion	11	2 MPPA	-
	12	Increase in LSA Staff to 1100	-

2.2. Infrastructure/Transport Proposals

There are a number of infrastructure and transport proposals which have been captured within this assessment. Of these a number are directly attributable to the development at the JAAP site whilst others such as those along the A127 are mainly predicated by the JAAP development but also form part of wider aspirations for Southend.

The proposals at the JAAP site are specific junction improvements designed to increase capacity. These improvements are situated at the following locations; Southend/Sutton Road (Ann Boleyn) and the Sutton Ford Bridge junctions. Three junctions along the A127 have been identified; these are the Kent Elms junction (A127/A1015), Tesco's Roundabout (A127/Nestuda Way), and The Bell (A127/Rochford Road). These proposals are reliant upon the signalisation schemes coupled with additional lanes in some cases. The Tesco roundabout will be reconfigured to allow access to the Nestuda Way business park described in Table 1.

A key aspiration of these proposals is to reduce the level of traffic rat running through Rochford Town Centre and to avoid congestion along the A127 corridor and parallel local routes adjacent to A127 which are used by some travellers due to the delays along the A127 itself.

A number of public transport proposals have been put forward including a new Bus Link at Sumpters Way, a new bus access to Aviation Way, a new multi modal airport interchange and 4 new bus routes (described as routes A-D). The new interchange at the airport is designed subject to further design and feasibility but has the objective of improving connectivity at airport by providing a safe and convenient transfer between modes at this location including the railway station. This site will be focused upon the Manners Way and Harp House roundabout and Eastwoodbury Crescent.

In addition a high quality public transport (HQPT) bus corridor running from the airport to Southend-on-Sea town centre with a 10 minute frequency at peak times is also modelled in the do something scenario. All proposals are summarised in Table 2 including a summary of the model scenarios and differences between the do minimum and do something. All sites are displayed in Figure 5. Figure 6 provides a summary of the differences between current and proposed junction alignments in Rochford area and A127 corridor. This are diagrammatic drawings and to not reflect the actual designs for these junctions which are currently being progressed.

Table 2. Scenario Summary

Highway				
Location	**Transport Element**	**Description**	**2021 DM**	**2021 DS**
JAAP Site	Sutton Ford bridge	Signalisation to increase capacity		✔
	Hall Road / Cherry Orchard Way Junction	Capacity Improvement at the Hall Road / Cherry Orchard Way through additional lanes/roundabout circulatory capacity		✔
	The Ann Boleyn roundabout	Capacity Improvement at the Southend/Sutton Road roundabout through additional lanes/roundabout circulatory capacity		✔
	Sumpter's Way	Introduction of Bus Only Link/Walk & Cycle Link		✔
	Airport Multi Modal Interchange	To provide a convenient interchange between bus series serving Rochford/Southend, the new business parks, airport terminal and the railway station		✔
A127 Corridor	Kent Elms Junction	A127 Corridor Improvement scheme, designed to increase capacity through additional lanes/signal optimisation and improve pedestrian and cycle movements		✔
	Tesco Roundabout	A127 Corridor Improvement scheme, designed to increase capacity through additional lanes/signal optimisation and improve pedestrian and cycle movements – includes proposed link to Nestuda Way Business Park		✔
	Bell Junction	A127 Corridor Improvement scheme, designed to increase capacity through additional lanes/signal optimisation and improve pedestrian and cycle movements		✔
Accesses	JAAP Sites	Access to the JAAP Sites	✔	✔
	Rochford Housing Schemes	Access to the Housing Schemes	✔	✔
Public Transport				
Location	**Transport Element**	**Description**	**2021 DM**	**2021 DS**
Study area wide	Five New Proposed Bus Corridors (routes A to E, see figure 18)	Introduction of new bus corridors to connect the Southend & Rochford residential areas with the employment zones and housing sites near the JAAP area.		✔
Southend	High Quality Public Transport (HQPT) Corridor	Mass transit system running from London Southend Airport to Southend Town Centre		✔

Figure 4. Proposed Development Sites

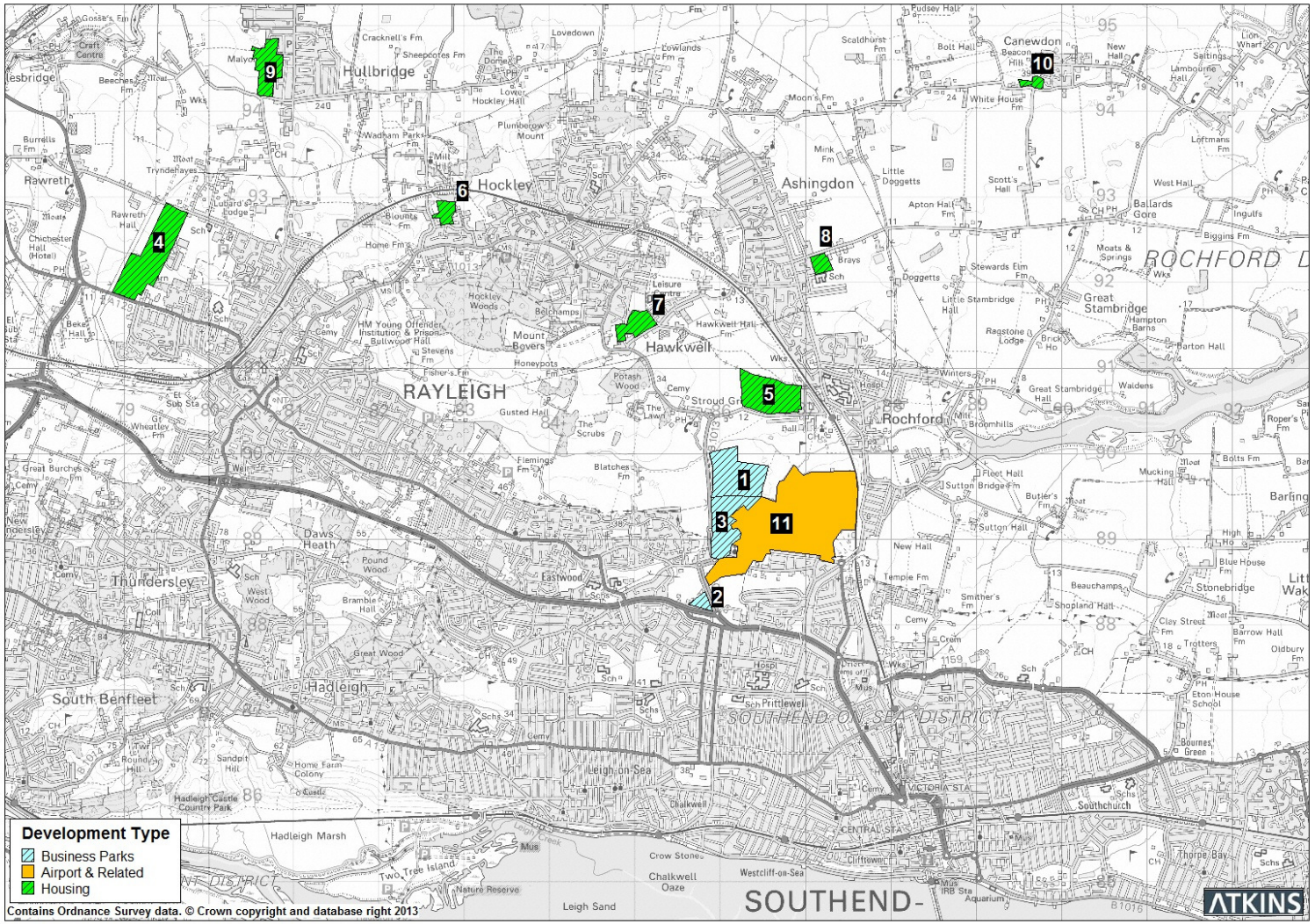


Figure 5. Proposed Infrastructure

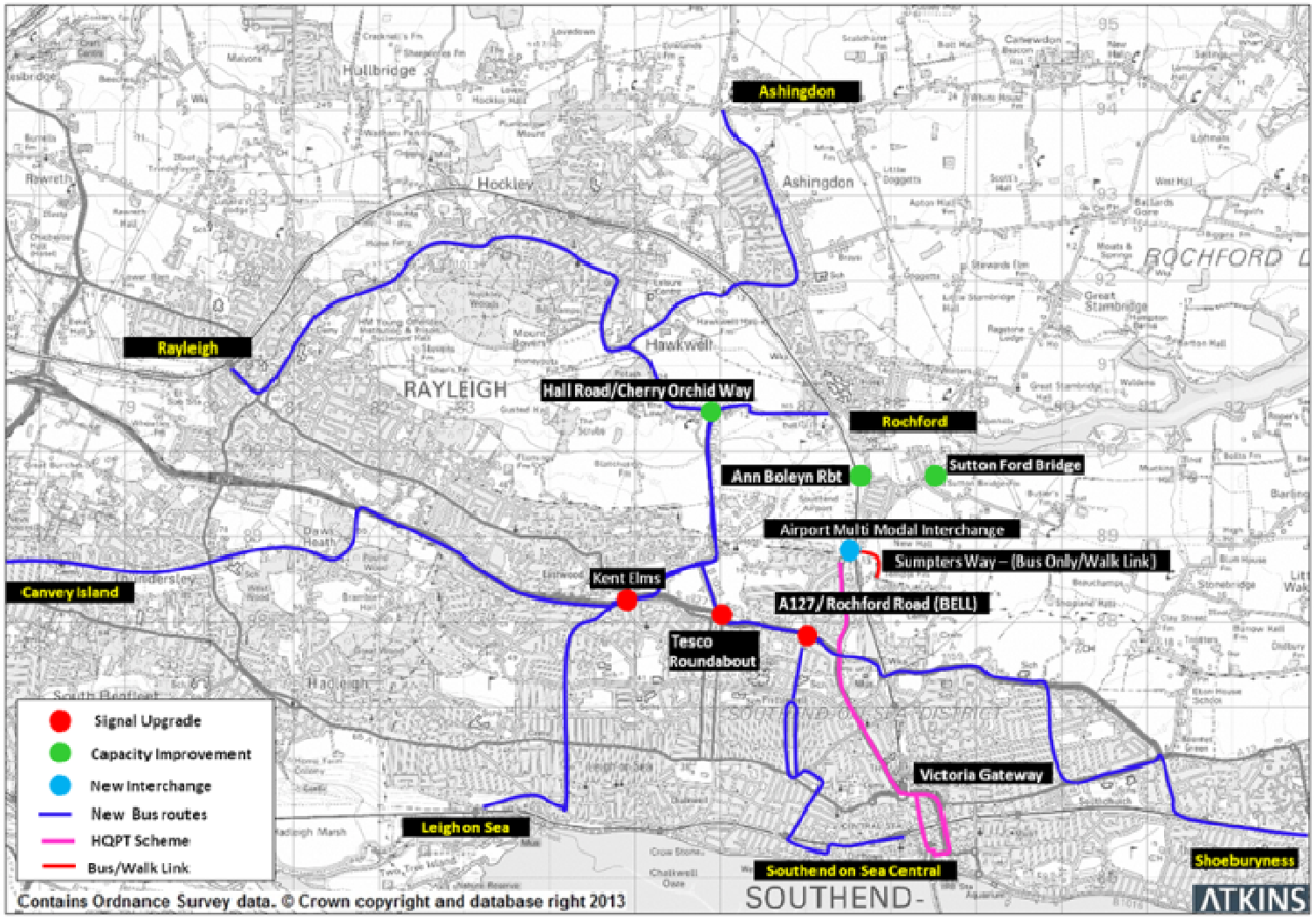


Figure 6. Junction Improvements - Existing vs Proposed

3. Forecast Model Inputs

This section describes the identification and processing of input data required to develop the representation of 2021 conditions.

3.1. Development Data (Local Planning Forecasts)

Table 1 lists development sites identified within the study area. Each of these includes a total development quantum to which a trip rate is assigned to estimate a total trip volume. This task is completed separately for each land use type, for example a housing development is likely to have a different trip pattern (in terms of arrival and departure) to an employment site. The table below displays the trip rates applied to development which is taken from the latest TRICS database (V6.9.1 - December 2011) of observed trip rates. Table 3 records the 12 hour two way trip rate for a selection of development adopted for this assessment.

Table 3. Adopted Development Trip Rates (TRICS) 12 hours (0700-1900)

Landuse (unit)	Total Person Trip Rate		Total Trip Rate (two way) Per Unit
	Arrivals	Departures	
B1(a) Business Park (per 100 Sqm GFA)	7.0	6.7	13.8
B1(c)Light Industrial (per 100 Sqm GFA)	4.9	4.8	9.7
B2 General Industrial (per 100 Sqm GFA)	3.7	3.9	7.6
B1/B2 Ind Unit (per job)	0.9	0.9	1.8
Student Accom (per Resident)	0.4	0.5	0.9
Private Houses (per unit)	3.7	3.9	7.6
Private Flats TC (per unit)	1.3	1.6	2.8
B1 Office (per 100 Sqm GFA)	5.4	5.2	10.6
A3 - Restaurants (per 100 Sqm GFA)	18.5	14.3	32.8
A1 - Food Retail (per 100 Sqm GFA)	103.2	99.2	202.3
D1 - Health Club (per 100 Sqm GFA)	12.5	10.6	23.1
Hotel (per room)	3.6	3.6	7.2
A1 -Non Food Retail (per 100 Sqm GFA)	38.8	38.4	77.2

Table 4 applies the trip rates listed in Table 3 to all developments identified for this assessment. In some cases the development is subdivided into different uses or types as illustrated by the subdivision of Saxon Business Park into slightly different office specifications. All trips are shown in person rather than vehicle trips as required by the structure of SoSMMM.

Table 4. Applied Trip Rates by Development (12 hours 0700-1900)

Site name	Type	Landuse	Quantum	Development Unit	Adopted Person Trip Rate (0700-1900)		2021 Total Person Trips (0700-1900)	
					Origin	Destination	Origin	Destination
JAAP Development								
Saxon Business Park1a	Office	B1(a) Business Park (GFA)	12000 sq metres	per 100 Sqm	6.75	7.05	810	846
	Office	B1(c)Light Industrial (GFA)	8017 sq metres	per 100 Sqm	4.84	4.89	388	391
Saxon Business Park 1b	Office	B1(a) Business Park (GFA))	23511 sq metres	per 100 Sqm	6.75	7.05	1587	1658
	Office	B1(c)Light Industrial (GFA)	15703 sq metres	per 100 Sqm	4.84	4.89	760	766
	Office	B2 General Industrial (GFA)	9795 sq metres	per 100 Sqm	3.9	3.68	382	360
Saxon Business Park 2	Office	B1(a) Business Park (GFA)	18000 sq metres	per 100 Sqm	6.75	7.05	1215	1269
	Office	B1(c)Light Industrial (GFA)	12004 sq metres	per 100 Sqm	4.84	4.89	581	586
Aviation Way	Office	B1(a) Business Park (GFA)	7200 sq metres	per 100 Sqm	6.75	7.05	486	508
	Office	B1(c)Light Industrial (GFA)	4814 sq metres	per 100 Sqm	4.84	4.89	233	235
	Office	B2 General Industrial (GFA)	3000 sq metres	per 100 Sqm	3.9	3.68	117	110
Nestuda Way	Office	B1(a) Business Park (GFA)	4800 sq metres	per 100 Sqm	6.75	7.05	324	338
	Office	B1(c)Light Industrial (GFA)	3203 sq metres	per 100 Sqm	4.84	4.89	155	156
	Office	B2 General Industrial (GFA)	2000 sq metres	per 100 Sqm	3.93	3.68	78	74
Total			124027sq metres				7116	7297
LDF Housing								
West Rochford Housing	Housing	Private Houses (Units)	600	Per Dwelling Unit	3.93	3.68	2358	2208
Rayleigh Housing	Housing	Private Houses (Units)	550	Per Dwelling Unit	3.93	3.68	2162	2024
West Hockley Housing	Housing	Private Houses (Units)	50	Per Dwelling Unit	3.93	3.68	197	184
South Hawkwell Housing	Housing	Private Houses (Units)	175	Per Dwelling Unit	3.93	3.68	688	644
East Ashingdon Housing	Housing	Private Houses (Units)	100	Per Dwelling Unit	3.93	3.68	393	368
SW Hullbridge Housing	Housing	Private Houses (Units)	250	Per Dwelling Unit	3.93	3.68	983	920
South Canewdon Housing	Housing	Private Houses (Units)	60	Per Dwelling Unit	3.93	3.68	236	221
Total			1785 DU				7017	6569
Airport Expansion	Based on external calculations- see Appendix D						2400	2400
LSA staff Airside facing		B1/B2 Ind Unit (Emp)	476	per Job	0.9	0.86	428	409
LSA staff MRO		B1/B2 Ind Unit (Emp)	626	per Job	0.9	0.86	563	538
Total			1102 jobs				991	947
All Sites Total							17524	17213

3.2. National Trip End Forecasts (TEMPRO)

The DfT's TEMPRO database provides all large scheme appraisals (broadly >£5million) with a reference for trip end growth within the study area between the base and forecast years. SoSMMM adopts a 2009 base year which was developed through the use of observed data i.e. road side interviews and the equivalent for public transport services. The model was validated against independent datasets and therefore produces an accurate representation of current travel demand. This demand is 'growthed' to levels representative of 2021 conditions using TEMPRO forecasts. This assessment uses version 6.2 of the TEMPRO database, the current release in line with present DfT guidance.

The use of trip data within the previous section (from local planning forecasts) adjusts the distribution of this growth to reflect the local planning view and therefore ensures trip growth is allocated to model zones most reflective of where development will likely occur. This process ensures the model assessment is as accurate as possible by allocating trip ends where future year development is identified. Further detail on this approach is described in section 4.

TEMPRO is disaggregated into numerous areas across the UK which are broadly in line with administrative boundaries for example the whole of Southend borough forms a single area. Rochford is divided into two separate areas or zones covering the town centre and rural areas. For the purposes of this assessment the whole of the UK is divided into 47 separate sectors of which the first 30 capture trips in Southend, Rochford and the rest of Essex. The TEMPRO dataset is aggregated into these sectors prior to its application within SoSMMM. These sectors are listed in Table 5, with the Southend, Rochford and surrounding sectors displayed in Figure 7.

Figure 7. Southend and surrounding TEMPRO Sectors

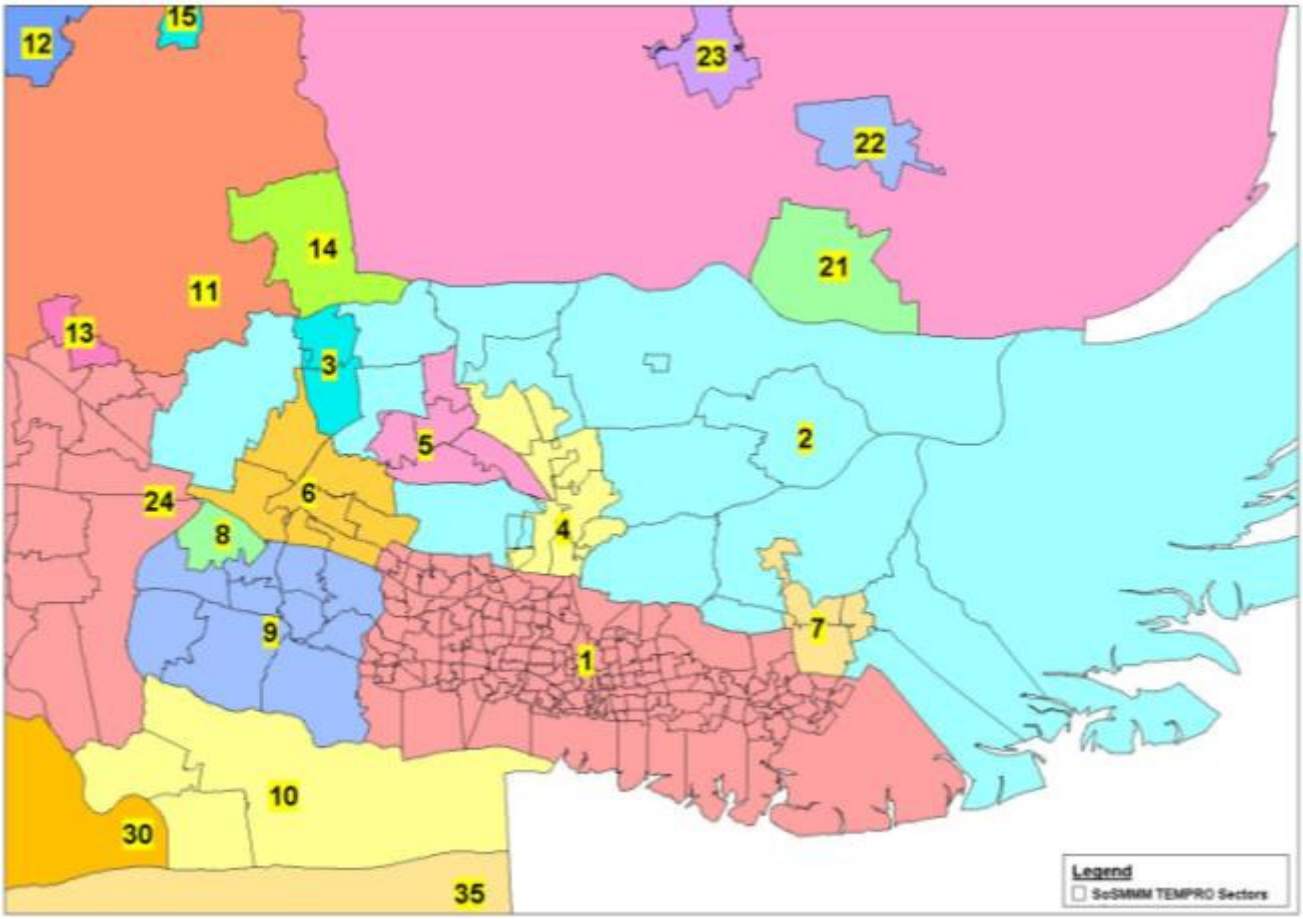


Table 5. TEMPRO Sectors

Sector	Description	Sector	Description
1	Southend-on-Sea	16	Writtle
2	Rochford Rural	17	Boreham
3	Hullbridge	18	Harlow
4	Rochford Town Centre	19	Maldon Rural
5	Hockley	20	Maldon
6	Rayleigh	21	Burnham-on-Crouch
7	Great & Little Wakering	22	Southminster
8	Castle Point Rural	23	Maylandsea
9	Benfleet	24	Basildon
10	Canvey Island	25	Braintree/Uttlesford
11	Chelmsford Rural	26	Brentwood
12	Chelmsford Town Centre	27	Colchester
13	Wickford	28	Epping Forest
14	South Woodham Ferrers	29	Tendring
15	Danbury/Little Baddow	30	Thurrock

Table 6 provides a summary of the net planning forecasts within the TEMPRO database which underpin the trip end forecasts within the dataset for sectors 1 to 5. Overall it can be seen that while population and households are growing at approximately 10% between 2009 and 2021. The growth in jobs and employment is less at approximately 5%.

Table 6. TEMPRO Planning Forecasts (v6.2)

Authority	Population (persons)				Households (dwelling)			
	2009	2021	Difference	% Difference	2009	2021	Difference	% Difference
Southend-on-Sea	166138	180945	14807	9%	75063	83910	8847	12%
Rochford Rural	6855	7355	500	7%	2725	2971	246	9%
Hullbridge	6493	7102	609	9%	2620	2891	271	10%
Rochford Town Centre	17103	18265	1162	7%	7235	7826	591	8%
Hockley	14358	15377	1019	7%	5851	6323	472	8%
Total	***210947***	***229044***	***18097***	***9%***	***93494***	***103921***	***10427***	***11%***
Authority	**Jobs**				**Workers**			
	2009	2021	Difference	% Difference	2009	2021	Difference	% Difference
Southend-on-Sea	65881	70196	4315	7%	79039	83136	4097	5%
Rochford Rural	2191	2259	68	3%	3495	3566	71	2%
Hullbridge	929	961	32	3%	3265	3374	109	3%
Rochford Town Centre	6325	6500	175	3%	8169	8247	78	1%
Hockley	3133	3259	126	4%	6930	7015	85	1%
Total	***78459***	***83175***	***4716***	***6%***	***100898***	***105338***	***4440***	***4%***

Table 7 provides a summary of the 24 hour trip end forecasts taken from TEMPRO for 2021 displayed in productions and attractions format. TEMPRO values are always recorded per 24 hour period whilst TRICS data is 12 hour (0700-1900). The table shows that TEMPRO records trips growing by approximately 10% between 2009 and 2021, achieving a rate of approximately 0.8% per annum.

Table 7. TEMPRO Trip End Forecasts (v6.2) 24 Hour Period

TEMPRO Sector	Productions				Attractions			
	2009	2021	Difference	% Difference	2009	2021	Difference	% Difference
Southend-on-Sea	195611	215167	19556	10%	183529	201958	18429	10%
Rochford Rural	8607	9186	579	7%	6119	6761	642	10%
Hullbridge	7452	8087	635	9%	2928	3261	333	11%
Rochford Town Centre	20379	21756	1377	7%	16065	17652	1587	10%
Hockley	16555	17662	1107	7%	8807	9725	918	10%
Total	***248604***	***271858***	***23254***	***9%***	***217448***	***239357***	***21909***	***10%***

3.3. Value of Time and Distance

Values of time and distance are used by the model to create a generalised cost for each journey. Values shown in Table 8 represent values per person used in the demand model element of SoSMMM whilst values shown in Table 9 are per vehicle and are used within the highway assignment model. In both cases values either taken directly or calculated from values contained in WebTAG unit 3.5.6.

Table 8. Person Values of Time (pence per minute, 2002 prices)

Purpose	2009	2021
Work	38.53	45.28
Non-Work	19.26	22.64

Table 9. Values of Time/Distance (pence per minute/per kilometre 2002 prices)

2009						
	AM		IP		PM	
Journey Purpose	PPM	PPK	PPM	PPK	PPM	PPK
Work	49.16	13.93	50.51	12.14	50.08	13.71
Non-Work	11.13	6.77	12.83	5.99	12.75	6.67
LGV	18.23	13.52	18.23	12.37	18.23	13.37
HGV	37.85	49.1	33.42	41.86	49.5	51.89
2021						
	AM		IP		PM	
Journey Purpose	PPM	PPK	PPM	PPK	PPM	PPK
Work	57.07	13.26	58.66	11.54	57.92	13.05
Non-Work	12.43	6.13	14.2	5.43	14.18	6.04
LGV	21.31	14.33	21.31	13.09	21.31	14.17
HGV	44.34	52.29	39.15	44.52	57.99	55.23

3.4. Public Transport Fare

Table 10 displays the historic changes in bus fares (in real terms without inflation). Changes in bus fares in future years were calculated using historical fare data taken from the Local Bus Fares Index by metropolitan area status and country: Great Britain, annual from 1995 (Source: DfT Fares Survey, Department for Transport statistics). This data source indicates an average growth in bus fares of c2% per annum, which was used in the model for future bus fare.

Table 10. Historical Growth in Bus Fares (real terms)

Year	Fare Index, (constant prices) 1995=100	Growth
1995	100	
1996	102.7	2.70%
1997	105.9	3.12%
1998	107.6	1.61%
1999	110.2	2.42%
2000	112	1.63%
2001	115.4	3.04%
2002	119.3	3.38%
2003	119.8	0.42%
2004	122.4	2.17%
2005	125.2	2.29%
2006	133.9	6.95%
2007	128.2	-4.26%
2008	129.5	1.01%
2009	141.4	9.19%
2010	136.5	-3.47%
Average		2.15%

Similarly, rail fares indices shown in Table 11 were derived for London and SE operators from data published in National Rail Trends yearbook 2010-2011. A linear rail fare growth of c1.5% p.a in constant prices was calculated up to 2011 as shown in Table 11, and was used in the model.

Table 11. Historical Growth in Rail Fares (real terms)

Year	Fares Index (Constant Prices) 2004=100	Growth
2004	100	
2005	101.6	1.56%
2006	103.7	2.14%
2007	104.5	0.73%
2008	106.3	1.70%
2009	113.3	6.66%
2010	109.8	-3.15%
2011	111.4	1.48%
Average		1.59%

3.5. LGV and HGV Growth

Whilst the demand model element of SoSMMM uses changes in generalised cost to predict future year highway and public trips, goods vehicles are excluded from this process and manually factored up from 2009 levels. Table 12 records the values used taken from the National Transport Model (NTM), the DfT's standard forecasting tool for LGV and HGV trips.

Table 12. LGV & HGV Growth Factors from 2009 (NTM Growth Factors v5 –RTF11)

Vehicle Type	2021
LGV	1.384
HGV	1.201

4. Reference Case Demand

The forecasting procedure takes reference case (RC) matrices as inputs to the model assessment, as well as a network specification. These matrices represent the 'first estimate' of future year demand before the demand model is run in forecast model i.e. prior to the calculation of traveller responses to changes in generalised cost such as congestion. Reference case matrices combine changes in trip levels from the base to forecast taken from TEMPRO with their distribution across the study area determined through analysis of the development schedule. This section describes the development of these matrices.

WebTAG Unit 3.15.2, para 5.7.8 states that trip end growth should be consistent with TEMPRO at the study area level, in order to allow consistency between different parts of the country when justifying transport proposals, as well as reducing the risk of optimism bias. Consequently, trip end growth was controlled to TEMPRO forecasts at the study area level, but distributed on the basis of the more detailed local planning data (provided in Table 1).

4.1. Matrix Segmentation

The base year SoSMMM matrices incorporates travel demand segmented into the following journey purposes for both highway and public transport travellers which are maintained in the reference case matrices for future year forecasts.

- Home based Employers Business (HBEB)
- Home based Other (HBO)
- Home based Work (HBW)
- Non Home based Employers Business (NHBEB)
- Non Home based Other (NHBO)

All of the above purposes are disaggregated into Car Available (CA) and Non Car Available (NCA) trips. All proportions were identified through the analysis of observed base year datasets, and shown in Table 13 . Forecast year trip ends extracted from TEMPRO and development trips determined through the application of trip rates (TRICS) are segmented using the same purposes/car availability proportions given below.

Table 13. Purpose Proportions by Mode (Base year observed)

Segmentation by person type			
	AM	**IP**	**PM**
CA	94.56%	93.32%	98.70%
NCA	5.44%	6.68%	1.30%
Highway			
Purpose	**AM**	**IP**	**PM**
HBW	35.32%	17.07%	23.47%
HBEB	4.67%	4.60%	2.82%
HBO	45.52%	49.13%	33.95%
NHBEB	5.94%	12.81%	15.10%
NHBO	8.55%	16.39%	24.66%
Public Transport			
Purpose	**AM**	**IP**	**PM**
HBW	65.35%	17.21%	37.98%
HBEB	2.60%	1.21%	5.10%
HBO	27.99%	67.35%	32.88%
NHBEB	1.24%	1.71%	4.87%
NHBO	2.81%	12.52%	19.18%

4.2. Matrix Build Procedure

The procedure used to build the reference case matrix is summarised as follows:

- Calculate a growth factor for trips (by mode and journey purpose segment) by comparing TEMPRO base (2009) and forecast (2021) trip ends within the study area,
- Produce reference case demand matrices by furnessing the base demand to the forecast trip ends excluding sites with new development,
- For new development sites (Greenfield sites) a gravity model is used to obtain a trip distribution which is applied to trip end totals, and
- In the final stage combine forecast trip ends and Greenfield sites forming reference case demand which in turn is segmented by mode and time period using base year proportions.

4.2.1. Growth Factors

Growth factors are calculated in line with WebTAG guidance which suggests the calculation of separate factors by journey purpose and car availability segments. The steps involved in creating background growth are:

- aggregate base Production/Attraction (P/A) trip ends,
- extract TEMPRO base year trip ends and future year trip ends at an all-day and all-modes level in P/A format, and
- calculate forecast year background trip ends by purpose and by car availability by applying TEMPRO growth factors to base P/A trip ends.

Table 14 displays TEMPRO 24 hour trip end totals (P/A level) for Southend-on-Sea and surrounding authorities, repeating Table 7.

Table 14. TEMPRO Background Growth 24 Hour PA Level (all modes)

TEMPRO Sector	Productions				Attractions			
	2009	2021	Difference	% Difference	2009	2021	Difference	% Difference
Southend-on-Sea	195611	215167	19556	10%	183529	201958	18429	10%
Rochford Rural	8607	9186	579	7%	6119	6761	642	10%
Hullbridge	7452	8087	635	9%	2928	3261	333	11%
Rochford Town Centre	20379	21756	1377	7%	16065	17652	1587	10%
Hockley	16555	17662	1107	7%	8807	9725	918	10%
Total	248604	271858	23254	9%	217448	239357	21909	10%

4.2.2. Distribution of Growth within the Study Area

Development trip ends shown in Table 4 were converted from Origin/Destination (O/D) format to P/A format in line with the structure of the demand model element of SoSMMM. The conversion uses factors shown below calculated through the comparison of O/D and P/A totals within TEMPRO (v6.2) for relevant authority sectors.

- Origin to Production = 0.593
- Destination to Attraction = 0.507

Table 15. Development Trip ends PA Level (all modes)

TEMPRO Sector	Origin	Destination	Production	Attraction
Southend-on-Sea	557	568	330	288
Rochford Rural	10479	10329	6214	5237
Hullbridge	983	920	583	466
Rochford Town Centre	4620	4567	2740	2315
Hockley	885	828	525	420
Total	17524	17212	10392	8726

In the next stage development trip ends shown above are removed from the TEMPRO background P/A trip ends allowing the calculation of a revised background growth factor. In effect this step ensures that calculated trip ends for development sites are fully represented leaving a residual growth factor for non development zones. In some cases this will result in negative growth for existing trips, for example when significant development occurs at any one location a change in underlying trip patterns and a redistribution of trips will occur in future years with the development in place.

Table 16 displays the growth factors applied to non development zones following the removal development trips identified in Table 15. In some cases there is a reduction in existing trips once development trips have been added to the matrices reflecting a redistribution of trips in future years with development in place.

Table 16. TEMPRO 24hr Reduced Background Growth (Development Trips removed)

	Production				Attraction			
TEMPRO Sector	2009	2021	Difference	% Difference	2009	2021	Difference	% Difference
Southend-on-Sea	195611	214837	19226	10%	183529	201670	18141	10%
Rochford Rural	8607	2972	-5635	-65%	6119	1524	-4595	-75%
Hullbridge	7452	7504	52	1%	2928	2795	-133	-5%
Rochford Town Centre	20379	19016	-1363	-7%	16065	15337	-728	-5%
Hockley	16555	17137	582	4%	8807	9305	498	6%
Total	248604	261466	12862	5%	217448	230631	13183	6%

Table 17 shows the final reference case totals by five TEMPRO sectors. 2009 trip totals taken from the model are below those recorded in WebTAG reflecting the different development approaches i.e. TEMPRO data is extrapolated from 2001 census data while the 2009 model matrices are constructed from observed datasets (road side interviews).

The values shown are in general slightly higher than the level of growth shown in Table 14 recorded in TEMPRO. This reflects the implementation of growth factors individually by journey purpose and segment to

model matrices whilst the TEMPRO derived factor reflects all trips. Overall it can be seen that the growth value of 12% growth is achieved for Southend-on-Sea is comparable to 10% recorded in TEMPRO. At other locations growth is typically higher reflecting that these areas of the model are not fully observed within the base year matrices and therefore trip end growth (with development) as a proportion of total trips tends to be greater.

Table 17. Forecast Trip End Growth from Base Year

	Production				Attraction			
TEMPRO Sector	2009	2021	Difference	% Difference	2009	2021	Difference	% Difference
Southend-on-Sea	179568	201576	22008	12%	179617	201603	21986	12%
Rochford Rural	4903	11447	6544	133%	4582	10292	5710	125%
Hullbridge	1496	2192	696	47%	992	1570	578	58%
Rochford Town Centre	15146	17123	1977	13%	16198	18315	2117	13%
Hockley	6939	7963	1024	15%	4485	5375	890	20%
Total	208052	240301	32249	16%	205874	237155	31281	15%

4.2.3. Furnessing Trip Ends

Furnessing is a process whereby the production and attraction ends of the journey are applied and balanced when applied to the base year matrices to develop the forecast year RC. This process uses the trip end targets shown in Table 17. Once furnessed the RC matrix was then segmented by mode and time period using base year proportions. Table 18 records the reference case matrices across the entire model area at P/A and O/D format by mode. 2021 RC demand at a PA and OD level by 15 sectors is provided in Appendix A.

Table 18. Reference Case (RC) Demand Whole Model

PA Level					OD Level				
AM Peak Period (0700-1000)									
Mode	**2009**	**2021 RC**	**Difference**	**% Difference**	**Mode**	**2009**	**2021 RC**	**Difference**	**% Difference**
Car	72721	82589	9868	14%	Car	80085	89917	9832	12%
Bus	9071	9836	765	8%	Bus	9807	10648	841	9%
Rail	10434	12135	1701	16%	Rail	11065	12884	1819	16%
Total	92226	104560	12334	13%	All	100957	113449	12492	12%
Inter-Peak Period (1000-1600)									
Mode	**2009**	**2021 RC**	**Difference**	**% Difference**	**Mode**	**2009**	**2021 RC**	**Difference**	**% Difference**
Car	109178	124615	15437	14%	Car	154339	176446	22107	14%
Bus	16391	18547	2156	13%	Bus	23915	26835	2920	12%
Rail	3668	4220	552	15%	Rail	6758	7807	1049	16%
Total	129236	147383	18147	14%	All	185012	211087	26075	14%
PM Peak Period (1600-1900)									
Mode	**2009**	**2021 RC**	**Difference**	**% Difference**	**Mode**	**2009**	**2021 RC**	**Difference**	**% Difference**
Car	39639	45287	5648	14%	Car	87865	97115	9250	11%
Bus	462	564	102	22%	Bus	8228	9122	894	11%
Rail	3221	3787	566	18%	Rail	9638	11150	1512	16%
Total	43322	49638	6316	15%	All	105732	117387	11655	11%
All Day (0700-1900)									
Mode	**2009**	**2021 RC**	**Difference**	**% Difference**	**Mode**	**2009**	**2021 RC**	**Difference**	**% Difference**
Car	221538	252491	30953	14%	Car	322289	363478	41189	13%
Bus	25925	28948	3023	12%	Bus	41950	46605	4655	11%
Rail	17322	20142	2820	16%	Rail	27461	31841	4380	16%
Total	264785	301581	36796	14%	All	391700	441924	50224	13%

4.3. Trip Distribution for Development Sites

Where the development trips (Table 4) are located at a zone that is populated in the base year model i.e. existing sites such as Aviation Way, the distribution of trips in 2021 is retained from 2009. This is referred to as a brownfield site distribution. Where new sites are identified (referred as greenfield) a distribution is not available and hence one must be determined. This is overcome by using a gravity model where the attractiveness of a destination is a function of the relative importance of that destination, and a deterrence of travel e.g. distances, time, cost etc. The RC rather than base case demand is used in this calculation in combination with the generalised cost of travel taken from highway matrices for HBW. The output is a synthetic matrix where development trip ends are distributed throughout the study area for assignment. It is to be noted that in case of greenfield zones the gravity formulation is absolute and not incremental as there are no base trips available. The formulation adopted for distributing trips for greenfield sites is described in the box below.

Gravity Model Formulation

The Gravity Model Distribution is based on the Newton's gravitational formula, and in transport modelling, the trip distribution takes the following form:

$$T_{ij} = O_i \,.\, Dj \,.\, f(C_{ij})$$

Where:

- T_{ij} is the number of trips between origin and destination.
- Oi is the total trips generated at origin and is the number of trips attracted to destination. (the reference tripends in our case)
- f (C_{ij}) is called the deterrence function (a generalised function of the travel cost) based on the cost of travel between O and D.

The distribution model uses a log-normal (or negative exponential) form of the deterrence function as follows:

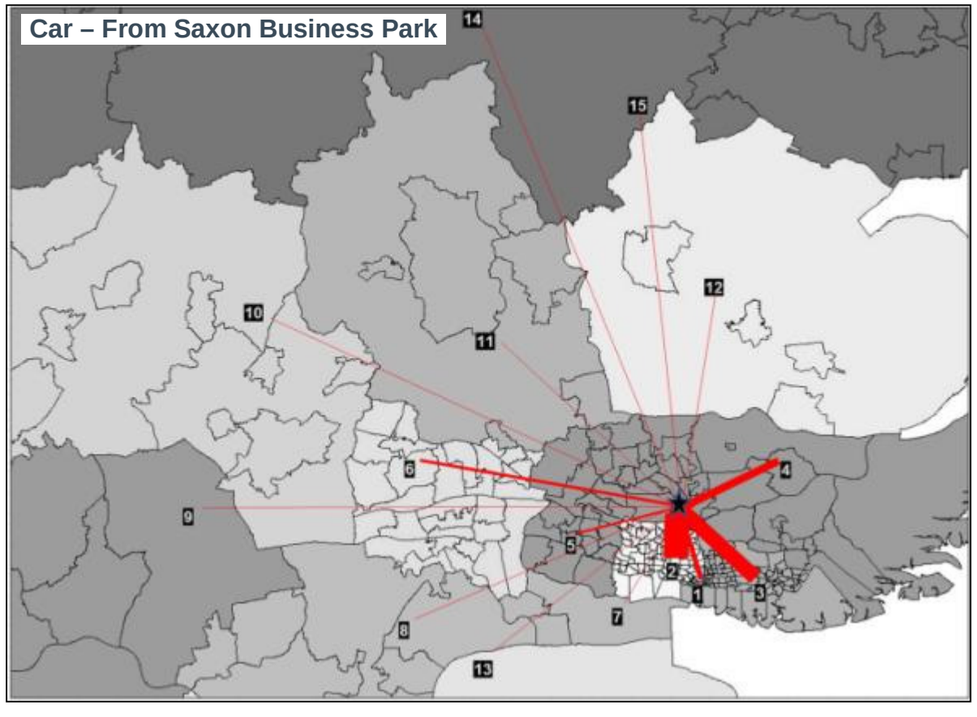
$$f(C_{ij}) = \exp(\lambda \,.\, Cij)$$

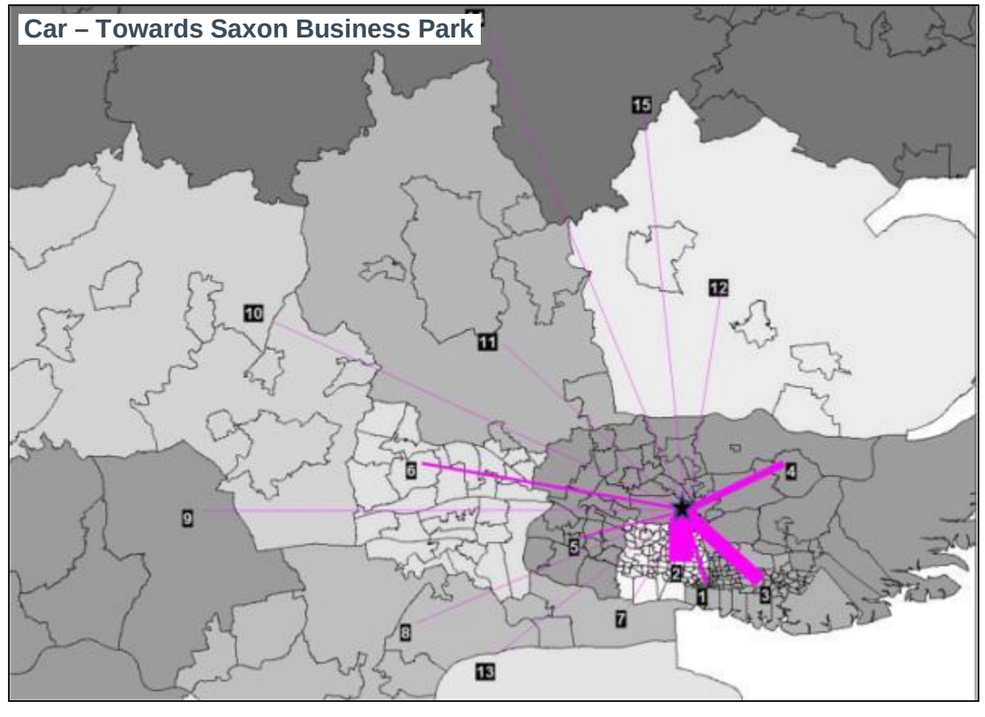
Where

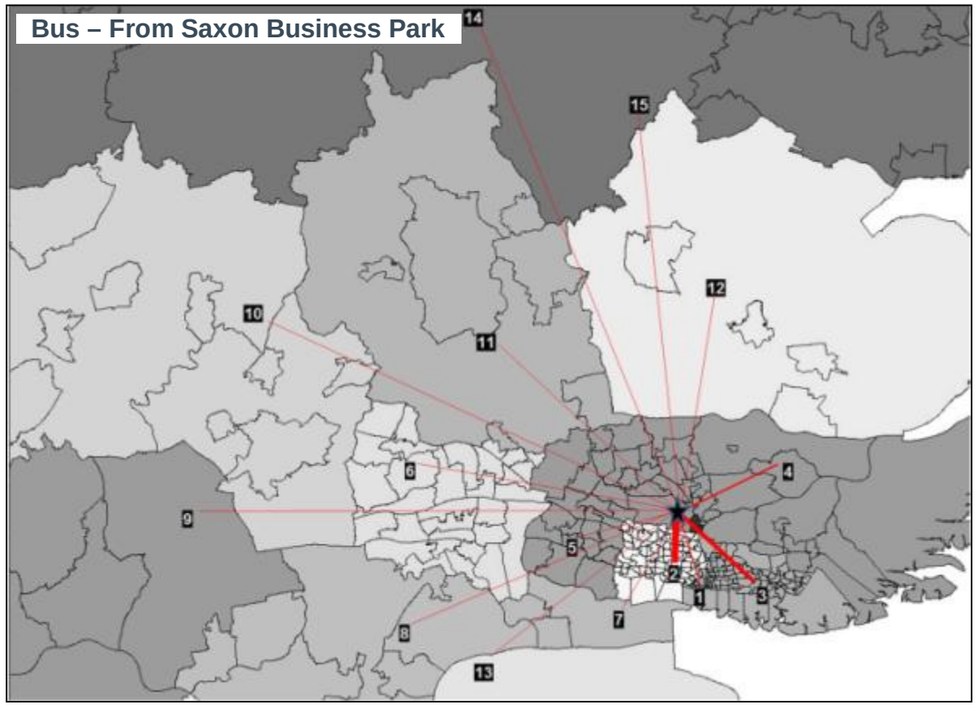
- λ is a measure of people's sensitivity to travel costs.
- C_{ij} – in our case is the Base Highway HBW distance skim

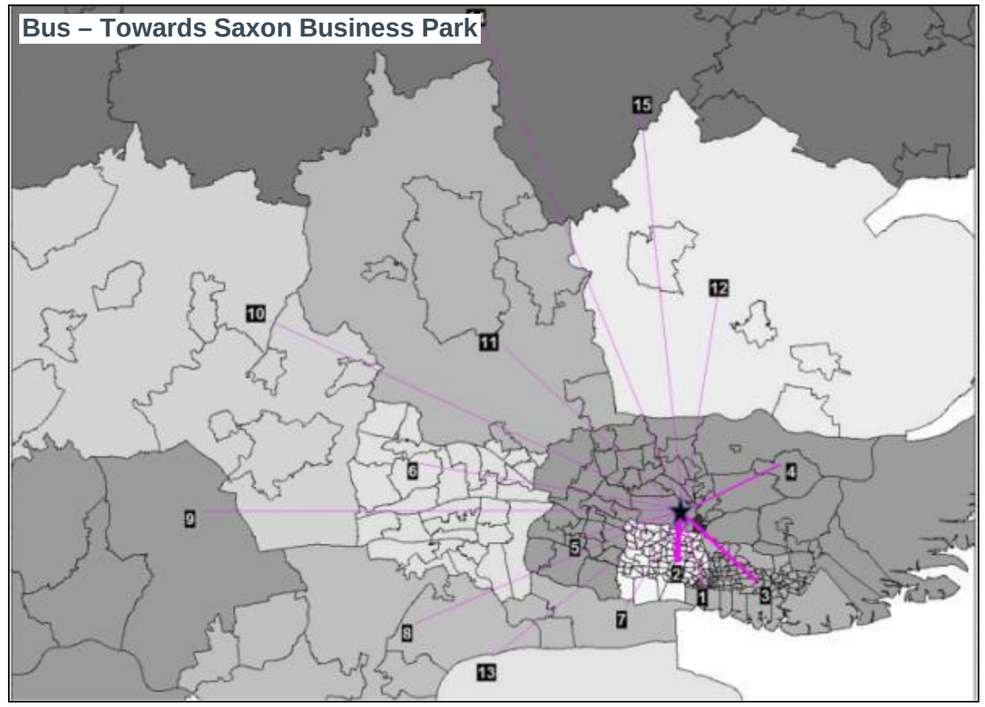
The 2021 12 hour distribution of car and bus trips to and from Saxon Business Park is illustrated in Figure 8 below.

Figure 8. **Distribution of Car and Bus trips to and from Saxon Business Park 2021 (12 hour OD level)**









5. Forecast Model Outputs

5.1. Model Convergence

Demand model convergence is measured by the change in travel made between two zone pairs in successive iterations of the demand model. This contrasts to the link based assessment used for highway models. In transport economics, the demand and supply curves relate the volume of travel with generalised cost and hence, the actual volume of travel must be the point where the two curves cross; known as the 'equilibrium' point. At equilibrium, the demand of travel is consistent with the network performance and other supply effects in servicing that level of demand. Convergence measures how far the demand model iteration is from this equilibrium.

Convergence of the demand model is measured by the % gap between supply and demand curves. Perfectly converged models would have a % gap of zero and WebTAG guidance recommends values of less that 0.2% (unit 3.10.4). It is shown in the table below that convergence of 0.14% or better is obtained for all runs. This is an important consideration in demand modelling as high levels of model convergence go some way to removing 'model noise'. In the case of the Southend model the level of convergence reached is sufficient to restrict the impacts of this to a minimum ultimately improving the quality of the assignment as shown by Table 19 below.

Table 19. Demand Model Convergence

Model	Convergence after Loop	% Gap
	2021	
Do Minimum	15	0.1398
Do Something	13	0.0941

The highway model assignment adopts a convergence criteria based upon the % flows and gap criteria's. The "% flows" reports the proportion of assignment links where assigned flows changes by less than 1% (or, strictly speaking, less than PCNEAR %) from one simulation assignment loop to the next. This is a somewhat arbitrary function but one which has been used in SATURN from the beginning of the software release and has thereby acquired a certain historical momentum.

The "% gap" is a more stringent stopping criterion to terminate assignment simulation loops and includes the interaction effects within the simulation. It is, firstly, the difference between the current total vehicle costs on the assigned routes and the total vehicle costs if all drivers were to use minimum cost routes with the costs fixed. This measure is then "normalised" by dividing by the total vehicle costs and expressing it as a %.Therefore the lower the value the better the level of convergence reached. A gap of under 1% can be regarded as satisfactory. A gap value of under 0.1% is regarded as a suitable target and is adopted for the Southend-on-Sea multi modal model.

Table 20 reports the highway convergence. In all cases the % gap is less than 0.1% and the %flows exceed 90% in all cases. This demonstrates a good level of convergence. The nature of the public transport model assignment (i.e. without capacity restraint) means that very high levels of convergence are always reached and thus are not reported below.

Table 20. Highway Model Convergence

Criteria	AM Peak		
	2009	2021 DM	2021 DS
Convergence after loop #	13	16	2
% flows differing by<1%	94.8	96.8	99.6
% Gap	0.013	0.026	0.01
Criteria	**Inter Peak**		
	2009	2021 DM	2021 DS
Convergence after loop #	8	9	2
% flows differing by<1%	92.6	90.9	99.4
% Gap	0.005	0.019	0.002
Criteria	**PM Peak**		
	2009	2021 DM	2021 DS
Convergence after loop #	7	25	2
% flows differing by<1%	98.7	96.3	98
% Gap	0.002	0.033	0.003

5.2. Demand Response

Whilst the demand model operates in P/A format the assignment of trips is made in O/D format and hence matrices in this format are presented below. Table 21 displays the trips totals at an O/D level for each of the three modes represented in the model car, bus and rail trips. Totals are shown for the base and for both 2021 forecast year scenarios across the entire model area. The data is presented in person trips. The results are provided by assignment hours and for 12 hours between 0700 and 1900. Table 22 displays the corresponding trip proportions.

Table 21. Trips by Mode (Whole Model Area)

OD Level						
AM Peak Hour (0800-0900)						
Mode	**2009**	**2021 RC**	**2021 DM**	**% Growth from 2009**	**2021 DS**	**% Growth from 2009**
Car	30267	34439	34208	13%	34367	14%
Bus	3020	3280	3308	10%	3436	14%
Rail	3563	4148	3927	10%	3807	7%
Total	36850	41867	41443	12%	41611	13%
Average Inter- Peak Hour (1000-1600)						
Mode	**2009**	**2021 RC**	**2021 DM**	**% Growth from 2009**	**2021 DS**	**% Growth from 2009**
Car	25724	29408	29586	15%	29561	15%
Bus	3994	4481	4356	9%	4470	12%
Rail	1128	1304	1223	8%	1184	5%
Total	30846	35193	35166	14%	35215	14%
PM Peak Hour (1700-1800)						
Mode	**2009**	**2021 RC**	**2021 DM**	**% Growth from 2009**	**2021 DS**	**% Growth from 2009**
Car	30623	33477	33458	9%	33403	9%
Bus	2913	3229	3242	11%	3344	15%
Rail	3441	3981	3770	10%	3681	7%
Total	36977	40687	40470	9%	40428	9%
All Day (0700-1900)						
Mode	**2009**	**2021 RC**	**2021 DM**	**% Growth from 2009**	**2021 DS**	**% Growth from 2009**
Car	322289	363478	363889	13%	363995	13%
Bus	41950	46605	45986	10%	47371	13%
Rail	27461	31841	30077	10%	29223	6%
Total	391700	441924	439953	12%	440589	12%

Table 22. Trips by Mode Proportions (Whole Model)

OD Level				
AM Peak Hour				
Mode	**2009**	**2021 RC**	**2021 DM**	**2021 DS**
Car	82.14%	82.26%	82.54%	82.59%
Bus	8.20%	7.83%	7.98%	8.26%
Rail	9.67%	9.91%	9.47%	9.15%
Total	100.00%	100.00%	100.00%	100.00%
Average Inter- Peak Hour				
Mode	**2009**	**2021 RC**	**2021 DM**	**2021 DS**
Car	83.39%	83.56%	84.13%	83.95%
Bus	12.95%	12.73%	12.39%	12.69%
Rail	3.66%	3.71%	3.48%	3.36%
Total	100.00%	100.00%	100.00%	100.00%
PM Peak Hour				
Mode	**2009**	**2021 RC**	**2021 DM**	**2021 DS**
Car	82.82%	82.28%	82.67%	82.62%
Bus	7.88%	7.94%	8.01%	8.27%
Rail	9.31%	9.78%	9.31%	9.11%
Total	100.00%	100.00%	100.00%	100.00%
All Day (0700-1900)				
Mode	**2009**	**2021 RC**	**2021 DM**	**2021 DS**
Car	82.28%	82.25%	82.71%	82.62%
Bus	10.71%	10.55%	10.45%	10.75%
Rail	7.01%	7.21%	6.84%	6.63%
Total	100.00%	100.00%	100.00%	100.00%

It can be seen from Table 21 that trip numbers increase by 2021 in line with expectations for all modes. The 12 hour trip totals record a greater number of trips in the do something scenario suggesting a higher level of capacity within this network. When mode proportions are considered it can be seen that the do minimum records broadly comparable numbers to the 2009 model. The do something scenario achieves an increase in bus trips with a slight reduction in rail, overall car proportions are stable. Overall the changes recorded are shown to be small. 2021 forecast year demand at a PA and OD level by 15 sectors is provided in Appendix B.

5.2.1. JAAP Site

For comparative purposes, trips and mode share for the JAAP site consisting of Saxon Business Park, Nestuda Way Business Park, Aviation Way Business Park and the Airport are presented in Table 23 and Table 24.

Table 23. Trips by Mode (JAAP Area)

OD Level						
AM Peak Hour (0800-0900)						
Mode	**2009**	**2021 RC**	**2021 DM**	**% Growth from 2009**	**2021 DS**	**% Growth from 2009**
Car	872	1987	1969	126%	1974	126%
Bus	18	223	311	1628%	372	1967%
Rail	9	223	69	667%	63	600%
Total	899	2433	2349	161%	2408	168%
Average Inter- Peak Hour (1000-1600)						
Mode	**2009**	**2021 RC**	**2021 DM**	**% Growth from 2009**	**2021 DS**	**% Growth from 2009**
Car	815	1781	1792	120%	1784	119%
Bus	28	349	369	1218%	425	1418%
Rail	8	74	23	188%	22	175%
Total	851	2204	2184	157%	2231	162%
PM Peak Hour (1700-1800)						
Mode	**2009**	**2021 RC**	**2021 DM**	**% Growth from 2009**	**2021 DS**	**% Growth from 2009**
Car	1148	2177	2184	90%	2169	89%
Bus	24	255	328	1267%	376	1467%
Rail	21	217	70	233%	65	210%
Total	1192	2649	2581	117%	2610	119%
All Day (0700-1900)						
Mode	**2009**	**2021 RC**	**2021 DM**	**% Growth from 2009**	**2021 DS**	**% Growth from 2009**
Car	10488	22198	22234	112%	22156	111%
Bus	295	3534	4143	1304%	4813	1532%
Rail	134	1739	548	309%	506	278%
All	10918	27471	26925	147%	27475	152%

Table 24. Trips by Mode Proportions (JAAP Area)

OD Level				
AM Peak Hour				
Mode	**2009**	**2021 RC**	**2021 DM**	**2021 DS**
Car	96.99%	81.69%	83.84%	81.98%
Bus	2.04%	9.16%	13.23%	15.43%
Rail	0.97%	9.15%	2.93%	2.60%
Total	100.00%	100.00%	100.00%	100.00%
Average Inter- Peak Hour				
Mode	**2009**	**2021 RC**	**2021 DM**	**2021 DS**
Car	95.74%	80.82%	82.04%	79.97%
Bus	3.32%	15.84%	16.89%	19.05%
Rail	0.94%	3.34%	1.07%	0.98%
Total	100.00%	100.00%	100.00%	100.00%
PM Peak Hour				
Mode	**2009**	**2021 RC**	**2021 DM**	**2021 DS**
Car	96.24%	82.20%	84.61%	83.12%
Bus	1.98%	9.62%	12.69%	14.40%
Rail	1.78%	8.17%	2.70%	2.48%
Total	100.00%	100.00%	100.00%	100.00%
All Day (0700-1900)				
Mode	**2009**	**2021 RC**	**2021 DM**	**2021 DS**
Car	96.06%	80.81%	82.58%	80.64%
Bus	2.71%	12.86%	15.39%	17.52%
Rail	1.23%	6.33%	2.04%	1.84%
Total	100.00%	100.00%	100.00%	100.00%

The tables above for the JAAP site indicate the contribution of improved public transport provision in the form of bus services on significantly increasing bus and decreasing highway mode share. Mode share for bus services increases by approximately 2% in all peaks. The largest fall in highway mode share is recorded in the average interpeak hour which sees an approximate 3% fall.

5.2.2. Saxon Business Park

For comparative purposes, trips and mode share at a 12 hour level (0700-1900) for the Saxon Business Park are presented in Table 25 below. The table records a slightly higher volume of trips in the do something scenario likely reflecting additional network capacity. Where high levels of congestion exist the model will typically adjust forecasts for trip distribution i.e. if approach to the business park makes it a less attractive destination (through congestion) then alternative (lower cost) destinations will be considered. It is noticeable that the proportion of bus users is significantly higher in the do something scenario and these travellers represent the majority of trip increase likely reflecting the enhanced level of public transport provision through the four new bus routes in this scenario.

Table 25. Trips Saxon Business Park by Mode/Proportion

OD Level					
All Day (0700-1900)			All Day (0700-1900)		
Mode	2021 DM	2021 DS	Mode	2021 DM	2021 DS
Car	7671	7643	Car	83.61%	79.84%
Bus	1289	1757	Bus	14.04%	18.35%
Rail	216	174	Rail	2.35%	1.81%
Total	9175	9574	All	100.00%	100.00%

Table 26 illustrates the numbers of rail travellers accessing the Saxon Business Park. Overall it can be seen that the number of travellers is relatively low reflecting the position of the site without direct access to a rail station. All trips shown in the table below access or egress the site via a bus based trip.

Table 26. Rail Trips Accessing Saxon Business Park

Peak Hr	From Saxon		To Saxon	
	2021 DM	2021 DS	2021 DM	2021 DS
AM	15	11	12	11
IP	4	3	4	4
PM	14	12	14	11

5.3. Highway Conditions

5.3.1. Journey Times

Figure 9 displays the two routes identified to analyse highway journey times. These routes are the A127 corridor from the borough boundary through to Priory Crescent and the HQPT corridor from the airport towards the Town Centre. Table 27 and Table 28 detail a comparison of highway journey times between the base year and the two forecast year scenarios for all peaks. When times along the A127 are compared to 2009, it can be observed that journey times are quicker in do something for all cases excluding the eastbound PM peak. Times for the do something scenario are broadly comparable or better than the 2009 equivalent demonstrating the increase of capacity along this through the upgrade to A127 junctions.

Table 27. Highway Journey Times A127 Borough Boundary to Cuckoo Corner

Route	AM Peak			
	Direction	2009	2021 DM	2021 DS
Along A127 (Borough Boundary to Cuckoo Corner)	EB	00:13:09	00:14:47	00:13:12
	WB	00:16:24	00:17:02	00:16:07
	IP Peak			
	Direction	2009	2021 DM	2021 DS
	EB	00:10:05	00:09:56	00:08:40
	WB	00:11:52	00:11:53	00:11:03
	PM Peak			
	Direction	2009	2021 DM	2021 DS
	EB	00:13:24	00:13:32	00:14:31
	WB	00:14:31	00:14:26	00:12:38

Table 28. Highway Journey Times HQPT Corridor

Route	AM Peak			
	Direction	Base	2021 DM	2021 DS
Southend Airport to HQPT Terminus	NB	00:09:38	00:10:42	00:10:31
	SB	00:13:23	00:17:30	00:18:25
	IP Peak			
	Direction	Base	2021 DM	2021 DS
	NB	00:07:48	00:09:25	00:09:28
	SB	00:11:10	00:12:42	00:12:56
	PM Peak			
	Direction	Base	2021 DM	2021 DS
	NB	00:10:16	00:10:45	00:10:54
	SB	00:12:33	00:14:23	00:16:07

Along the HQPT corridor route journey times are shown to be broadly comparable between 2021 scenarios during the inter peak and northbound peak directions. Southbound during the AM and PM peak journey times are slightly higher in the do something scenario likely reflecting the priority provided to HQPT vehicles acting to the detriment to other highway users.

5.3.2. Vehicle Flows

Figure 10 and Figure 11 display highway flow comparisons for the AM and PM peaks respectively. It is demonstrated that in both peaks the vehicle flow along the A127 increases in the do something scenario, likely reflecting the increases in capacity discussed in the previous section. Flows along Sutton and Southend road to the east of the airport site are shown to reduce in both peaks and in part evidence suggests that many of these trips have transferred to the A127 to take advantage of the improved journey times. The improvements at the Bell Junction (A127/Rochford Road) appear to make the A127 and Rochford Road route more attractive whereas previously traffic used the alternative of turning left at the Tesco roundabout (A127/Nestuda Way) before accessing Eastwoodbury lane. Flows on routes running parallel to the A127 are also shown to decrease which suggests traffic is also reassigning to the A127 from these routes.

5.3.3. Delays

Figure 12 and Figure 13 display a comparison of node delays recorded between the do minimum and do something scenarios for the AM and PM peak respectively. During the AM peak it can be observed that the significant delays at the Bell Junction (A127/Rochford Road) are improved following the implementation of the junction upgrade. Delays on routes away from the A127 typically improve as flows reassign to the strategic corridor. A similar pattern is observed in the PM but in this case the most significant improvement is observed at the Kent Elms (A127/A1015) junction.

Figure 9. Route Map: Highway Journey Time Routes

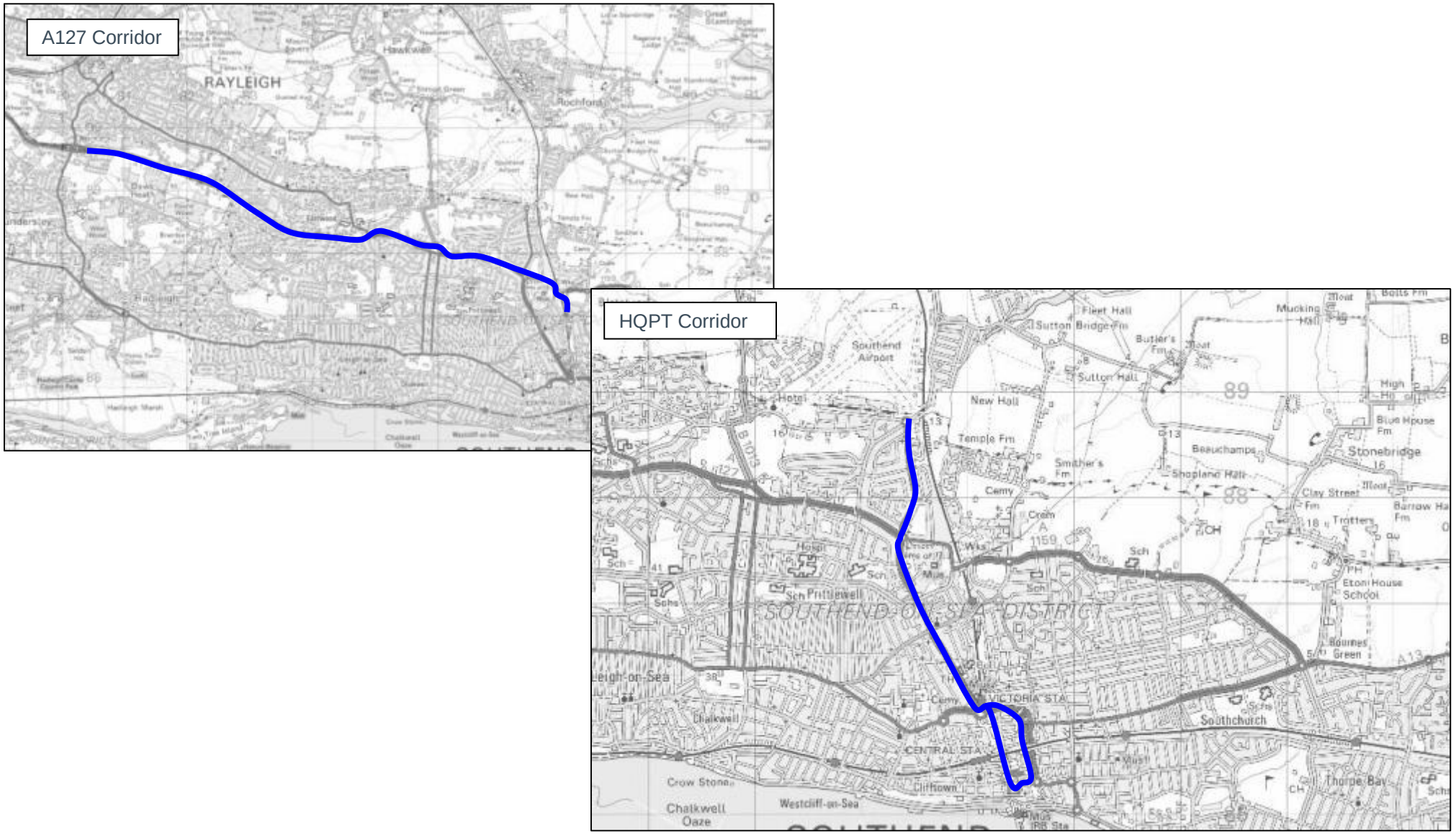


Figure 10. Highway Flow Difference (Do Something – Do Minimum) AM Peak 2021

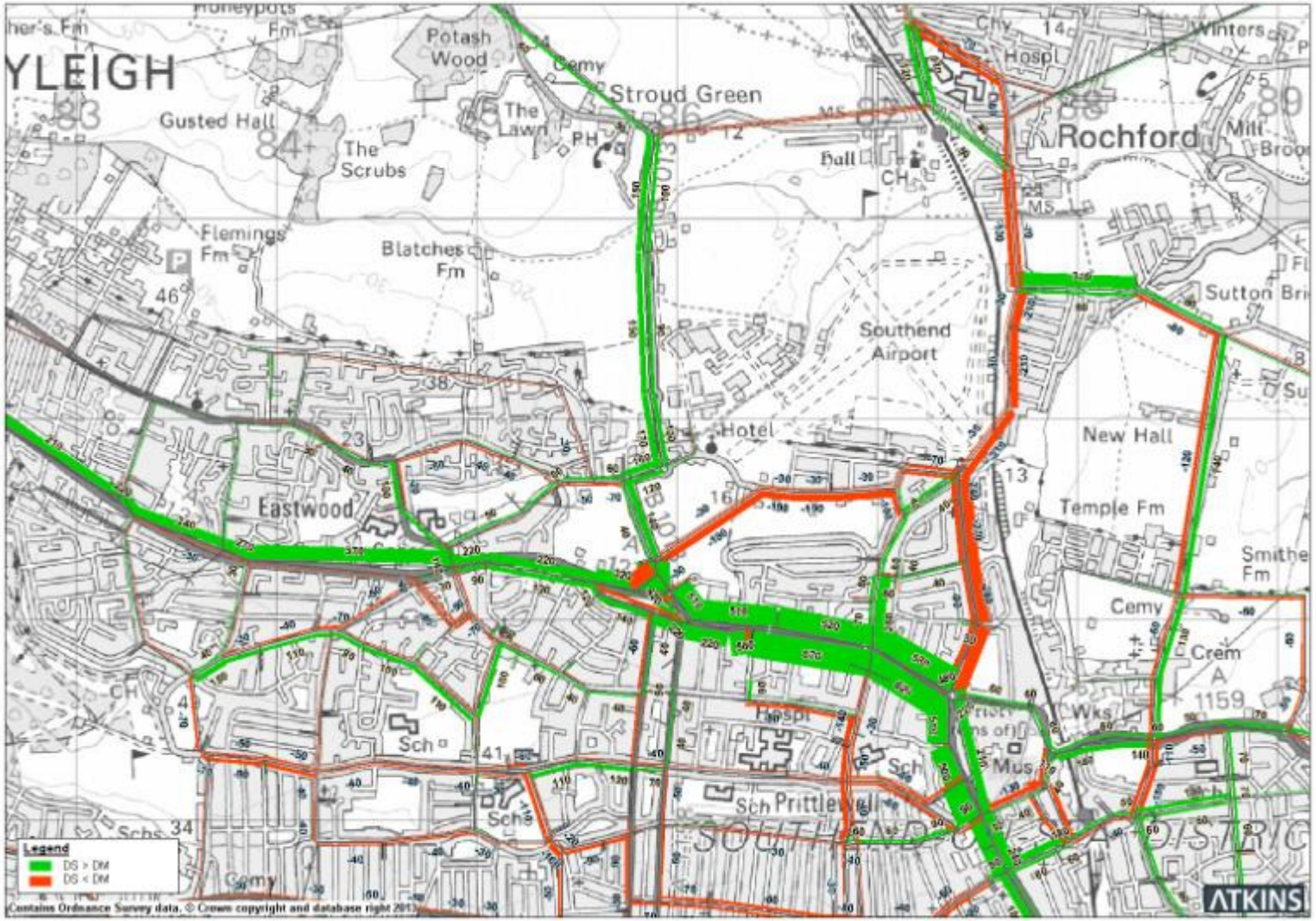


Figure 11. Highway Flow Difference (Do Something – Do Minimum) PM Peak 2021

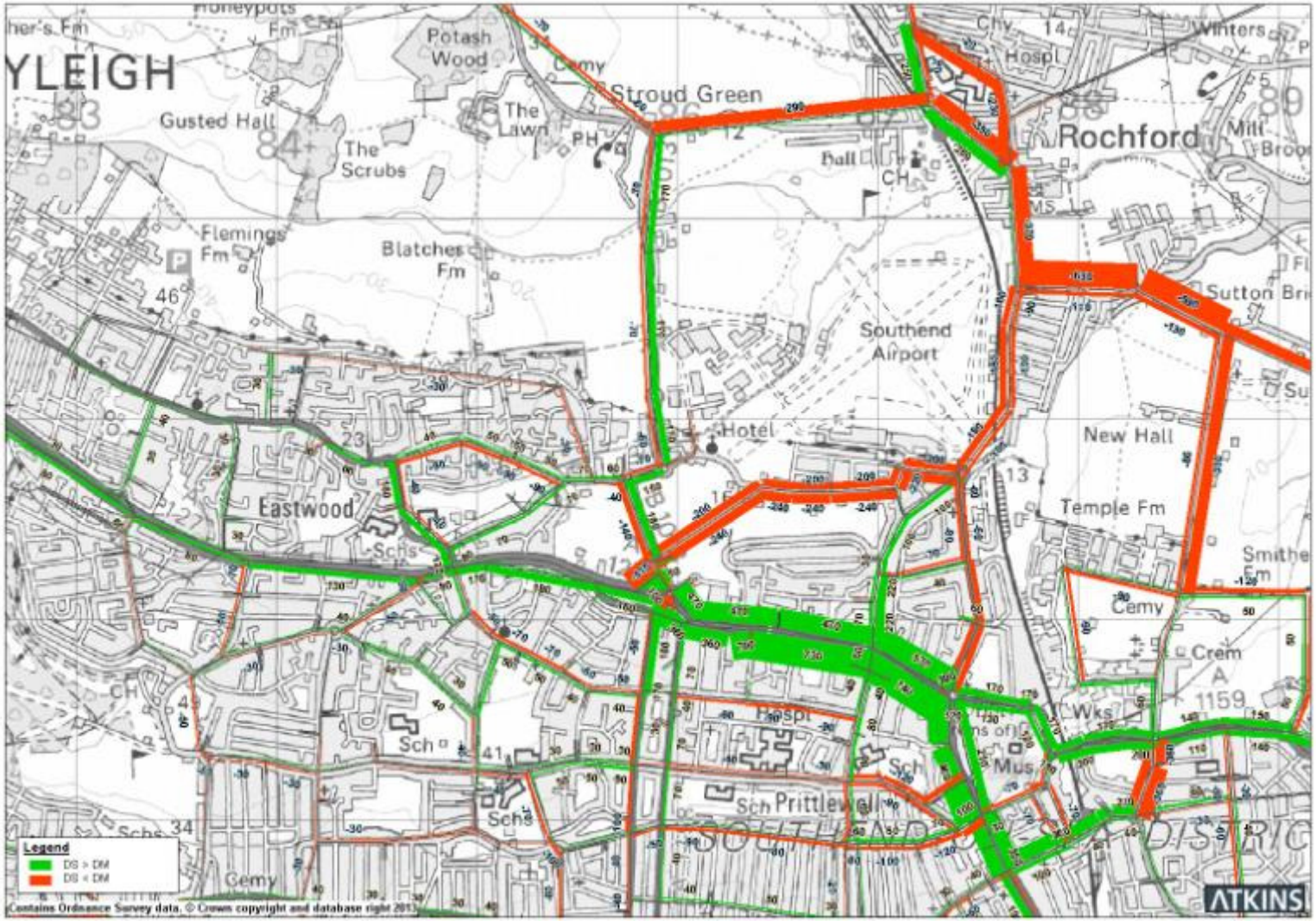


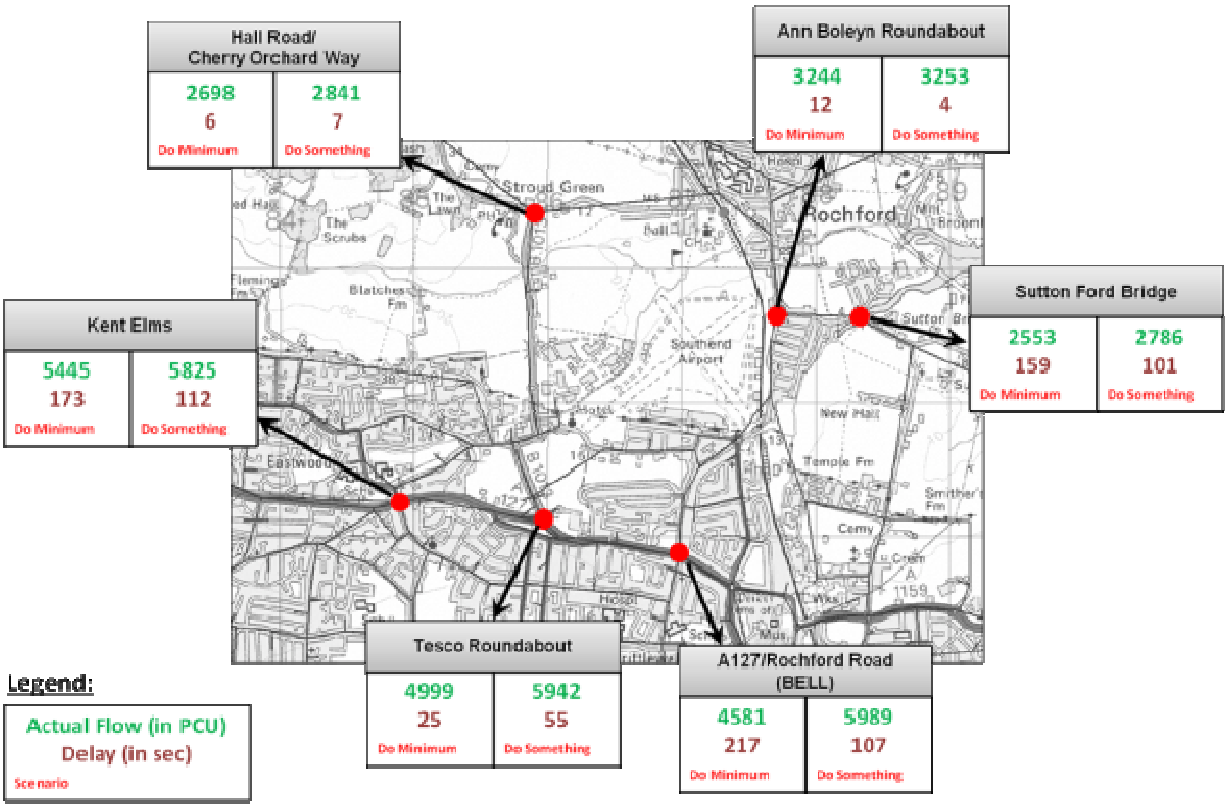
Figure 12. Highway Junction Delays Comparison AM Peak 2021

Figure 13. Highway Junction Delays Comparison PM Peak 2021

The junction improvements along the A127 corridor and in proximity to the JAAP site are designed to reduce congestion. Figure 14 provides a detailed comparison of average delay in the AM peak 2021 assignments between the do minimum (current alignment) and proposed improvements in the do something. It is shown that in the majority of cases the improvements result in lower levels of delay in the do something scenario, though flows are of a similar order. In particular the improvements to the Bell and Kent Elms junctions generate significant savings. This confirms the findings from the previous figures. The improvement at Tesco junction results in slightly higher delay but in the context of approximately 1000 additional vehicles. This reflects the reassignment of vehicles onto the A127 from parallel side routes underpinned by the improvements at the Kent Elms and Bell junctions. Without the Tesco improvement scheme at this location the delays would likely be significantly higher. The signal times incorporated into the assessment reflect a first estimate which in turn is likely to be further refined once the design evolves.

The Sutton Road Bridge improvement has the largest benefit of the four Rochford schemes providing a delay saving of approximately one minute. The improvements at the Ann Boleyn are shown to provide small levels of benefit whilst the improvement at Hall Road/Cherry Orchard Way is shown to be neutral.

Figure 14. Rochford and A127 Junctions (average delay seconds) AM Peak 2021



5.4. Public Transport Trips

The figures below display the differences between the public transport passenger flows between the do minimum and do something scenarios of the 2021 forecasts replicating the differences shown for highway trips in Figure 10 Figure 11. The plots demonstrate the attractiveness of new services serving Saxon Business Park with a significant increase in passenger trips at this location in the AM and PM peaks. These services have taken trips from routes running along Rochford Road (North and Southbound trips) and Eastwoodbury Lane (East and Westbound trips). There is a modest fall in Southbound rail trips in the AM peak and vice versa Northbound in the PM peak. Some of these trips are likely transferring to the comparable route of the HQPT service.

Figure 15. Public Transport Passengers Flow Difference (Do Something – Do Minimum) AM Peak 2021

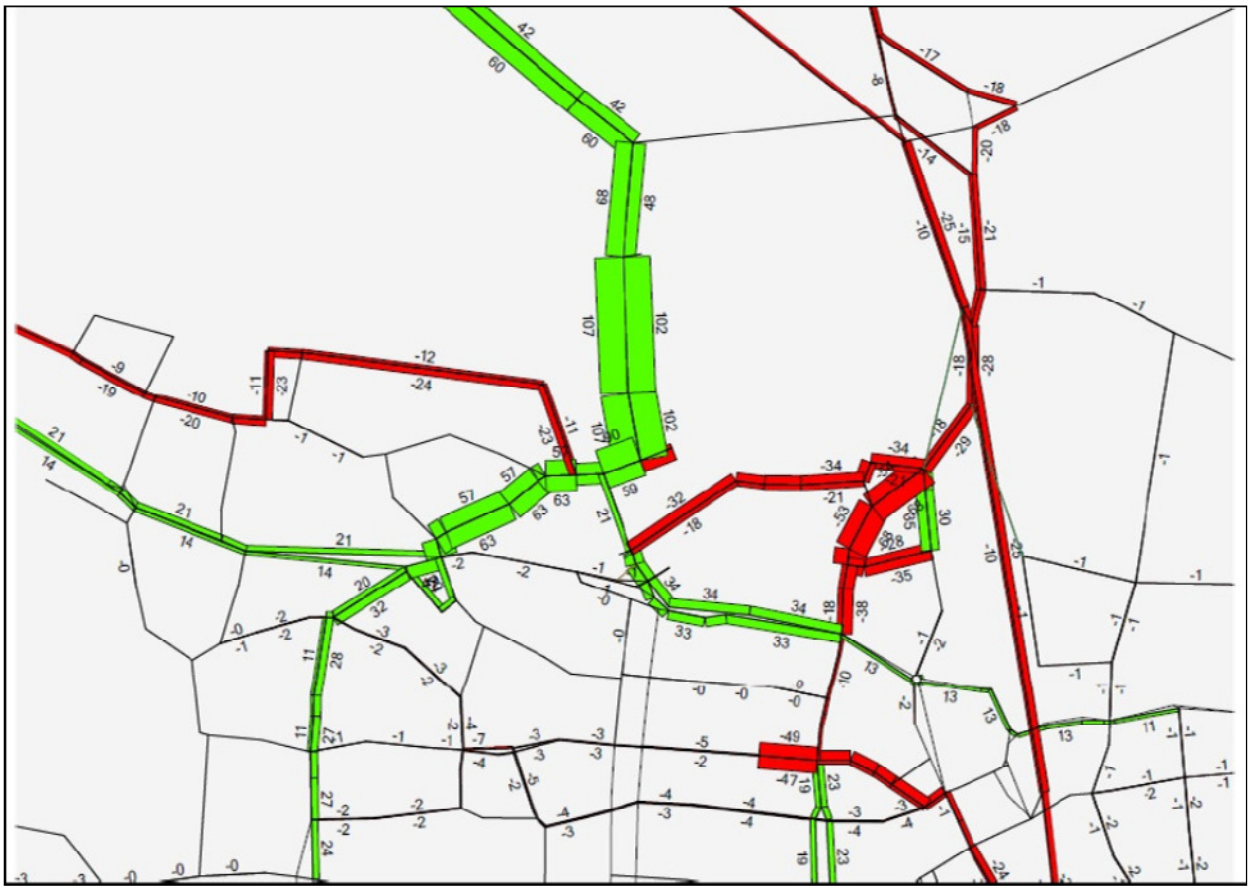
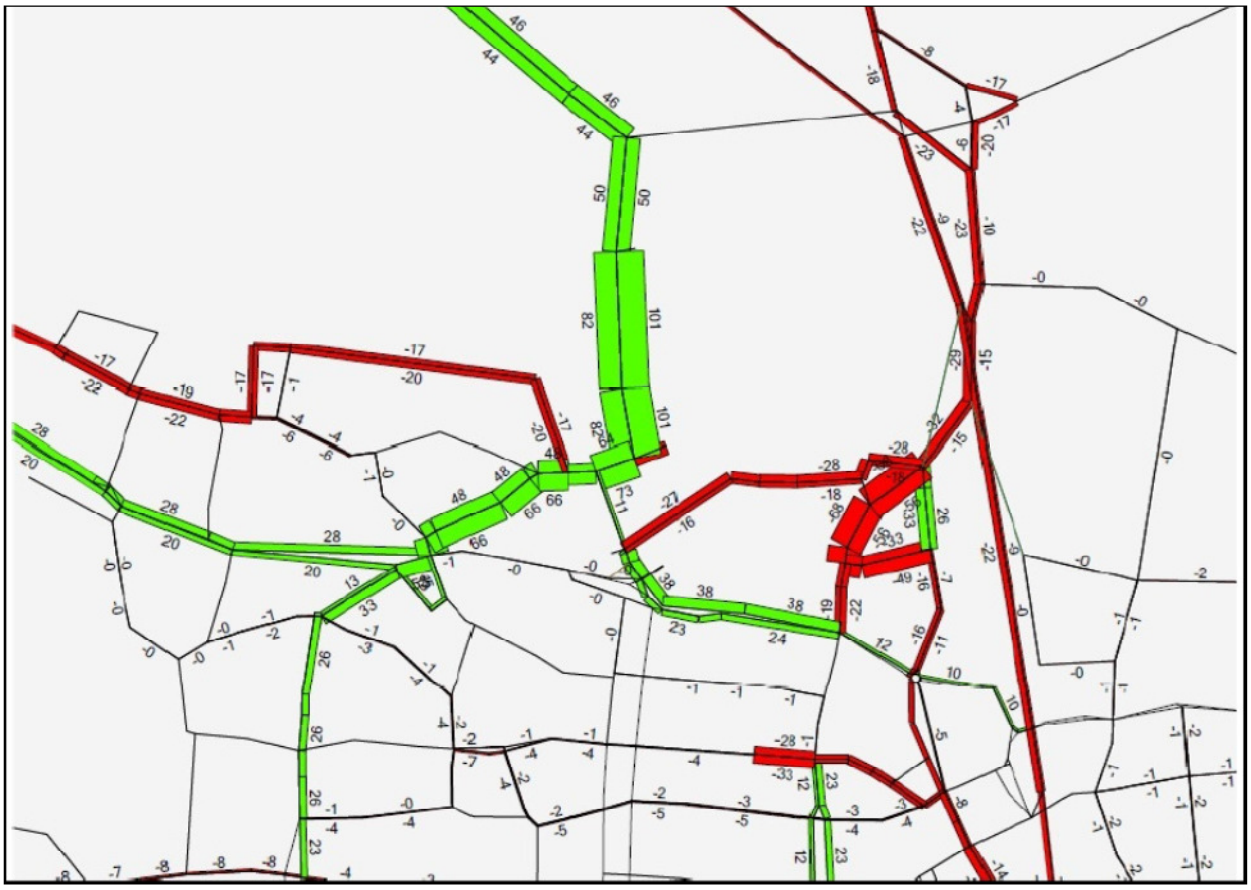


Figure 16. Public Transport Passengers Flow Difference (Do Something – Do Minimum) PM Peak 2021



5.5. Screenline Flows

The three figures below (Figure 17, Figure 18 and Figure 19) display screenline flow comparisons for highway, bus and rail flows. Highway flows are recorded in vehicles whilst bus and rail flows are in passengers.

Highway flows are shown to significantly increase from 2009 values for 2021 scenarios along the A127. Flows are higher for the do something scenario in all cases with corresponding falls along the competing routes of the A1015 and A13. Across the northern screenline flows in the do something scenarios are typically higher along Cherry Orchard Way in the AM and PM peak periods. Southend Road vehicle flows are correspondingly lower as are those along Sutton Road.

When bus flows are considered it can be observed that the new proposed routes in the do something scenario attract approximately 100 trips in each peak and by direction along Cherry Orchard Way. There is a modest fall for routes along Southend Road suggesting some passengers are transferring from these routes. Elsewhere a small reduction in bus trips is observed along the A1015 but other flows are broadly stable between scenarios in 2021. Services along the A127 have become marginally more attractive reflecting improved journey times and this is evidenced through some increases for flows along the A127 in comparison to modest falls along the A13.

Rail flows are slightly lower on the East to West line in the do something scenario suggesting a modest transfer to private vehicle. Along the Southend Victoria line flows also fall suggesting a small level of abstraction to bus including the competing HQPT corridor.

Figure 17. Screenline Flows- Highway Flows (in Vehicles) 2021

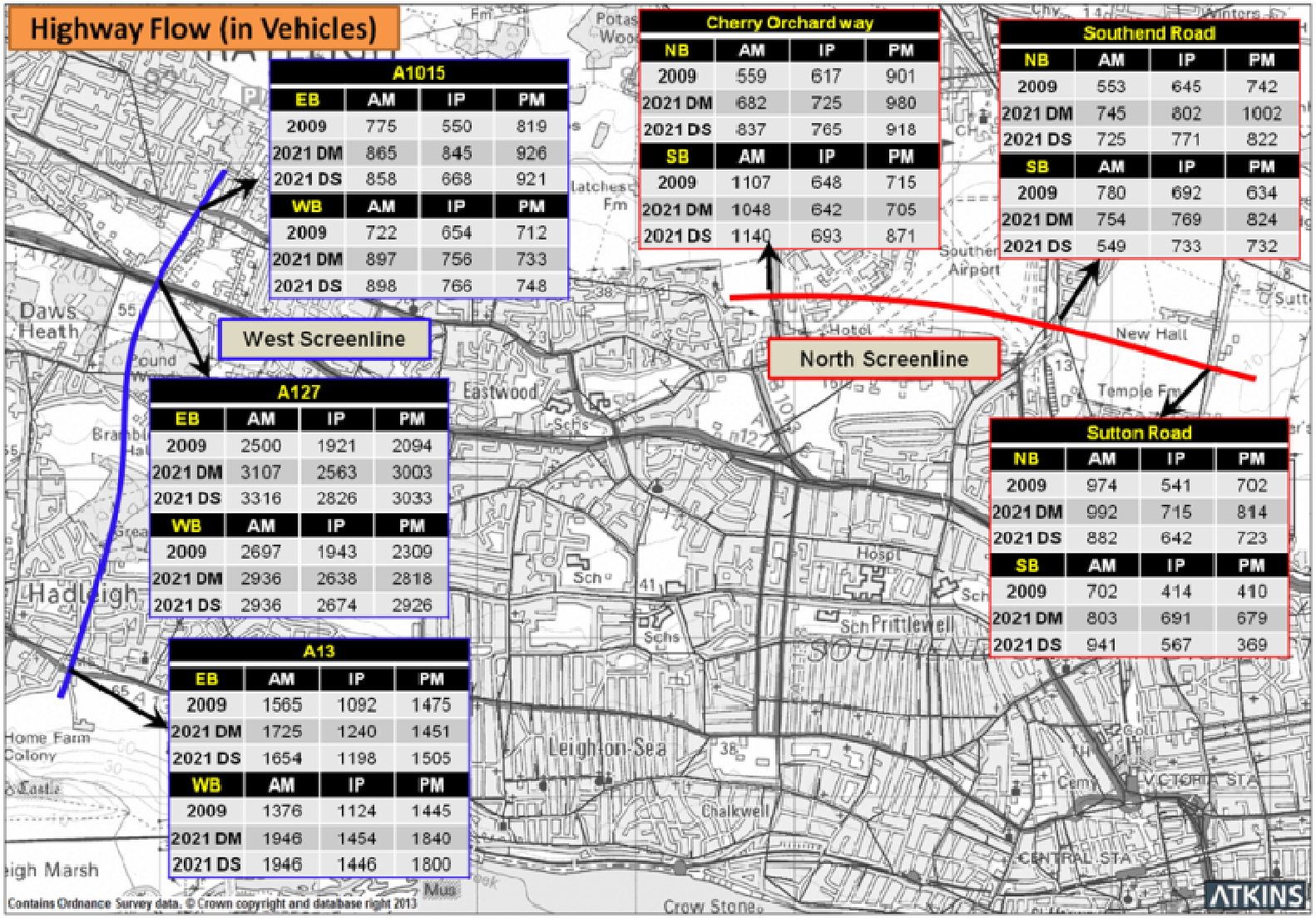


Figure 18. Screenline Flows- Bus Flows (in Persons) 2021

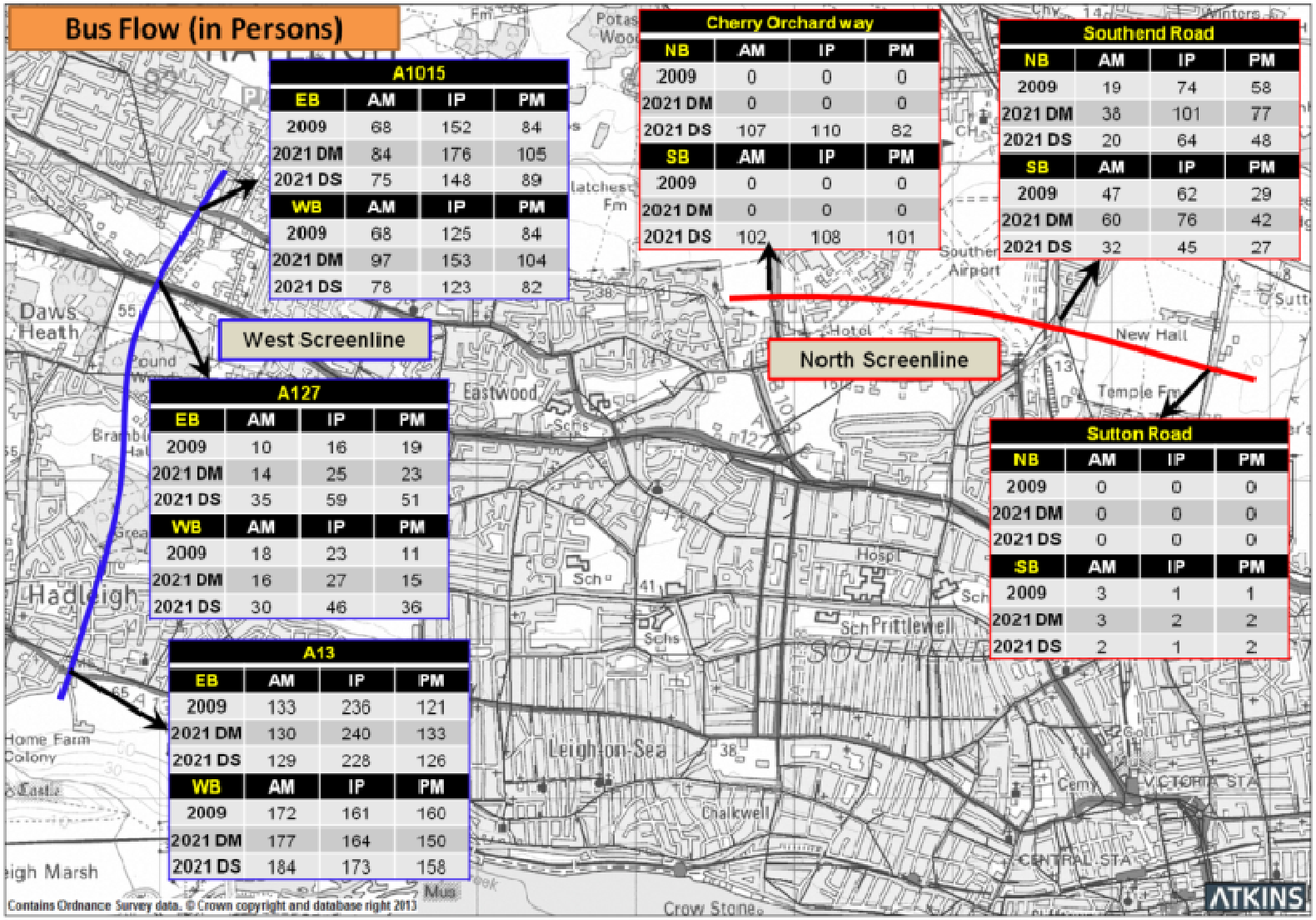
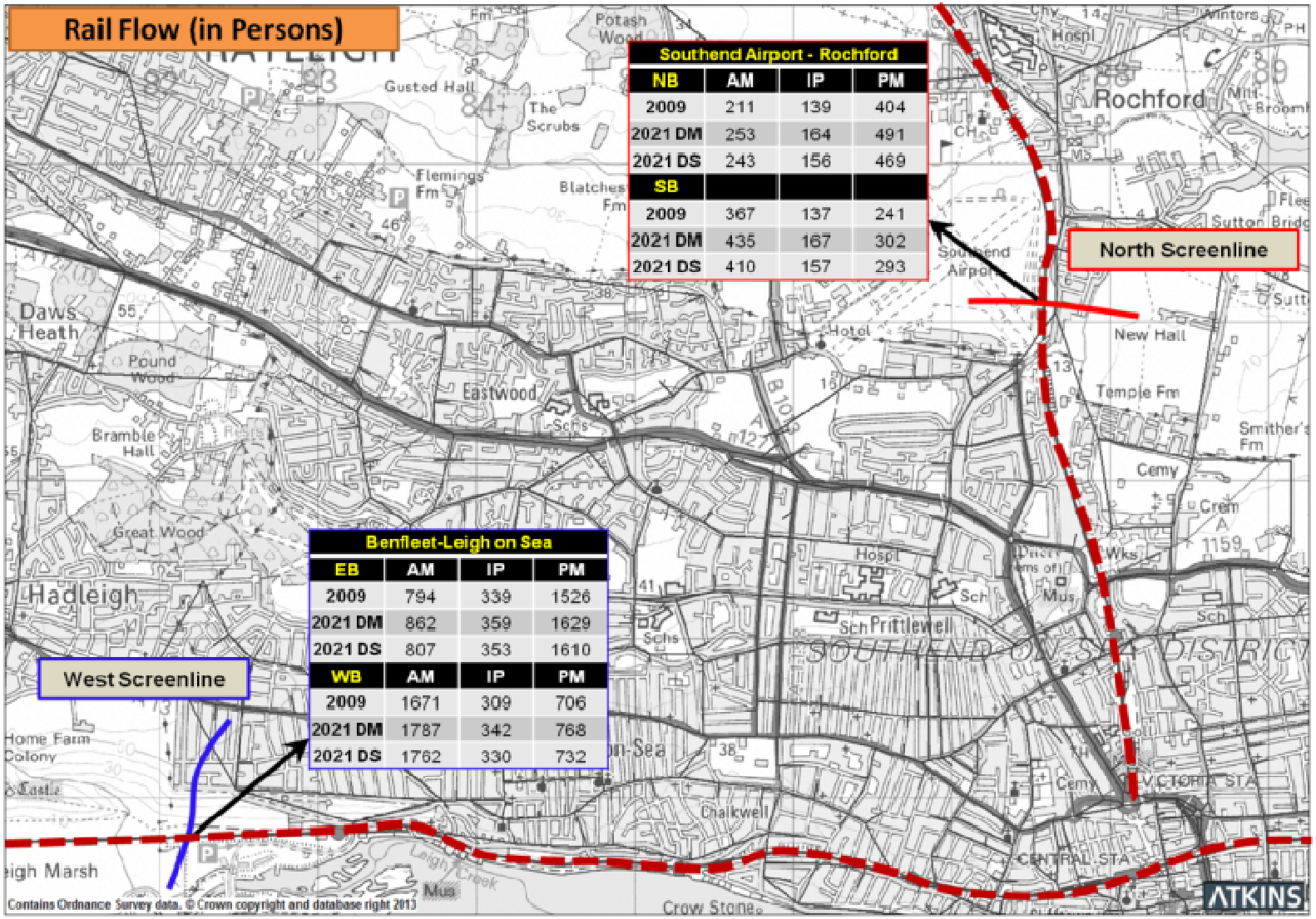


Figure 19. Screenline Flows- Rail Flows (in Persons) 2021



5.6. Bus Route Analysis

In order to fully consider the impact of introducing HQPT services, the boarding, alighting and line loading of passengers along the entire route of the service has been analysed for 2021 scenarios for the morning and evening peak hours. This analysis is summarised in Table 29 and Table 30 which provide a 'heatmap' analysis of boarding and alighting passengers for the AM and PM respectively. The heatmap shows a range from green as a reduction due to alighting, to shades of red as an increase. Figure 20 provides an illustration of this profile in graphical format for the AM peak.

Table 29. HQPT Boarding and Alighting AM Peak hour 2021 DS

Towards Town Centre			
Stops	Alighting	Boarding	Volume
Airport	0	30	30
Cuckoo Corner	-2	12	40
Prittlewell East St	-6	2	36
Southend Victoria	-22	1	15
Southend Travel Centre	-13	1	3
HQPT Terminus (b)	-3	0	0
Towards Airport			
Stops	Alighting	Boarding	Volume
HQPT Terminus (a)	0	10	10
HQPT Terminus (b)	0	2	12
Southend Victoria	-2	21	31
Prittlewell East St	-3	8	36
Cuckoo Corner	-2	2	35
Airport	-35	0	0

Table 30. HQPT Boarding and Alighting PM Peak hour 2021 DS

Towards Town Centre			
Stops	Alighting	Boarding	Volume
Airport	0	26	26
Cuckoo Corner	-1	13	38
Prittlewell East St	-5	2	35
Southend Victoria	-19	1	17
Southend Travel Centre	-14	1	4
HQPT Terminus (b)	-4	0	0
Towards Airport			
Stops	Alighting	Boarding	Volume
HQPT Terminus (a)	0	9	9
HQPT Terminus (b)	0	3	12
Southend Victoria	-2	16	26
Prittlewell East St	-2	7	31
Cuckoo Corner	-1	3	33
Airport	-33	0	0

Table 29 and Table 30 above illustrate that the majority of passengers using the southbound HQPT service are boarding at the airport or Cuckoo Corner, choosing to alight at Southend Victoria or the travel

centre. In the reverse direction passengers are boarding in greatest numbers at the HQPT terminus and Southend Victoria with the vast majority alighting at the airport. Figure 20 illustrates this profile for HQPT services. Similar figures (Figure 22 to Figure 25) are provided for the new proposed routes A-D. These routes are illustrated in Figure 21.

Route A runs from Rayleigh to Leigh-on-Sea via the Saxon Business Park. Figure 22 illustrates that when travelling from Leigh station passengers are boarding from Leigh Station to Kent Elms corner with a significant number of passengers alighting at Saxon Business Park and Rectory Road. A high proportion of passengers are also departing at Rayleigh High Street. In the reverse direction a similar pattern is true with passengers boarding at Rayleigh high street and Saxon Business Park but alighting at a large number of locations along the route.

Route B runs from Shoeburyness to Nestuda Way. Travelling towards Nestuda Way passengers are boarding along the entire route excluding a couple of stops with virtually all passengers alighting at Nestuda Way. In the reverse direction passengers are boarding at Nestuda Way and departing along the route.

Route C runs from Ashingdon to Southend Travel Centre. From Ashingdon passengers are boarding along the route up to the Saxon Business Park. They are also alighting at this location. In the reverse direction significant volumes of passengers are alighting at Saxon Business Park and Rectory road having boarded along the route from the Travel Centre through to the Tesco roundabout.

Route D runs from Canvey Island to Rochford. A significant volume of passengers are boarding at Canvey Island and departing at South Benfleet rail station and Saxon Business Park. In the opposite direction passengers are boarding at the Saxon Business Park and alighting at most destinations along the route.

The ‘heatmap’ analysis of for Routes A, B, C & D along with PM peak Boarding & Alighting profile maps for HQPT and Routes A,B,C & D are presented in Appendix C.

Figure 20. HQPT Boarding and Alighting AM Peak hour 2021

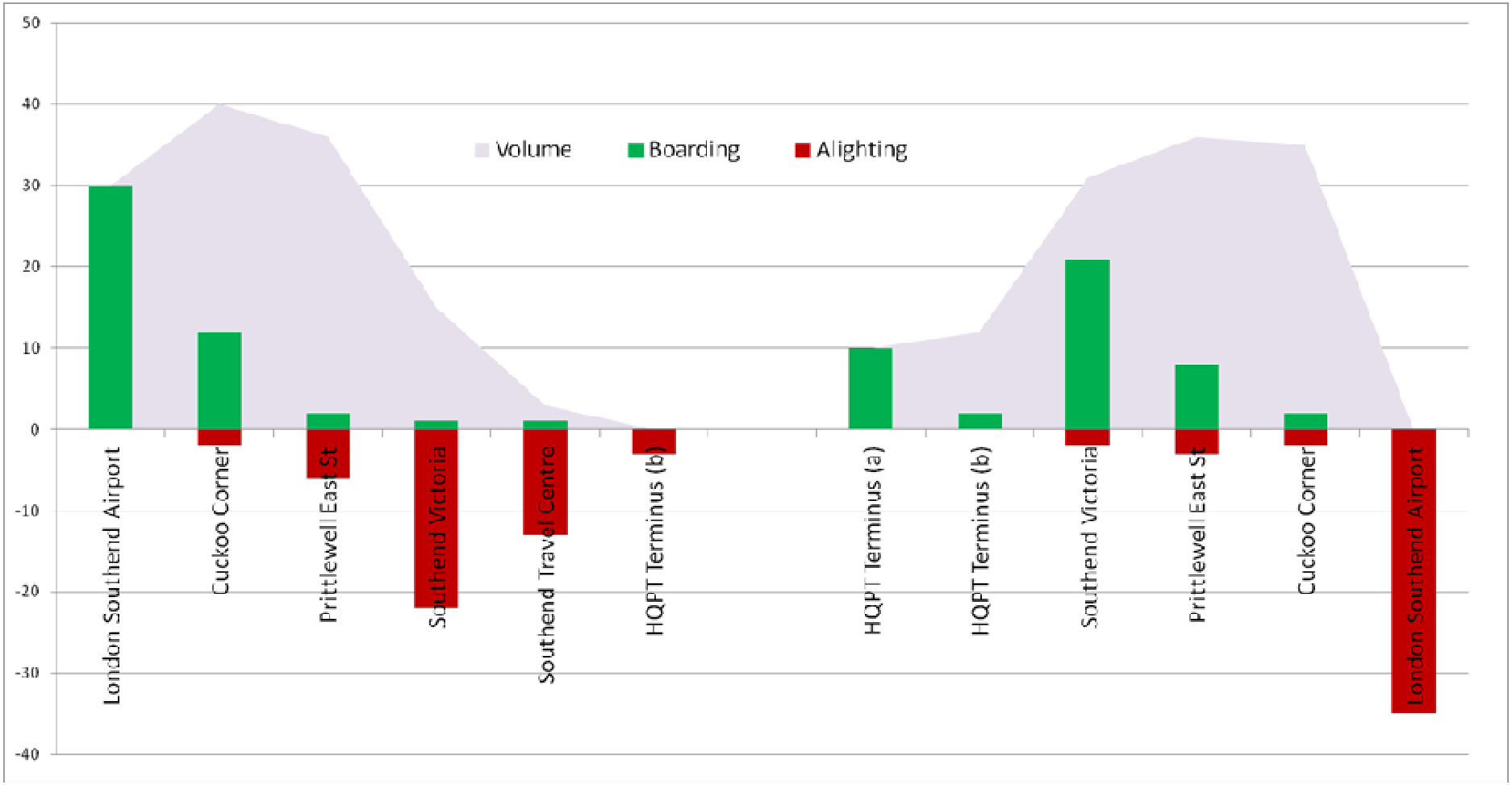


Figure 21. Proposed Bus Routes A, B, C & D

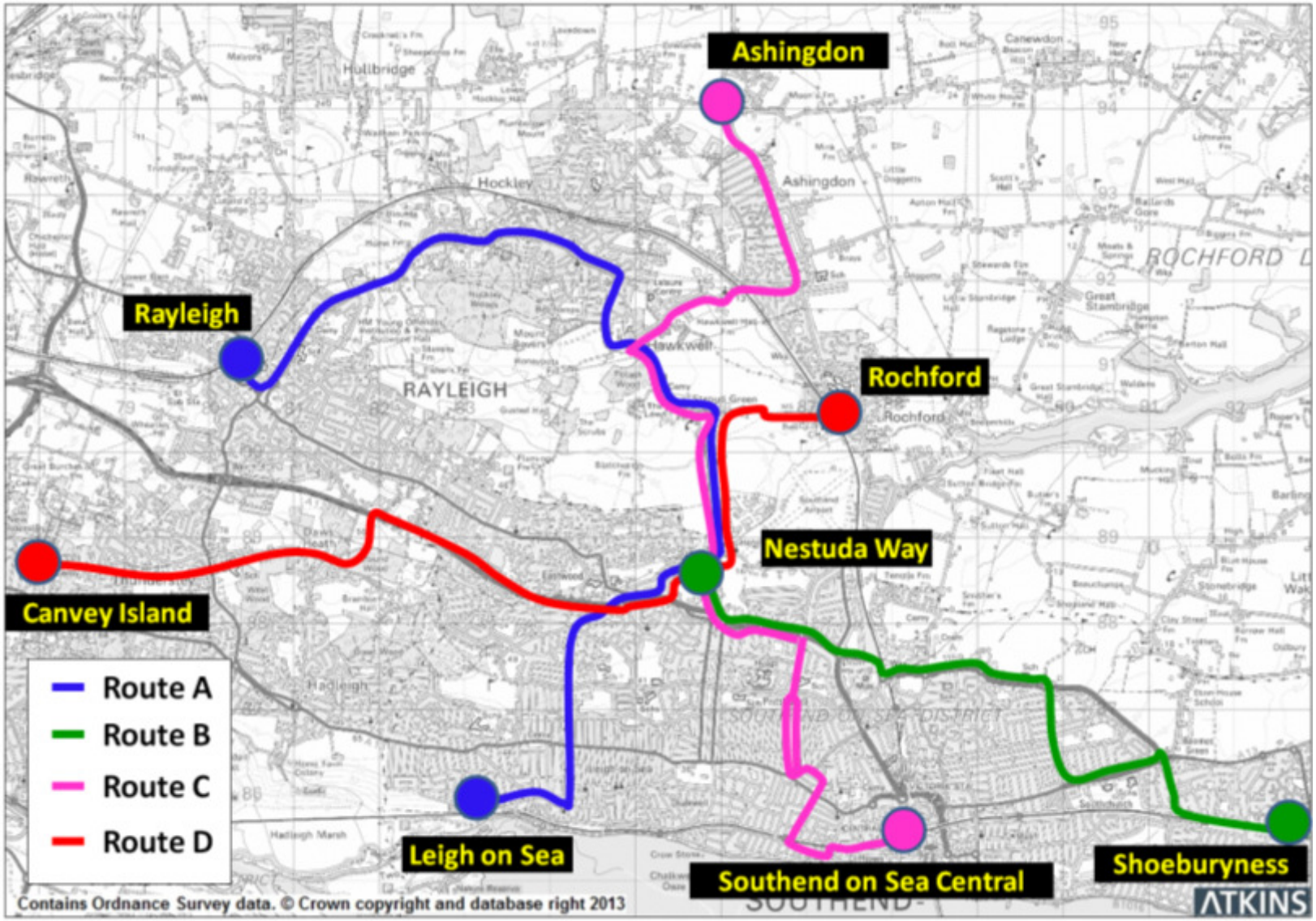


Figure 22. Route A Boarding and Alighting AM Peak hour 2021

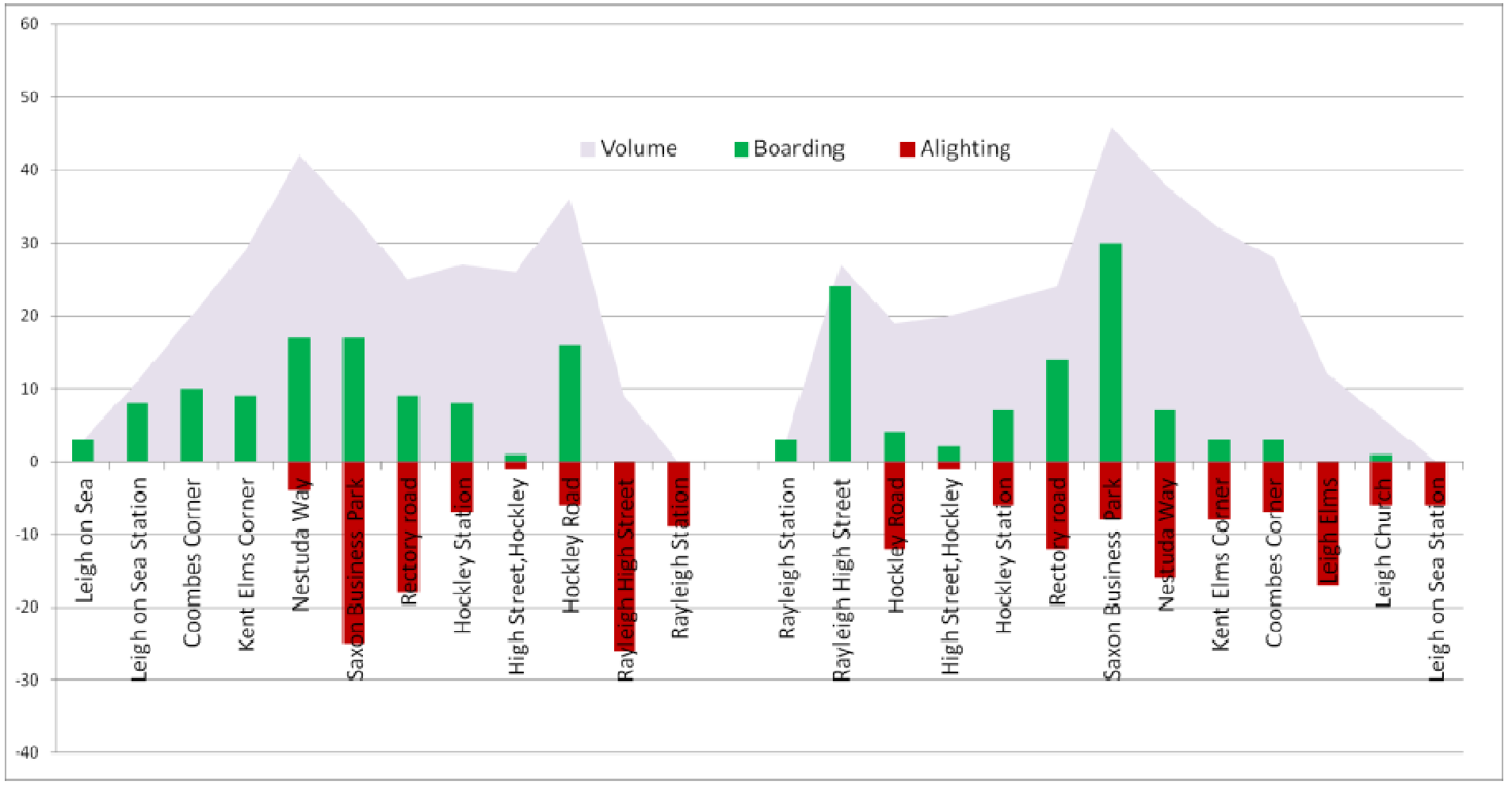


Figure 23. Route B Boarding and Alighting AM Peak hour 2021

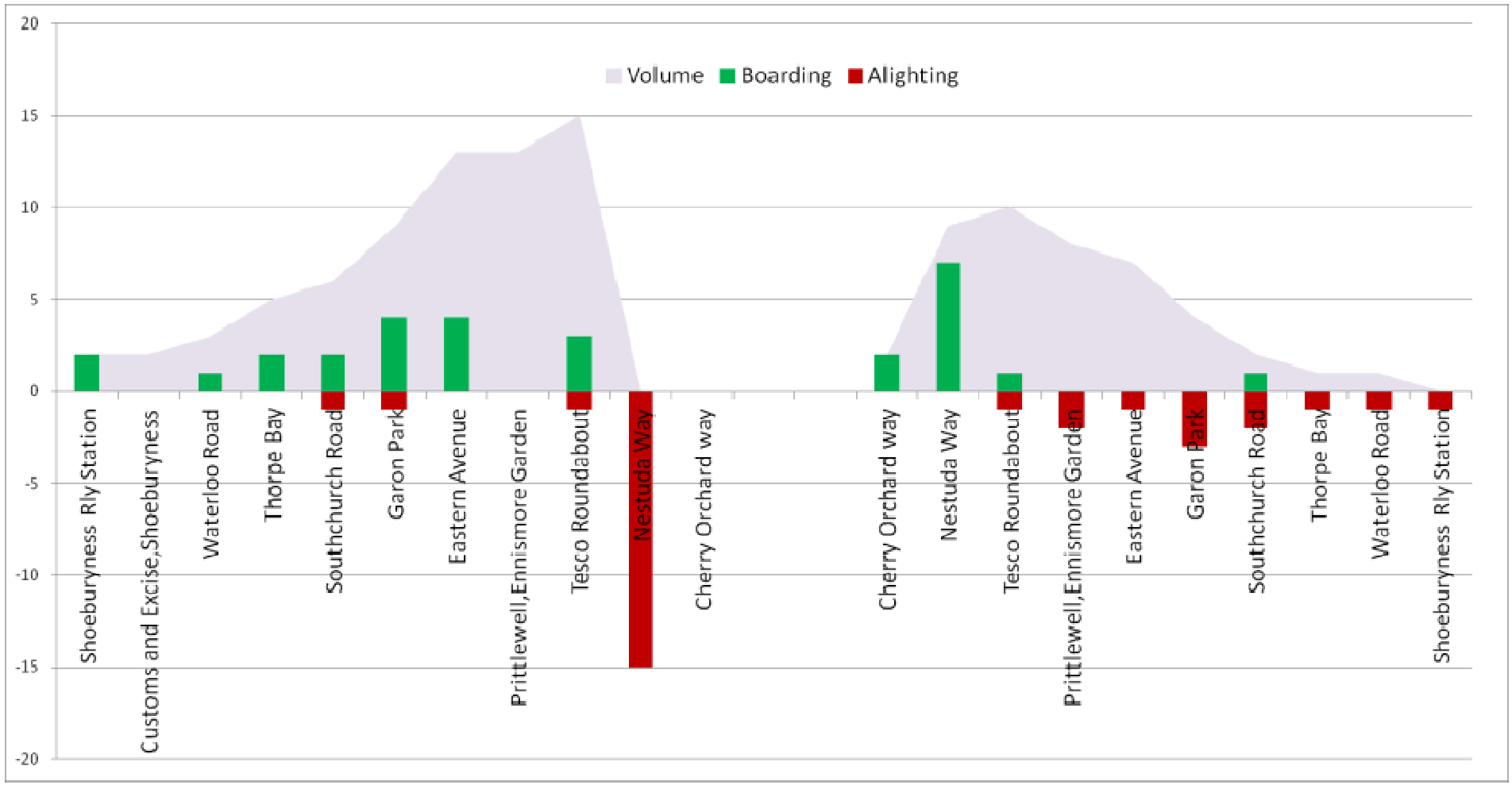


Figure 24. Route C Boarding and Alighting AM Peak hour 2021

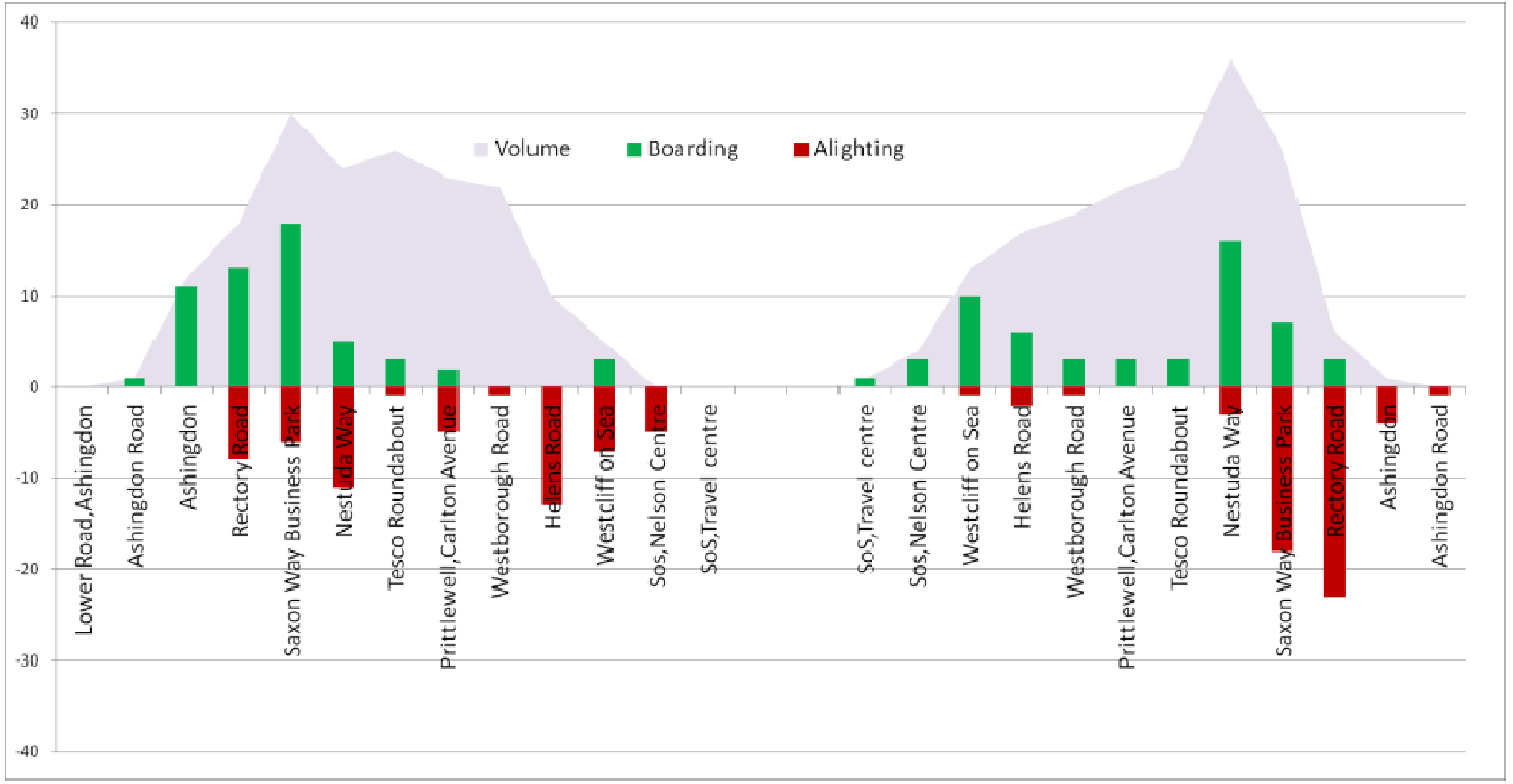


Figure 25. Route D Boarding and Alighting AM Peak hour 2021

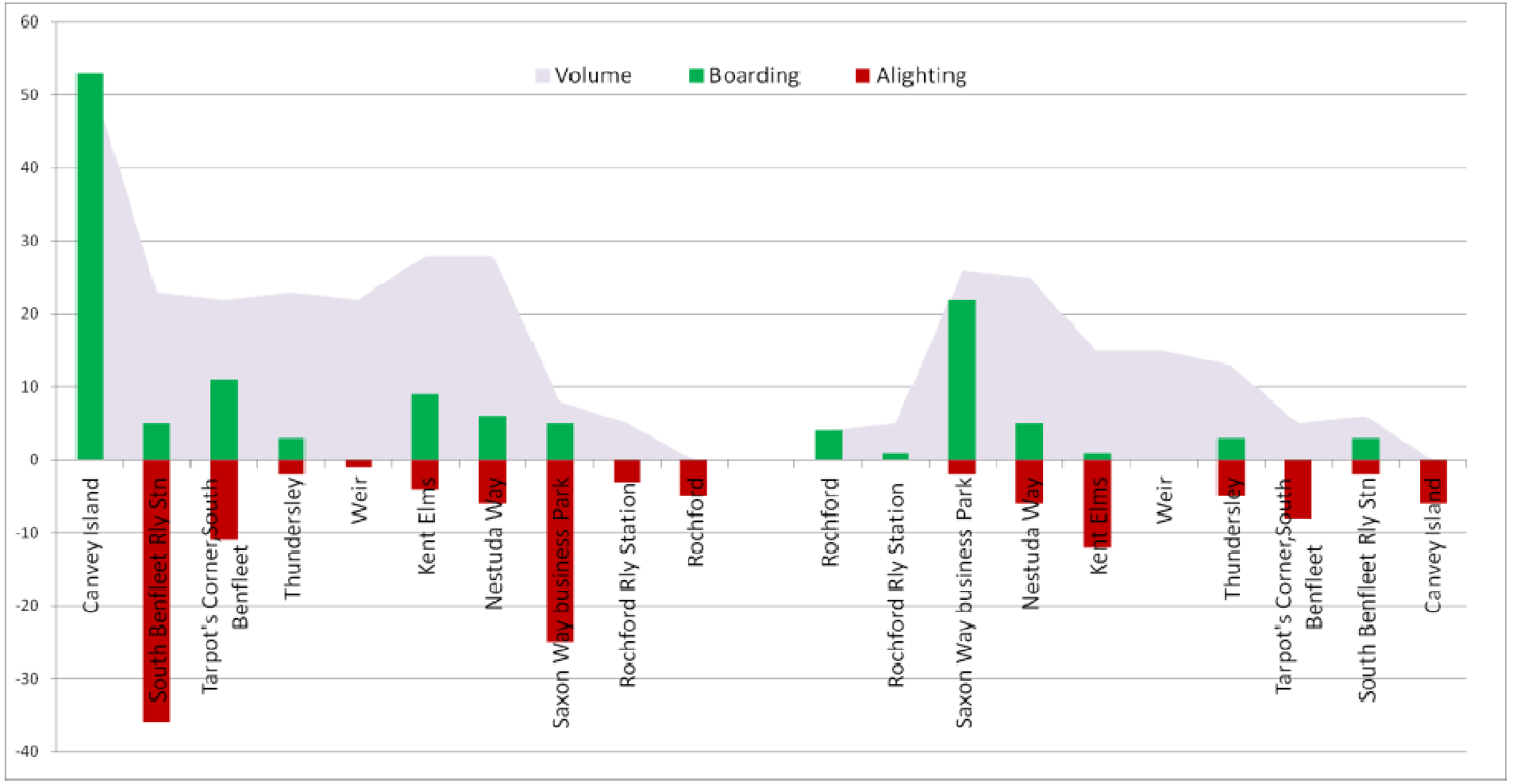


Table 31 provides an illustration of interchange at LSA in the do something scenario. It is proposed that a multi modal interchange be implemented at this location. The interchange has the objective of providing HQPT infrastructure designed to encourage public transport trips at a location well served by public transport services. The figure demonstrates that the majority of travellers choose to access the airport by private car. A high proportion of travellers are accessing the site by bus with a relatively small number by rail.

Table 31. Southend Airport Multimodal Interchange (Do something) 2021

Airport Demand	AM Peak		Average IP		PM Peak	
	From Airport	To Airport	From Airport	To Airport	From Airport	To Airport
Highway (Car)	305	310	313	296	391	384
Bus (all)	63	55	91	88	72	73
Bus (HQPT alone)	30	35	37	41	26	33
Rail	13	13	5	5	13	13

Table 32 and Table 33 provide a comparison of existing services to the proposed HQPT service for the AM and PM peaks. It is shown in both cases that whilst HQPT services run with a ten minute frequency they do not attract significant patronage when compared to other services such as the number 7 which shares a competing route. In general non HQPT routes attract lower patronage in the do something scenario reflecting the additional four bus routes in this scenario and to a lesser extent transfer to private car.

Table 32. AM Peak Line Load Summary

AM Peak (0800-0900)			2021 DM		2021 DS	
Service	Service Name	Headway AM (min)	Line Boardings	Max Volume	Line Boardings	Max Volume
7i	Rayleigh-Ashingdon-STC	60	65	17	53	15
7i2	Hockley-Shoeburyness	30	72	27	57	17
7i3	Rayleigh-Ashingdon-STC	60	52	17	40	15
7o	STC-Ashingdon-Rayleigh	30	171	50	140	39
7o2	STC-Hockley	60	20	10	16	7
8i	Rayleigh-Hawkwell-STC	60	33	17	22	8
8o3	STC-Hawkwell-Rayleigh	60	37	17	24	8
HQPTi	Southend International Airport – Chancellor Road roundabout	10	NA	NA	46	40
HQPTo	Chancellor Road roundabout- Southend International Airport	10	NA	NA	42	36

Table 33. PM Peak Line Load Summary

Pm Peak (1700-1800)			2021 DM		2021 DS	
Service Id	Service Name	Headway PM (min)	Line Boardings	Max Volume	Line Boardings	Max Volume
7i	Rayleigh-Ashingdon-STC	60	67	17	59	17
7i2	Hockley-Shoeburyness	60	44	15	39	13
7i3	Rayleigh-Ashingdon-STC	30	97	32	79	24
7o	STC-Ashingdon-Rayleigh	60	73	24	57	15
7o2	STC-Hockley	60	38	20	30	13
7o3	STC-Ashingdon-Rayleigh	60	15	9	14	8
8i	Rayleigh-Hawkwell-STC	60	76	22	60	17
8o3	STC-Hawkwell-Rayleigh	60	43	17	33	11
HQPTi	Southend International Airport – Chancellor Road roundabout	10	NA	NA	43	38
HQPTo	Chancellor Road roundabout- Southend International Airport	10	NA	NA	38	33

6. Outline Economic Case

Table 34 provides a summary of the economic case for the infrastructure improvements contained in the do something scenario. This assessment assumes a total capital cost of £20 million (M) for infrastructure (£13M at discounted 2002 prices – Present Value Costs or PVC). The benefits are calculated for highway users only by comparing the time skims of do minimum and do something scenarios. Public transport benefits have not been considered in this case as it is expected that most of the benefits of the do something package will be accrued through A127 benefits. The result of the assessment indicates that over a 60 year appraisal £73M of benefits (Present Value Benefits or PVB) will be accrued (2002) prices. This generates a net present value (NPV) of £60M giving a benefit to cost ratio (BCR) of 5.62.

Table 34. Appraisal Summary Table (2002 prices)

AST	
Highway Time Savings	£ 73M
PVB	£ 73M
PVC	£ 13M
NPV (PVB-PVC)	£ 60M
BCR	5.62:1[1]

[1] 'Present' Value and Cost represents the monetary value in todays terms (nominal) rather than future year values with inflation included

7. Summary

7.1. Summary of Key Findings

This assessment provides evidence for the following outcomes by 2021. The proposed junction improvements along the A127 and Rochford district are key to fully unlocking development at the Airport and JAAP site. Evidence from this assessment suggests these schemes will achieve the following:

- Journey time savings of approximately one minute along the A127 corridor during peak periods and therefore likely increased resilience to incidents as the network operates at a lower ratio of total capacity. This is evidenced by the reductions in delays at the Bell and Kent Elms junctions shown in Figure 12, Figure 13, and Figure 14.
- Reduced levels of rat running along parallel routes such as the A13 but also through Rochford Town Centre as evidenced through Figure 10 to Figure 11 which demonstrate lower flows along Southend Road and Hall Road through Rochford Town Centre.

When mode proportions are considered in Table 22 shows that highway trips remain broadly stable between the do minimum and do something scenarios a proportion of total trips. This suggests that whilst highway congestion increases, the attractiveness of public transport does not, most likely because the existing bus provision is reliant on shared lanes with little priority and is therefore subject to the same delays private car users experience.

The impact of proposed public transport improvements when only the JAAP site is considered indicate a far greater take up of public transport services at this location. Mode share for bus trips grows by approximately 2% above the do minimum with a corresponding fall in car trips of c3% in the do something scenario. The plots of public transport passenger flows provided in Figure 15 and Figure 16 support this by demonstrating the attractiveness of these services to passengers and some level of abstraction from other routes.

Analysis of trips at the Saxon Business park site indicates the success of improving public transport provision at this location. Of particular note is the significant increase in bus mode share from 15% to 18% from the do minimum to do something scenarios. More detailed analysis of the four new proposed routes suggests that they will all be well used and in the JAAP site at locations such as Nestuda Way and Saxon Business Parks which are key contributors to this. There is a corresponding fall in highway based trips suggesting public transport provision is a good investment in this area. For example when mode share is considered (Table 25) in the do something scenario it is shown that highway proportions remain stable suggesting proportionally bus use increases at a comparable level.

There is little evidence to suggest that HQPT corridor presents high value for money. Whilst the service benefits from a 10 minute frequency it is not well patronised attracting roughly 40 passengers per direction per hour in the peak periods, or less than 7 passengers per vehicle on average. The reasons for this are various; the route is short and therefore has a limited catchment, competing services such as the number 7 travel a longer distance and therefore link greater proportions of the population. Finally the route is competing with a high quality rail service with a 15 minute frequency. The low level of patronage recorded appears to be at least in part abstracted from rail services which are not in line with the objectives of the scheme. This is evidenced by the public transport plots (Figure 15, Figure 16) which demonstrate a small level of rail abstraction. Whilst the route does not present economic value for money it may meet other policy objectives i.e. improved connectivity, accessibility and sustainability.

An outline economic assessment for the do something package of proposals assuming a broad £20M capital cost* suggests a benefit to cost ratio of 5.62. This value is likely to be higher once the benefits for public transport users are also included i.e. through additional journey time savings through reduced highway congestion.

The JAAP document outlines a number of proposed improvements to walking and cycling infrastructure i.e. new cycling routes and improved pedestrian crossings at junctions. These measures are likely to support the continued growth in walking and cycling trips within the JAAP area and in turn increase the mode share for these trips.

This modelling work provides evidence based on the provision of key infrastructure. Underpinning the strategy for transport provision in the JAAP is the requirement for the implementation of Travel Plans by businesses in the area. The travel plans will provide incentives for employees to use more sustainable means of transport and will have a positive impact on the transport network servicing the JAAP.

£20 million capital cost assumes in broad terms £5 million each for three A127 junction with a further £5 million for other measures including highway measures in Rochford and new bus services.

7.2. JAAP Policies

The JAAP submission document sets out the objectives for transport to achieve good connectivity through all modes of transport and to minimise the impacts of additional traffic and in turn congestion. The text provided above indicates the benefits that transport proposals will provide, in particular the A127 schemes to relieve congestion, improve journey times and support network resilience. Improved public transport provision to serve the JAAP site including Saxon Business Park is shown to be attractive to travellers improving the sustainability of development at this location. These measures will be complemented by further infrastructure and measures to support walking, cycling and a reduction in travel through work place travel plans.

7.3. Suitability for Further Assessments

This assessment represents the first opportunity to apply the Southend Multi Modal Model. Evidence detailed in this report across Southend and the wider network including Rochford suggests the model is a suitable tool for scheme assessment and policy appraisal within the area. This includes the following functionality:

- The processing of land use changes to formulate reference case matrices,
- The creation of synthetic matrices for greenfield sites,
- The core functionality of the model to predict responses (mode, destination, frequency etc) to changing travel costs in future years, and
- The capability to produce a broad range of outputs available for further analysis or presentation.

The model is a suitable platform to support the regeneration and expansion of London Southend Airport and its environs through economic growth, building on the policies in the Rochford District and Southend Borough Councils` Core Strategies. The model also supports the development of Business Cases for transport investment that will be submitted to the Local Enterprise Partnership (LEP) and Department for Transport (DfT) should these opportunities arise.

Appendices

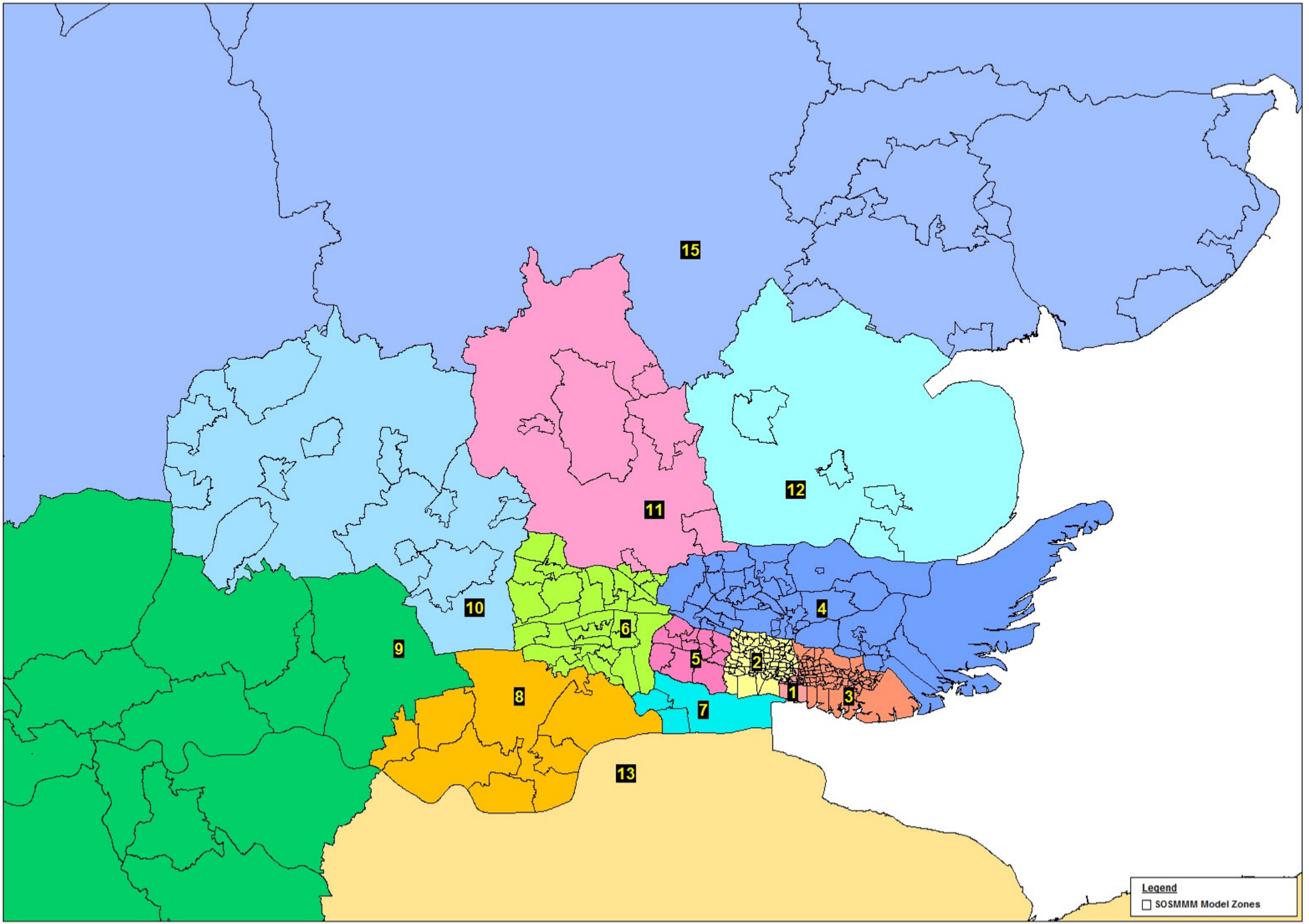
Appendix A. Reference Case Matrices

All matrices within this appendix and Appendix B are presented in by 15 sectors described in the table below.

1	SOSMMM City Centre
2	SOSMMM West
3	SOSMMM East
4	Rochford
5	Castle Point
6	Basildon
7	Canvey Island
8	Thurrock
9	London
10	Brentwood
11	Chelmsford
12	Maldon
13	South East (UK)
14	North(UK)
15	East of England

A.1. PA Level

A.2. OD Level


15
12
11
10
4
6
9
5
2
8
1
3
7
13
Legend
SOSMMM Model Zones

2021 CAR

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	660	1509	1447	2251	157	268	54	89	166	74	219	11	16	38	223	7181
2	2752	9601	5774	5595	1165	1463	370	339	570	458	341	120	226	168	340	29282
3	3697	4214	6102	2664	467	830	128	262	538	249	258	56	121	65	187	19837
4	2345	7162	2784	1972	437	486	50	119	191	133	56	18	107	8	61	15928
5	451	1386	894	399	0	0	0	0	6	0	0	0	0	0	0	3135
6	228	638	443	423	0	0	0	0	0	0	12	0	0	0	0	1744
7	135	471	281	99	0	0	0	0	0	0	0	0	0	0	0	986
8	194	250	146	164	0	0	0	0	0	0	0	0	0	0	0	754
9	223	340	349	163	0	0	0	0	0	0	0	0	0	0	0	1075
10	64	115	63	46	0	0	0	0	0	0	0	0	5	0	0	294
11	229	371	135	102	0	10	0	0	0	0	0	0	0	0	0	848
12	32	169	39	48	0	0	0	0	0	0	0	0	0	0	0	288
13	49	79	105	76	0	0	0	0	0	0	0	0	0	0	8	318
14	53	21	40	25	0	0	0	0	0	0	0	0	0	0	0	140
15	252	318	139	61	9	0	0	0	0	0	0	0	0	0	0	780
Total	11366	26644	18739	14089	2234	3057	602	809	1471	913	886	206	475	279	820	82589

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	2580	5162	5894	1724	459	240	237	115	583	103	213	43	169	82	187	17791
2	5149	9972	7649	10108	1909	1392	584	347	682	181	401	129	303	75	506	39388
3	6374	8161	7736	3953	762	572	280	213	648	124	286	59	349	107	348	29972
4	2203	10738	3814	3618	604	673	113	176	252	164	290	46	95	38	223	23049
5	410	1958	570	594	15	0	0	0	0	7	0	0	0	0	21	3575
6	283	1478	272	686	0	0	0	0	0	0	0	0	0	0	0	2719
7	214	585	258	98	0	0	0	0	0	0	0	0	0	0	0	1154
8	158	387	92	171	0	0	0	0	0	0	0	0	0	0	6	815
9	666	753	276	289	0	0	0	0	19	0	16	0	0	0	0	2018
10	86	168	55	175	8	0	0	0	0	0	0	0	0	0	0	492
11	232	464	178	264	0	0	0	0	15	0	6	0	0	0	8	1166
12	21	115	40	41	0	0	0	0	0	0	0	0	0	0	0	216
13	209	301	134	109	0	0	0	0	0	0	0	0	0	0	0	752
14	42	110	57	58	0	0	0	0	0	0	0	0	0	0	0	267
15	188	586	202	229	21	0	0	6	0	0	9	0	0	0	0	1239
Total	18817	40936	27227	22115	3777	2878	1214	857	2198	579	1221	277	918	302	1298	124615

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	864	2030	2426	1007	327	126	95	85	151	39	100	11	25	22	88	7399
2	1810	3303	2424	4009	571	316	200	89	151	71	158	44	26	5	196	13373
3	2367	2353	2177	1532	438	279	114	73	210	75	111	20	73	28	109	9958
4	889	3743	1727	1166	219	218	58	87	88	25	95	28	36	6	40	8425
5	158	936	268	186	0	0	0	0	0	0	0	0	0	0	5	1553
6	182	619	164	198	0	0	0	0	0	0	8	0	0	0	0	1170
7	73	160	80	16	0	0	0	0	0	0	0	0	0	0	0	330
8	71	164	154	88	0	0	0	0	0	0	0	0	0	0	0	476
9	145	333	127	106	4	0	0	0	0	0	0	0	0	0	0	715
10	38	197	74	62	0	0	0	0	0	0	0	0	0	0	0	373
11	74	258	161	43	0	9	0	0	0	0	0	0	0	0	0	545
12	12	86	20	9	0	0	0	0	0	0	0	0	0	0	0	126
13	21	104	71	42	0	0	0	0	0	5	0	0	0	0	0	244
14	13	92	14	2	0	0	0	0	0	0	0	0	0	0	0	121
15	61	197	161	53	0	0	0	0	0	0	0	0	8	0	0	479
Total	6777	14575	10049	8518	1559	948	467	334	600	216	473	103	168	62	438	45287

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	4104	8701	9767	4983	943	635	386	289	901	216	532	65	210	142	498	32371
2	9711	22876	15846	19712	3645	3171	1155	776	1402	710	900	294	555	248	1042	82044
3	12438	14728	16015	8149	1667	1681	521	547	1396	447	655	135	543	200	644	59768
4	5438	21642	8325	6755	1259	1378	221	382	530	322	442	92	239	52	324	47401
5	1019	4279	1733	1178	15	0	0	0	6	7	0	0	0	0	26	8262
6	693	2735	879	1307	0	0	0	0	0	0	20	0	0	0	0	5634
7	422	1216	619	213	0	0	0	0	0	0	0	0	0	0	0	2470
8	423	801	392	423	0	0	0	0	0	0	0	0	0	0	6	2045
9	1035	1426	753	557	4	0	0	0	19	0	16	0	0	0	0	3808
10	188	481	193	283	8	0	0	0	0	0	0	0	5	0	0	1159
11	536	1093	475	409	0	19	0	0	15	0	6	0	0	0	8	2560
12	65	370	98	98	0	0	0	0	0	0	0	0	0	0	0	630
13	280	484	310	227	0	0	0	0	0	5	0	0	0	0	8	1314
14	108	223	111	85	0	0	0	0	0	0	0	0	0	0	0	527
15	501	1100	501	343	30	0	0	6	0	0	9	0	8	0	0	2498
Total	36960	82156	56015	44722	7569	6884	2284	2000	4268	1708	2580	586	1561	642	2555	252491

2021 BUS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	68	337	140	39	16	16	3	1	4	0	43	0	0	0	23	691
2	711	1119	340	202	433	137	25	6	58	0	21	1	0	0	3	3057
3	400	362	659	118	7	19	4	3	7	0	6	0	1	0	1	1586
4	163	333	166	1138	296	156	5	3	10	2	30	2	0	0	11	2315
5	56	130	20	95	340	65	106	2	0	0	2	0	0	0	0	816
6	28	64	10	107	262	224	20	28	0	0	0	0	0	0	0	745
7	15	38	7	5	312	13	0	0	0	0	0	0	0	0	0	388
8	1	5	2	3	10	45	0	3	0	0	0	0	0	0	0	70
9	2	9	8	6	0	0	0	0	0	0	0	0	0	0	0	25
10	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
11	25	8	5	31	2	0	0	0	0	0	0	0	0	0	30	102
12	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	6	1	1	4	0	0	0	0	0	0	25	0	0	0	0	37
Total	1476	2407	1358	1751	1679	675	165	46	79	2	126	3	1	0	69	9836

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	182	1298	754	242	86	27	20	5	2	0	44	0	0	0	53	2711
2	1003	1751	709	641	283	215	54	5	7	0	19	1	0	0	7	4696
3	696	804	1196	395	28	23	5	2	6	0	10	0	0	0	0	3164
4	255	791	449	1640	297	304	6	7	7	3	40	3	0	0	16	3816
5	93	779	47	186	594	310	273	9	0	0	3	0	0	0	0	2294
6	48	179	25	224	176	439	17	34	0	0	0	0	0	0	0	1142
7	18	47	11	4	232	36	2	0	0	0	0	0	0	0	0	349
8	6	5	5	7	13	74	0	6	0	0	0	0	0	0	0	115
9	2	13	4	4	0	0	0	0	0	0	0	0	0	0	0	23
10	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
11	41	10	8	41	2	0	0	0	0	0	0	0	0	0	66	168
12	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	22	0	0	11	0	0	0	0	0	0	31	0	0	0	0	64
Total	2365	5676	3205	3401	1710	1427	376	68	21	3	147	4	0	0	142	18547

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	6	52	41	9	5	2	1	0	0	0	1	0	0	0	1	117
2	19	43	18	18	5	1	1	0	0	0	0	0	0	0	0	107
3	24	30	47	14	1	0	0	0	0	0	0	0	0	0	0	116
4	7	20	29	55	7	8	0	0	0	0	1	0	0	0	0	127
5	2	7	0	8	9	5	13	1	0	0	0	0	0	0	0	46
6	0	5	1	7	4	11	1	1	0	0	0	0	0	0	0	29
7	0	2	0	0	5	0	0	0	0	0	0	0	0	0	0	8
8	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3
9	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	2	0	0	0	0	0	0	0	0	0	0	3	7
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	3
Total	60	159	136	117	37	29	16	2	0	0	3	0	0	0	4	564

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	255	1686	935	290	107	45	24	6	6	0	87	0	0	0	77	3519
2	1733	2913	1067	862	722	353	81	12	66	0	40	2	1	0	10	7860
3	1119	1196	1901	528	36	42	9	5	13	0	16	0	1	0	1	4866
4	424	1144	644	2832	600	468	11	10	17	5	71	5	0	0	27	6258
5	152	915	67	289	943	380	393	12	0	0	5	0	0	0	0	3156
6	77	248	36	338	442	673	37	64	0	0	0	0	0	0	0	1915
7	33	86	17	9	549	49	2	0	0	0	0	0	0	0	0	745
8	7	10	6	10	24	121	0	10	0	0	0	0	0	0	0	188
9	4	22	12	12	0	0	0	0	0	0	0	0	0	0	0	51
10	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4
11	66	18	13	74	5	0	0	0	0	0	0	0	0	0	99	276
12	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	6
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	30	1	1	15	0	0	0	0	0	0	57	0	0	0	0	104
Total	3901	8242	4699	5269	3427	2131	556	117	101	6	277	7	2	0	215	28948

2021 RAIL

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	10	26	49	60	15	38	23	5	322	12	6	2	3	0	9	580
2	103	34	100	195	47	96	10	41	3490	8	5	0	16	17	8	4170
3	503	61	145	146	8	51	1	3	1456	2	9	0	11	3	5	2403
4	379	208	144	155	18	47	3	8	368	3	13	2	0	1	6	1356
5	135	52	16	23	0	1	0	1	229	0	0	0	16	4	0	478
6	354	273	96	50	0	0	0	0	12	0	0	0	0	0	0	786
7	269	5	154	8	0	0	0	0	4	0	0	0	0	0	0	440
8	88	55	66	4	0	0	0	0	3	0	0	0	0	0	0	216
9	420	408	305	97	12	4	1	0	60	0	0	0	1	0	7	1316
10	12	1	0	2	0	0	0	0	1	0	0	0	0	0	0	17
11	41	0	1	4	0	0	0	0	1	0	0	0	0	0	0	48
12	19	2	4	2	0	0	0	0	0	0	0	0	0	0	0	28
13	69	0	6	0	0	0	0	0	0	0	0	0	0	0	0	75
14	0	67	66	0	0	0	0	0	0	0	0	0	0	0	0	133
15	7	33	29	16	1	0	0	0	5	0	0	0	0	0	0	90
Total	2410	1224	1180	762	102	237	38	59	5953	25	33	4	47	25	35	12135

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	17	28	61	123	37	93	37	38	216	4	3	0	12	30	6	704
2	193	20	49	140	1	54	0	29	344	1	3	0	18	15	19	887
3	76	30	51	64	9	63	1	20	271	0	3	1	18	12	2	621
4	186	126	93	65	16	17	2	16	68	1	2	1	4	6	10	612
5	17	4	26	12	0	0	0	0	16	0	0	0	0	0	0	74
6	91	41	54	14	0	0	0	0	4	0	0	0	0	0	0	203
7	55	6	10	4	4	0	0	0	0	0	0	0	0	0	0	80
8	19	5	9	5	0	0	0	0	8	0	0	0	0	0	0	45
9	204	313	153	48	7	18	0	8	0	6	0	0	0	0	0	759
10	13	10	3	1	0	0	0	0	4	0	0	0	0	3	0	34
11	9	7	2	3	0	0	0	0	0	0	0	0	0	0	0	21
12	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6
13	20	21	9	3	11	0	0	0	0	0	0	0	0	0	0	65
14	4	41	38	1	0	0	0	0	0	5	0	0	0	0	0	90
15	9	0	0	7	1	0	0	0	0	0	0	0	0	0	4	21
Total	917	653	557	490	85	246	40	111	931	17	10	2	53	66	41	4220

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	10	62	49	108	45	150	102	40	188	8	6	7	19	4	5	803
2	87	12	48	67	16	41	1	11	180	11	9	0	13	33	1	529
3	51	32	80	63	5	49	16	10	114	0	7	1	10	3	12	453
4	60	79	45	54	7	16	6	2	36	1	3	1	1	0	2	312
5	6	3	2	5	0	0	0	1	11	0	0	0	0	0	0	27
6	16	31	15	11	0	2	0	0	1	0	0	0	0	0	0	76
7	7	5	2	1	0	0	0	0	0	0	0	0	0	0	0	15
8	2	48	6	1	0	0	0	0	0	0	0	0	0	0	0	56
9	151	717	385	107	42	2	2	1	0	0	0	0	1	0	0	1407
10	4	3	1	1	0	0	0	0	5	0	0	0	0	0	0	14
11	4	1	1	3	0	0	0	0	0	6	0	0	0	0	0	15
12	5	1	0	1	0	0	0	0	0	0	0	0	0	0	0	7
13	6	7	9	1	0	0	0	0	0	0	0	0	0	0	0	24
14	14	2	0	1	2	0	0	0	0	0	0	0	0	0	0	19
15	5	3	15	0	1	0	0	0	6	0	0	0	0	0	0	30
Total	427	1006	657	424	117	261	127	63	541	25	24	9	44	41	19	3787

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	36	116	159	291	97	281	162	83	726	24	14	9	35	35	20	2086
2	382	67	196	403	63	192	10	81	4014	19	17	0	48	66	27	5586
3	630	122	277	273	22	164	18	32	1841	2	19	2	39	18	19	3477
4	626	413	282	274	41	79	12	26	473	5	17	4	4	6	17	2280
5	158	59	44	40	0	1	0	2	256	0	0	0	16	4	0	579
6	461	345	164	75	0	2	0	0	17	0	0	0	0	0	0	1064
7	332	16	166	12	4	0	0	0	4	0	0	0	0	0	0	534
8	109	107	80	10	0	0	0	0	11	0	0	0	0	0	0	317
9	774	1438	843	252	61	25	3	8	61	7	0	0	2	0	8	3482
10	30	15	3	4	0	0	0	0	10	0	0	0	0	3	0	65
11	54	8	4	11	0	0	0	0	1	6	0	0	0	0	0	84
12	29	3	4	4	0	0	0	0	0	0	0	0	0	0	0	40
13	96	28	24	5	12	0	0	0	0	0	0	0	0	0	0	164
14	18	110	104	3	2	0	0	0	0	5	0	0	0	0	0	242
15	21	36	44	23	2	0	0	0	12	0	0	0	0	0	4	142
Total	3755	2883	2395	1677	304	745	204	233	7425	68	67	15	144	132	95	20142

2021 ALL MODES COMBINED

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	738	1871	1636	2350	188	322	80	95	492	86	268	13	19	38	255	8451
2	3565	10754	6213	5993	1645	1696	405	386	4118	466	367	122	243	185	351	36510
3	4599	4637	6906	2928	481	900	133	267	2002	251	273	56	132	68	193	23826
4	2887	7703	3094	3265	751	689	59	130	569	137	99	22	108	9	78	19598
5	642	1567	929	517	340	66	106	3	235	0	2	0	16	4	0	4429
6	610	976	549	580	262	224	20	28	12	0	12	0	0	0	0	3275
7	420	513	441	111	312	13	0	0	4	0	0	0	0	0	0	1814
8	283	310	214	171	10	45	0	3	3	0	0	0	0	0	0	1040
9	646	756	662	265	12	4	1	0	60	0	0	0	1	0	7	2416
10	76	117	63	50	0	0	0	0	1	0	0	0	5	0	0	312
11	295	380	142	137	2	11	0	0	1	0	0	0	0	0	30	998
12	51	172	43	52	0	0	0	0	0	0	0	0	0	0	0	318
13	119	79	111	77	0	0	0	0	0	0	0	0	0	0	8	393
14	53	88	106	25	0	0	0	0	0	0	0	0	0	0	0	273
15	265	352	169	81	10	0	0	0	5	0	25	0	0	0	0	907
Total	15252	30276	21277	16602	4015	3969	804	914	7503	940	1045	213	524	304	923	104560

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	2779	6488	6709	2089	582	360	294	158	800	107	259	43	182	112	246	21206
2	6346	11743	8406	10889	2193	1662	639	382	1033	182	423	130	322	90	532	44971
3	7146	8994	8983	4413	798	659	285	235	925	124	299	60	368	119	350	33758
4	2644	11654	4356	5322	916	994	121	199	327	168	332	50	99	44	249	27477
5	520	2740	643	791	608	311	273	9	16	7	3	0	0	0	21	5942
6	422	1698	350	924	176	439	17	34	4	0	0	0	0	0	0	4064
7	287	638	279	106	235	36	2	0	0	0	0	0	0	0	0	1583
8	183	397	106	183	13	74	0	6	8	0	0	0	0	0	6	975
9	872	1079	433	341	7	18	0	8	19	6	16	0	0	0	0	2800
10	99	179	58	178	8	0	0	0	4	0	0	0	0	3	0	529
11	281	480	188	308	2	0	0	0	15	0	6	0	0	0	74	1355
12	26	115	40	45	0	0	0	0	0	0	0	0	0	0	0	225
13	229	322	142	112	11	0	0	0	0	0	0	0	0	0	0	817
14	46	151	95	59	0	0	0	0	0	5	0	0	0	0	0	357
15	220	586	202	247	21	0	0	6	0	0	39	0	0	0	4	1325
Total	22100	47265	30990	26007	5572	4551	1630	1036	3150	600	1378	283	971	368	1482	147383

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	879	2144	2517	1125	377	279	198	125	340	47	106	18	44	27	94	8319
2	1916	3359	2490	4094	592	359	202	100	331	81	168	44	39	38	196	14009
3	2441	2415	2304	1609	444	329	130	82	324	75	118	21	83	31	120	10527
4	956	3841	1801	1274	233	242	64	89	124	26	99	29	37	6	42	8864
5	166	945	271	199	9	5	13	1	11	0	0	0	0	0	5	1626
6	198	654	179	216	4	13	1	1	1	0	8	0	0	0	0	1274
7	80	167	82	17	5	0	0	0	0	0	0	0	0	0	0	352
8	73	212	159	89	0	1	0	0	0	0	0	0	0	0	0	535
9	296	1051	512	215	45	2	2	1	0	0	0	0	1	0	0	2125
10	43	201	75	63	0	0	0	0	5	0	0	0	0	0	0	387
11	80	259	162	49	0	9	0	0	0	6	0	0	0	0	3	567
12	17	87	20	9	0	0	0	0	0	0	0	0	0	0	0	133
13	27	111	81	43	0	0	0	0	0	5	0	0	0	0	0	268
14	27	94	14	3	2	0	0	0	0	0	0	0	0	0	0	140
15	67	200	176	54	1	0	0	0	6	0	1	0	8	0	0	512
Total	7265	15740	10842	9059	1713	1239	610	400	1141	242	501	112	212	102	461	49638

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	4396	10503	10861	5564	1147	960	572	378	1632	240	633	74	245	177	595	37976
2	11827	25856	17109	20976	4430	3716	1246	869	5482	730	957	296	604	313	1079	95490
3	14187	16047	18193	8950	1724	1887	548	584	3250	450	690	137	583	218	664	68111
4	6487	23199	9251	9861	1900	1924	244	418	1020	332	531	101	244	59	368	55939
5	1328	5253	1843	1507	958	382	393	14	261	7	5	0	16	4	26	11997
6	1230	3328	1078	1720	442	676	37	64	17	0	20	0	0	0	0	8613
7	787	1318	803	234	553	49	2	0	4	0	0	0	0	0	0	3749
8	539	918	479	443	24	121	0	10	11	0	0	0	0	0	6	2550
9	1813	2887	1608	820	65	25	3	8	80	7	16	0	2	0	8	7341
10	218	496	196	291	8	0	0	0	10	0	0	0	5	3	0	1228
11	656	1119	492	494	5	20	0	0	16	6	6	0	0	0	107	2920
12	94	374	102	106	0	0	0	0	0	0	0	0	0	0	0	676
13	375	512	334	232	12	0	0	0	0	5	0	0	0	0	8	1479
14	126	333	215	88	2	0	0	0	0	5	0	0	0	0	0	769
15	552	1137	546	382	32	0	0	6	12	0	66	0	8	0	4	2744
Total	44616	93281	63109	51668	11300	9759	3044	2350	11794	1782	2924	608	1706	774	2866	301581

2021 CAR

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	727	1745	1758	2414	184	279	61	96	177	76	230	12	18	44	239	8061
2	2913	10653	6159	6230	1276	1506	413	355	590	468	365	129	229	169	364	31821
3	3858	4722	6724	2884	531	857	150	269	565	254	265	58	125	67	196	21524
4	2581	7692	3008	2142	469	520	57	133	207	135	66	21	113	9	64	17217
5	467	1497	935	434	0	0	0	0	6	0	0	0	0	0	1	3341
6	250	749	493	456	0	0	0	0	0	0	12	0	0	0	0	1961
7	141	512	293	103	0	0	0	0	0	0	0	0	0	0	0	1048
8	200	277	163	175	0	0	0	0	0	0	0	0	0	0	0	815
9	241	386	378	172	0	0	0	0	0	0	0	0	0	0	0	1177
10	69	153	74	58	0	0	0	0	0	0	0	0	5	0	0	359
11	252	402	150	106	0	11	0	0	0	0	0	0	0	0	0	921
12	33	180	42	49	0	0	0	0	0	0	0	0	0	0	0	305
13	51	96	113	81	0	0	0	0	0	0	0	0	0	0	8	351
14	58	39	46	26	0	0	0	0	0	0	0	0	0	0	0	169
15	276	344	151	66	9	0	0	0	0	0	0	0	0	0	0	847
Total	12119	29446	20491	15396	2469	3173	681	854	1545	934	939	220	490	289	872	89917

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3417	7179	8413	2799	647	354	319	190	798	136	309	53	228	107	285	25234
2	6922	15396	10804	14594	2714	1856	858	489	911	256	594	187	387	105	703	56776
3	8289	11553	11322	5515	1102	721	408	258	788	150	354	77	392	128	416	41474
4	3293	14788	5415	5022	833	921	156	260	355	203	369	65	135	55	282	32152
5	560	2751	876	837	19	0	0	0	0	9	0	0	0	0	29	5082
6	408	2132	572	939	0	0	0	0	0	0	2	0	0	0	0	4053
7	292	843	356	134	0	0	0	0	0	0	0	0	0	0	0	1625
8	207	546	196	245	0	0	0	0	0	0	0	0	0	0	7	1202
9	862	1036	529	369	1	0	0	0	20	0	19	0	0	0	0	2836
10	130	328	126	238	10	0	0	0	0	0	0	0	0	0	0	831
11	344	648	297	331	0	3	0	0	18	0	8	0	0	0	9	1657
12	34	178	68	57	0	0	0	0	0	0	0	0	0	0	0	337
13	248	424	240	149	0	0	0	0	0	1	0	0	0	0	0	1063
14	73	175	98	67	0	0	0	0	0	0	0	0	0	0	0	413
15	296	771	313	288	26	0	0	7	0	0	9	0	1	0	0	1712
Total	25375	58749	39624	31586	5352	3855	1741	1204	2891	755	1662	382	1144	395	1731	176446

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1536	3974	4981	2426	585	322	207	230	406	95	266	37	96	37	248	15446
2	3211	7640	5438	8409	1507	932	467	305	493	166	442	168	153	48	430	29807
3	3833	5844	5203	3344	878	534	275	165	367	109	227	53	146	58	208	21244
4	1797	7423	3317	2560	461	505	107	178	181	80	162	62	88	36	115	17072
5	294	1626	593	460	3	0	0	0	1	1	0	0	0	0	11	2989
6	306	1485	706	549	0	0	0	0	0	0	11	0	0	0	0	3058
7	134	382	181	58	0	0	0	0	0	0	0	0	0	0	0	756
8	125	373	292	160	0	0	0	0	0	0	0	0	0	0	2	952
9	295	655	531	226	7	0	0	0	1	0	2	0	0	0	0	1718
10	92	409	239	126	1	0	0	0	0	0	0	0	0	0	0	868
11	183	457	333	123	0	13	0	0	2	0	2	0	0	0	1	1114
12	27	151	61	29	0	0	0	0	0	0	0	0	0	0	0	267
13	52	214	176	111	0	0	0	0	0	6	0	0	0	0	0	561
14	35	148	54	16	0	0	0	0	0	0	0	0	0	0	0	253
15	159	425	293	117	6	0	0	2	0	0	1	0	9	0	0	1011
Total	12080	31206	22398	18715	3448	2306	1055	879	1452	457	1113	320	492	178	1014	97115

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	5681	12898	15152	7639	1415	955	587	516	1382	308	806	102	341	188	771	48741
2	13047	33690	22401	29233	5496	4294	1738	1149	1994	890	1400	483	769	322	1497	118404
3	15979	22120	23250	11742	2511	2113	833	692	1720	512	846	188	664	253	820	84241
4	7671	29903	11740	9724	1764	1945	319	571	743	418	598	148	336	100	461	66442
5	1321	5874	2405	1732	22	0	0	0	6	11	0	0	0	0	42	11412
6	965	4366	1772	1944	0	0	0	0	0	0	25	0	0	0	0	9072
7	567	1737	830	296	0	0	0	0	0	0	0	0	0	0	0	3429
8	533	1195	652	580	0	0	0	0	0	0	0	0	0	0	9	2968
9	1398	2078	1437	767	8	0	0	0	22	0	21	0	0	0	0	5731
10	291	889	439	422	11	0	0	0	0	0	0	0	6	0	0	2058
11	780	1507	780	560	0	27	0	0	20	0	9	0	0	0	9	3692
12	94	509	171	135	0	0	0	0	0	0	0	0	0	0	0	909
13	352	734	530	342	0	0	0	0	0	7	0	0	0	0	9	1974
14	166	361	199	109	0	0	0	0	0	0	0	0	0	0	0	835
15	731	1539	757	472	41	0	0	9	0	0	10	0	11	0	0	3570
Total	49575	119401	82513	65698	11268	9334	3477	2936	5888	2146	3714	921	2126	862	3618	363478

2021 BUS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	73	389	170	51	20	18	4	1	4	0	44	0	0	0	24	797
2	738	1221	372	229	444	142	28	7	59	0	22	2	0	0	3	3266
3	411	387	719	131	8	20	5	3	8	0	6	0	1	0	1	1699
4	165	350	175	1230	304	165	5	3	10	2	32	2	0	0	11	2455
5	57	176	20	121	370	87	133	3	0	0	2	0	0	0	0	969
6	29	73	12	120	268	243	21	32	0	0	0	0	0	0	0	798
7	16	39	7	5	321	14	0	0	0	0	0	0	0	0	0	402
8	1	5	2	3	10	48	0	4	0	0	0	0	0	0	0	74
9	3	11	9	6	0	0	0	0	0	0	0	0	0	0	0	28
10	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
11	27	10	6	33	2	0	0	0	0	0	0	0	0	0	32	110
12	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	8	1	1	5	0	0	0	0	0	0	28	0	0	0	0	43
Total	1529	2663	1492	1937	1748	736	197	52	80	2	134	3	1	0	72	10648

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	253	1781	1070	359	127	46	29	7	3	0	59	0	0	0	62	3795
2	1488	2606	1059	970	570	288	79	9	12	0	24	1	0	0	8	7113
3	976	1107	1760	571	46	31	9	4	9	0	14	0	0	0	0	4528
4	338	1045	595	2425	374	399	8	10	9	4	61	4	0	0	20	5294
5	123	992	57	351	869	432	425	16	0	0	4	0	0	0	0	3269
6	60	278	37	359	291	634	31	70	0	0	0	0	0	0	0	1760
7	25	70	13	8	345	46	3	0	0	0	0	0	0	0	0	508
8	7	8	6	10	17	92	0	9	0	0	0	0	0	0	0	148
9	3	24	7	8	0	0	0	0	0	0	0	0	0	0	0	41
10	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4
11	62	20	12	62	4	0	0	0	0	0	0	0	0	0	82	241
12	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	5
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	45	3	0	19	0	0	0	0	0	0	59	0	0	0	0	127
Total	3379	7935	4616	5149	2642	1969	584	123	32	4	222	5	1	0	172	26835

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	81	612	387	144	51	26	12	1	2	0	26	0	0	0	9	1351
2	462	902	361	354	242	73	28	2	9	0	6	0	0	0	0	2441
3	253	355	589	193	22	11	6	2	5	0	5	0	0	0	0	1441
4	81	262	172	932	87	105	3	3	4	1	24	1	0	0	4	1681
5	28	223	10	197	288	157	198	8	0	0	2	0	0	0	0	1112
6	13	125	16	145	103	209	14	38	0	0	0	0	0	0	0	663
7	7	26	3	4	113	13	0	0	0	0	0	0	0	0	0	166
8	1	5	2	3	3	21	0	3	0	0	0	0	0	0	0	39
9	2	38	5	10	0	0	0	0	0	0	0	0	0	0	0	56
10	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
11	35	15	6	24	2	0	0	0	0	0	0	0	0	0	21	102
12	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	23	3	1	9	0	0	0	0	0	0	29	0	0	0	0	65
Total	987	2569	1553	2017	910	616	262	58	21	1	91	2	0	0	34	9122

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	406	2782	1627	554	199	89	45	9	9	0	129	0	0	0	95	5944
2	2688	4729	1791	1552	1257	503	136	18	80	0	51	3	1	0	11	12820
3	1641	1849	3069	895	75	62	20	9	21	0	24	0	1	0	2	7668
4	584	1656	942	4587	765	669	17	16	24	7	118	7	1	0	36	9430
5	209	1392	87	669	1526	677	757	27	0	0	8	0	0	0	0	5350
6	102	477	64	624	662	1086	67	139	0	0	0	0	0	0	0	3221
7	47	135	23	17	779	73	3	0	0	0	0	0	0	0	0	1077
8	9	18	10	17	30	161	0	16	0	0	0	0	0	0	0	260
9	8	74	21	24	0	0	0	0	0	0	0	0	0	0	0	126
10	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	8
11	124	44	23	119	8	0	0	0	0	0	0	0	0	0	135	453
12	0	3	0	7	0	0	0	0	0	0	0	0	0	0	0	10
13	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	77	8	2	32	0	0	0	0	0	0	117	0	0	0	0	235
Total	5895	13168	7660	9103	5301	3322	1044	234	133	8	447	11	2	0	279	46605

2021 RAIL

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	11	32	90	84	26	65	38	11	342	13	8	3	9	0	9	742
2	105	39	104	210	54	137	10	47	3519	8	5	0	16	27	13	4295
3	506	69	152	154	9	61	8	6	1476	2	9	0	11	8	9	2481
4	383	220	154	165	20	50	4	8	372	3	13	3	0	1	8	1403
5	136	54	16	24	0	1	0	1	230	0	0	0	16	4	0	482
6	356	278	98	53	0	0	0	0	13	0	0	0	0	0	0	798
7	271	5	154	8	0	0	0	0	4	0	0	0	0	0	0	442
8	88	60	66	5	0	0	0	0	3	0	0	0	0	0	0	222
9	437	584	375	114	24	5	1	0	65	0	0	0	1	0	8	1614
10	13	1	0	2	0	0	0	0	1	0	0	0	0	0	0	18
11	42	0	3	5	0	0	0	0	1	0	0	0	0	0	0	51
12	20	2	4	3	0	0	0	0	0	0	0	0	0	0	0	28
13	70	2	6	0	1	0	0	0	0	0	0	0	0	0	0	80
14	0	68	66	0	0	0	0	0	0	0	0	0	0	0	0	135
15	8	33	29	16	1	0	0	0	6	0	0	0	0	0	0	94
Total	2446	1446	1319	844	136	318	60	74	6032	26	36	6	53	41	47	12884

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	22	68	207	261	75	199	105	63	325	8	14	4	36	32	11	1430
2	207	37	68	219	23	172	2	48	519	1	5	0	24	56	32	1413
3	103	68	85	122	21	106	31	33	376	0	4	2	23	44	14	1031
4	229	200	143	116	24	31	5	19	95	1	4	1	4	6	18	897
5	30	12	31	18	0	0	0	0	20	0	0	0	2	0	0	113
6	122	75	74	28	0	0	0	0	11	0	0	0	0	0	0	310
7	72	8	11	5	4	0	0	0	0	0	0	0	0	0	0	100
8	26	30	14	12	0	0	0	0	10	0	0	0	0	0	0	93
9	305	1050	489	125	57	21	1	11	17	8	0	0	0	0	1	2084
10	17	11	3	1	0	0	0	0	7	0	0	0	0	5	0	44
11	12	9	5	7	0	0	0	0	0	0	0	0	0	0	0	33
12	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7
13	26	33	18	5	15	0	0	0	0	0	0	0	0	0	0	96
14	8	50	40	3	1	0	0	0	0	6	0	0	0	0	0	108
15	15	9	2	13	1	0	0	0	3	0	0	0	0	0	6	48
Total	1199	1659	1189	935	220	529	144	174	1384	25	28	8	89	143	81	7807

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	15	148	304	345	113	300	263	83	415	18	28	17	52	6	13	2120
2	110	28	89	201	28	118	3	41	548	11	11	1	19	57	8	1273
3	92	94	126	162	22	97	109	54	354	0	8	4	17	32	21	1191
4	131	210	137	151	18	47	11	5	96	2	6	2	1	1	7	825
5	28	29	10	17	0	0	0	1	28	0	0	0	1	0	1	115
6	66	100	57	41	0	3	0	0	9	0	0	0	0	0	0	276
7	44	11	6	4	0	0	0	0	1	0	0	0	0	0	0	66
8	14	70	15	8	0	0	0	0	2	0	0	0	0	0	0	109
9	360	2760	1265	328	176	10	4	5	24	3	0	0	1	0	5	4940
10	14	5	2	2	0	0	0	0	7	0	1	0	0	1	0	33
11	8	6	6	10	0	0	0	0	0	6	0	0	0	0	0	35
12	7	1	0	2	0	0	0	0	0	0	0	0	0	0	0	11
13	13	20	20	3	2	0	0	0	0	0	0	0	0	0	0	58
14	17	16	3	2	3	0	0	0	0	1	0	0	0	0	0	42
15	10	13	19	5	1	0	0	0	8	0	0	0	0	0	1	56
Total	929	3510	2058	1283	362	574	390	188	1491	41	55	24	91	97	56	11150

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	49	248	602	690	214	563	406	157	1082	39	50	24	96	37	33	4291
2	423	103	261	630	105	427	15	136	4586	20	22	2	60	140	52	6981
3	702	231	362	439	51	264	149	92	2206	2	21	5	50	84	44	4702
4	742	631	433	433	62	127	20	32	562	7	23	6	6	8	34	3125
5	194	95	57	59	0	1	0	2	278	0	0	0	19	5	1	711
6	544	453	229	122	1	3	0	0	32	0	0	0	0	0	0	1384
7	388	24	171	17	4	0	0	0	5	0	0	0	0	0	0	608
8	128	159	95	25	0	0	0	0	16	0	0	0	0	0	0	423
9	1103	4394	2129	567	257	35	6	16	105	11	0	0	2	0	14	8639
10	44	17	5	6	0	0	0	0	15	0	1	0	0	6	0	94
11	61	15	14	22	0	0	0	0	1	6	0	0	0	0	0	119
12	32	3	5	6	0	0	0	0	0	0	0	0	0	0	0	46
13	109	55	44	7	18	0	0	0	1	0	0	0	0	0	0	234
14	25	134	109	5	5	0	0	0	0	7	0	0	0	0	0	285
15	32	55	51	34	2	0	0	0	17	0	0	0	0	0	7	198
Total	4574	6615	4566	3062	718	1421	595	436	8907	92	118	38	233	280	184	31841

2021 ALL MODES COMBINED

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	811	2165	2019	2549	230	361	103	108	523	89	283	15	26	44	272	9600
2	3756	11913	6635	6668	1775	1785	451	409	4168	476	392	131	246	196	380	39382
3	4775	5178	7595	3170	548	938	162	277	2049	256	280	58	136	76	206	25704
4	3129	8262	3337	3537	793	734	66	145	589	140	112	25	113	10	84	21076
5	661	1728	972	580	370	88	133	4	236	0	2	0	16	4	1	4793
6	636	1100	604	629	268	243	21	32	13	0	12	0	0	0	0	3558
7	427	556	454	115	321	14	0	0	4	0	0	0	0	0	0	1892
8	290	342	231	183	10	48	0	4	3	0	0	0	0	0	0	1110
9	681	981	762	292	24	5	1	0	65	0	0	0	1	0	8	2820
10	82	154	74	62	0	0	0	0	1	0	0	0	5	0	0	379
11	321	412	158	144	2	12	0	0	1	0	0	0	0	0	32	1082
12	53	182	47	54	0	0	0	0	0	0	0	0	0	0	0	336
13	121	98	120	82	1	0	0	0	0	0	0	0	0	0	8	431
14	58	107	113	26	0	0	0	0	0	0	0	0	0	0	0	303
15	293	378	182	88	10	0	0	0	6	0	28	0	0	0	0	985
Total	16094	33556	23301	18177	4354	4227	939	979	7658	962	1109	229	544	329	992	113449

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3693	9028	9690	3419	848	599	452	260	1126	145	383	57	264	138	357	30459
2	8618	18039	11930	15783	3306	2316	939	546	1441	257	622	188	411	161	743	65302
3	9368	12728	13167	6208	1169	858	449	295	1173	150	371	78	415	172	430	47032
4	3859	16033	6153	7563	1231	1352	169	288	459	209	434	71	140	62	320	38343
5	713	3756	963	1206	888	433	425	16	20	9	4	0	2	0	29	8465
6	589	2485	683	1327	292	634	31	70	11	0	2	0	0	0	0	6123
7	389	921	379	147	349	46	3	0	0	0	0	0	0	0	0	2234
8	240	583	216	267	17	92	0	9	10	0	0	0	0	0	7	1442
9	1170	2111	1024	502	58	21	1	11	37	8	19	0	0	0	1	4962
10	147	339	129	243	10	0	0	0	7	0	0	0	0	5	0	879
11	417	677	314	399	4	3	0	0	18	0	8	0	0	0	91	1931
12	40	179	68	63	0	0	0	0	0	0	0	0	0	0	0	349
13	274	457	258	154	15	0	0	0	0	1	0	0	0	0	0	1159
14	81	224	139	70	1	0	0	0	0	6	0	0	0	0	0	521
15	356	783	316	319	27	0	0	7	3	0	69	0	1	0	6	1886
Total	29953	68343	45430	37669	8214	6354	2469	1501	4307	785	1912	395	1233	538	1984	211087

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1632	4735	5672	2915	749	648	482	314	824	113	320	54	148	43	269	18917
2	3783	8570	5888	8963	1777	1123	498	348	1051	177	459	169	172	105	438	33521
3	4178	6293	5918	3699	921	643	390	221	726	109	239	57	163	90	229	23876
4	2009	7895	3625	3643	566	656	121	186	281	84	193	66	89	36	126	19578
5	350	1878	613	674	290	157	198	9	28	1	2	0	1	0	12	4216
6	386	1711	779	735	103	212	14	38	9	0	11	0	0	0	0	3997
7	185	419	191	67	113	13	0	0	1	0	0	0	0	0	0	988
8	140	448	309	172	3	21	0	3	2	0	0	0	0	0	2	1099
9	657	3453	1801	564	183	10	4	5	26	3	2	0	1	0	5	6714
10	107	414	241	130	1	0	0	0	7	0	1	0	0	1	0	903
11	226	478	344	158	2	13	0	0	2	6	2	0	0	0	21	1251
12	34	154	61	32	0	0	0	0	0	0	0	0	0	0	0	281
13	65	234	197	114	2	0	0	0	0	6	0	0	0	0	0	619
14	52	164	57	18	3	0	0	0	0	1	0	0	0	0	0	295
15	191	441	313	131	7	0	0	2	8	0	30	0	9	0	1	1132
Total	13997	37286	26008	22015	4721	3496	1708	1125	2964	499	1259	346	583	275	1104	117387

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	6136	15929	17381	8883	1827	1608	1037	682	2473	346	985	127	438	225	898	58976
2	16157	38521	24453	31414	6858	5225	1889	1303	6660	910	1473	488	829	462	1561	138205
3	18322	24200	26681	13076	2638	2439	1001	793	3948	515	891	193	714	337	865	96612
4	8998	32191	13116	14743	2591	2742	357	619	1329	432	738	162	342	108	531	78997
5	1724	7361	2548	2459	1548	678	757	29	284	11	8	0	19	5	43	17473
6	1611	5295	2065	2690	663	1089	67	139	32	0	25	0	0	0	0	13678
7	1001	1896	1024	329	783	73	3	0	5	0	0	0	0	0	0	5114
8	670	1372	756	622	30	161	0	16	16	0	0	0	0	0	9	3652
9	2508	6546	3587	1358	265	35	6	16	127	11	21	0	2	0	14	14495
10	335	907	444	436	11	0	0	0	15	0	1	0	6	6	0	2160
11	965	1566	816	701	8	28	0	0	21	6	9	0	0	0	145	4264
12	126	515	175	148	0	0	0	0	0	0	0	0	0	0	0	965
13	460	790	575	350	18	0	0	0	1	7	0	0	0	0	9	2210
14	191	495	308	114	5	0	0	0	0	7	0	0	0	0	0	1120
15	840	1602	810	538	44	0	0	9	17	0	127	0	11	0	7	4003
Total	60044	139184	94739	77862	17288	14077	5116	3605	14928	2246	4280	970	2360	1143	4081	441924

Appendix B. Post VDM Matrices

B.1. PA Level

B.2. OD Level

Base-2009 CAR

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	580	1359	1298	1921	142	243	47	75	146	67	195	11	13	32	187	6313
2	2492	8704	5344	4339	1074	1363	330	299	500	401	318	116	195	147	306	25927
3	3334	3876	5559	2145	430	781	118	227	482	214	237	57	104	57	158	17779
4	2070	5962	2103	1636	380	305	35	85	166	115	25	0	105	26	55	13067
5	441	1361	880	364	0	0	0	0	5	0	0	0	0	0	0	3051
6	225	635	423	319	0	0	0	0	0	0	12	0	0	0	0	1614
7	130	446	271	105	0	0	0	0	0	0	0	0	0	0	0	952
8	155	208	125	153	0	0	0	0	0	0	0	0	0	0	0	640
9	187	287	301	158	0	0	0	0	0	0	0	0	0	0	0	934
10	59	108	58	32	0	0	0	0	0	0	0	0	6	0	0	263
11	206	328	121	104	0	10	0	0	0	0	0	0	0	0	0	769
12	33	172	39	43	0	0	0	0	0	0	0	0	0	0	0	286
13	43	68	93	82	0	0	0	0	0	0	0	0	0	0	6	291
14	44	18	31	32	0	0	0	0	0	0	0	0	0	0	0	125
15	216	274	123	88	8	0	0	0	0	0	0	0	0	0	0	709
Total	10215	23807	16767	11520	2034	2702	530	687	1299	798	786	184	422	261	711	72721

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	2263	4625	5338	1332	408	226	213	98	509	92	198	48	145	68	158	15720
2	4631	9072	7026	8165	1765	1323	534	295	597	163	378	125	269	64	437	34842
3	5724	7463	7063	3075	703	549	259	188	562	110	268	61	304	94	298	26721
4	1798	8785	2900	3113	484	402	90	170	276	141	245	26	102	36	244	18812
5	380	1891	558	508	16	0	0	0	0	6	0	0	0	0	19	3379
6	268	1430	268	453	0	0	0	0	0	0	0	0	0	0	0	2419
7	202	555	251	87	0	0	0	0	0	0	0	0	0	0	0	1094
8	130	321	78	165	0	0	0	0	0	0	0	0	0	0	5	698
9	571	636	237	306	0	0	0	0	14	0	14	0	0	0	0	1778
10	82	159	52	165	7	0	0	0	0	0	0	0	0	0	0	464
11	207	421	159	215	0	0	0	0	13	0	5	0	0	0	7	1026
12	25	112	42	26	0	0	0	0	0	0	0	0	0	0	0	204
13	177	265	116	112	0	0	0	0	0	0	0	0	0	0	0	669
14	35	95	50	54	0	0	0	0	0	0	0	0	0	0	0	234
15	163	515	173	235	19	0	0	5	0	0	7	0	0	0	0	1118
Total	16656	36344	24310	18009	3402	2501	1096	756	1970	512	1114	259	820	262	1167	109178

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	765	1845	2219	860	294	122	84	70	131	34	99	12	21	19	76	6651
2	1626	3028	2249	3284	529	305	178	81	132	63	149	45	22	4	167	11863
3	2121	2154	2006	1103	403	260	103	65	182	63	104	20	64	25	93	8767
4	726	2933	1342	1073	164	155	58	89	85	16	92	22	42	6	43	6845
5	145	891	256	151	0	0	0	0	0	0	0	0	0	0	5	1447
6	173	608	162	112	0	0	0	0	0	0	8	0	0	0	0	1062
7	67	154	76	4	0	0	0	0	0	0	0	0	0	0	0	300
8	56	137	123	59	0	0	0	0	0	0	0	0	0	0	0	376
9	123	291	109	101	2	0	0	0	0	0	0	0	0	0	0	626
10	36	179	62	56	0	0	0	0	0	0	0	0	0	0	0	333
11	68	232	146	35	0	8	0	0	0	0	0	0	0	0	0	489
12	12	84	20	0	0	0	0	0	0	0	0	0	0	0	0	116
13	18	91	57	51	0	0	0	0	0	6	0	0	0	0	0	222
14	10	76	12	17	0	0	0	0	0	0	0	0	0	0	0	115
15	53	177	142	49	0	0	0	0	0	0	0	0	6	0	0	426
Total	5999	12878	8981	6954	1392	851	422	304	529	183	451	99	155	54	385	39639

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3607	7829	8855	4113	843	591	344	242	785	194	491	71	179	118	421	28684
2	8749	20804	14619	15787	3368	2991	1041	675	1229	627	844	286	486	215	910	72632
3	11179	13493	14628	6323	1536	1590	480	480	1227	387	609	137	472	176	549	53267
4	4594	17679	6345	5822	1028	863	183	344	527	272	362	48	248	68	342	38724
5	967	4143	1694	1023	16	0	0	0	5	6	0	0	0	0	24	7878
6	666	2673	852	884	0	0	0	0	0	0	20	0	0	0	0	5095
7	398	1155	598	196	0	0	0	0	0	0	0	0	0	0	0	2346
8	341	665	326	376	0	0	0	0	0	0	0	0	0	0	5	1713
9	882	1213	648	565	2	0	0	0	14	0	14	0	0	0	0	3337
10	176	447	172	252	7	0	0	0	0	0	0	0	6	0	0	1060
11	481	981	426	353	0	18	0	0	13	0	5	0	0	0	7	2283
12	70	367	101	69	0	0	0	0	0	0	0	0	0	0	0	606
13	238	423	265	245	0	0	0	0	0	6	0	0	0	0	6	1183
14	89	190	92	103	0	0	0	0	0	0	0	0	0	0	0	474
15	432	966	438	372	27	0	0	5	0	0	7	0	6	0	0	2254
Total	32869	73029	50058	36482	6828	6054	2048	1746	3798	1493	2352	542	1397	578	2264	221538

2021-DM

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	670	1321	1399	1777	122	201	40	71	231	80	229	11	56	820	370	7397
2	2551	9232	5269	5130	1023	1415	356	360	944	547	400	145	495	883	509	29261
3	3718	3958	6106	2379	377	735	113	253	639	234	248	55	243	398	288	19743
4	2032	6783	2454	1971	418	529	52	163	243	227	67	25	168	8	104	15245
5	400	1354	798	426	0	0	0	0	9	0	0	0	0	0	0	2987
6	202	627	396	464	0	0	0	0	0	0	18	0	0	0	0	1706
7	123	462	256	106	0	0	0	0	0	0	0	0	0	0	0	946
8	180	251	135	181	0	0	0	0	0	0	0	0	0	0	0	747
9	211	368	352	208	0	0	0	0	0	0	0	0	0	0	0	1138
10	59	117	58	48	0	0	0	0	0	0	0	0	0	0	0	282
11	204	379	121	110	0	12	0	0	0	0	0	0	0	0	0	826
12	30	171	35	51	0	0	0	0	0	0	0	0	0	0	0	288
13	51	81	103	84	0	0	0	0	0	0	0	0	0	0	0	319
14	56	25	49	25	0	0	0	0	0	0	0	0	0	0	0	155
15	242	329	130	64	11	0	0	0	0	0	0	0	0	0	0	777
Total	10730	25456	17661	13024	1951	2892	560	847	2066	1088	961	237	963	2109	1272	81817

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	2490	4551	5643	1481	382	204	216	122	909	146	213	44	349	772	326	17848
2	4941	9692	7442	9862	1773	1418	581	411	1009	270	520	175	602	321	890	39906
3	6471	7342	7645	3736	635	505	248	217	1001	146	321	72	834	705	573	30451
4	2056	10623	3781	3697	621	764	126	231	388	227	348	64	270	181	364	23739
5	399	2015	562	678	17	0	0	0	0	11	0	0	0	0	50	3731
6	272	1508	263	768	0	0	0	0	0	0	0	0	0	0	0	2810
7	212	608	256	115	0	0	0	0	0	0	0	0	0	0	0	1192
8	154	407	89	197	0	0	0	0	0	0	0	0	0	0	7	855
9	695	817	289	337	0	0	0	0	0	0	0	0	0	0	0	2138
10	84	173	53	193	7	0	0	0	0	0	0	0	0	0	0	510
11	224	489	191	285	0	0	0	0	0	0	0	0	0	0	0	1190
12	19	117	41	44	0	0	0	0	0	0	0	0	0	0	0	221
13	215	308	138	120	0	0	0	0	0	0	0	0	0	0	0	780
14	49	119	72	64	0	0	0	0	0	0	0	0	0	0	0	305
15	183	607	209	250	24	0	0	7	0	0	0	0	0	0	0	1280
Total	18465	39378	26673	21827	3459	2890	1171	988	3307	799	1401	355	2055	1979	2211	126958

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	859	1906	2414	861	290	118	91	84	177	38	94	11	25	244	135	7346
2	1701	3198	2312	3822	547	331	197	108	229	98	182	46	28	29	347	13177
3	2308	2171	2168	1394	381	260	106	67	363	118	117	20	82	140	173	9866
4	810	3638	1651	1159	220	249	62	119	171	34	114	33	71	6	52	8390
5	142	913	243	203	0	0	0	0	0	0	0	0	0	0	12	1513
6	167	614	153	213	0	0	0	0	0	0	9	0	0	0	0	1156
7	68	161	74	18	0	0	0	0	0	0	0	0	0	0	0	321
8	64	165	143	99	0	0	0	0	0	0	0	0	0	0	0	472
9	155	365	122	121	5	0	0	0	0	0	0	0	0	0	0	768
10	36	194	68	75	0	0	0	0	0	0	0	0	0	0	0	372
11	70	262	165	47	0	10	0	0	0	0	0	0	0	0	0	554
12	12	86	20	9	0	0	0	0	0	0	0	0	0	0	0	126
13	21	107	76	46	0	0	0	0	0	0	0	0	0	0	0	250
14	17	95	18	2	0	0	0	0	0	0	0	0	0	0	0	132
15	60	199	161	58	0	0	0	0	0	0	0	0	0	0	0	479
Total	6491	14073	9789	8127	1442	968	456	378	941	288	517	109	206	419	719	44923

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	4019	7778	9456	4118	793	523	347	277	1317	264	536	66	430	1836	832	32592
2	9194	22121	15024	18814	3343	3164	1134	879	2182	915	1103	366	1126	1233	1746	82344
3	12497	13471	15920	7508	1393	1499	467	537	2003	497	685	147	1159	1243	1034	60060
4	4898	21044	7886	6828	1259	1542	239	513	802	488	528	122	509	195	520	47374
5	941	4281	1603	1307	17	0	0	0	9	11	0	0	0	0	62	8231
6	641	2748	811	1445	0	0	0	0	0	0	27	0	0	0	0	5672
7	403	1231	586	239	0	0	0	0	0	0	0	0	0	0	0	2460
8	398	823	368	477	0	0	0	0	0	0	0	0	0	0	7	2074
9	1061	1550	763	665	5	0	0	0	0	0	0	0	0	0	0	4044
10	178	484	179	316	7	0	0	0	0	0	0	0	0	0	0	1164
11	499	1130	477	442	0	22	0	0	0	0	0	0	0	0	0	2570
12	61	374	96	104	0	0	0	0	0	0	0	0	0	0	0	635
13	287	496	316	250	0	0	0	0	0	0	0	0	0	0	0	1349
14	123	239	139	91	0	0	0	0	0	0	0	0	0	0	0	592
15	485	1135	500	372	36	0	0	7	0	0	0	0	0	0	0	2535
Total	35685	78907	54124	42978	6852	6750	2187	2213	6313	2175	2879	700	3224	4508	4202	253697

2021-DS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	662	1329	1379	1797	125	208	41	74	238	82	235	11	59	818	378	7437
2	2586	9253	5369	5144	1016	1394	359	359	942	529	394	143	490	873	508	29359
3	3681	3984	6029	2362	395	756	116	262	659	240	251	55	247	401	292	19731
4	2106	6796	2547	1950	415	513	50	161	236	223	65	24	164	7	103	15360
5	414	1352	848	432	0	0	0	0	8	0	0	0	0	0	0	3054
6	215	624	434	453	0	0	0	0	0	0	17	0	0	0	0	1743
7	131	470	279	111	0	0	0	0	0	0	0	0	0	0	0	991
8	186	251	142	183	0	0	0	0	0	0	0	0	0	0	0	762
9	224	361	371	210	0	0	0	0	0	0	0	0	0	0	0	1167
10	63	116	64	48	0	0	0	0	0	0	0	0	0	0	0	291
11	221	374	131	110	0	12	0	0	0	0	0	0	0	0	0	847
12	32	169	37	51	0	0	0	0	0	0	0	0	0	0	0	289
13	52	80	107	86	0	0	0	0	0	0	0	0	0	0	0	324
14	57	24	51	25	0	0	0	0	0	0	0	0	0	0	0	158
15	254	327	139	65	11	0	0	0	0	0	0	0	0	0	0	795
Total	10885	25508	17927	13027	1962	2882	566	856	2084	1074	961	234	960	2099	1282	82309

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	2474	4508	5586	1462	391	213	220	126	932	151	221	46	357	774	337	17795
2	4886	9736	7402	9836	1784	1410	580	411	1007	269	524	177	604	319	892	39838
3	6441	7392	7551	3586	670	525	257	226	1031	150	318	71	848	708	573	30348
4	2064	10657	3670	3612	612	742	123	225	381	223	342	63	268	180	361	23524
5	408	2015	582	660	16	0	0	0	0	10	0	0	0	0	49	3741
6	286	1508	275	745	0	0	0	0	0	0	0	0	0	0	0	2814
7	218	612	266	111	0	0	0	0	0	0	0	0	0	0	0	1208
8	158	408	93	193	0	0	0	0	0	0	0	0	0	0	7	859
9	713	815	298	324	0	0	0	0	0	0	0	0	0	0	0	2150
10	86	173	55	191	7	0	0	0	0	0	0	0	0	0	0	512
11	240	492	189	276	0	0	0	0	0	0	0	0	0	0	0	1197
12	20	118	41	43	0	0	0	0	0	0	0	0	0	0	0	223
13	220	307	140	117	0	0	0	0	0	0	0	0	0	0	0	784
14	50	119	72	63	0	0	0	0	0	0	0	0	0	0	0	305
15	189	611	208	243	23	0	0	6	0	0	0	0	0	0	0	1281
Total	18453	39473	26429	21463	3504	2889	1180	995	3351	803	1405	357	2077	1981	2218	126578

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	851	1880	2389	882	303	127	95	88	187	41	102	11	26	249	141	7373
2	1670	3194	2251	3838	551	329	201	108	230	96	182	46	28	29	346	13100
3	2295	2192	2141	1407	413	285	114	76	382	123	123	20	88	144	182	9985
4	784	3667	1451	1144	223	247	62	120	172	34	117	33	72	6	54	8187
5	136	877	232	198	0	0	0	0	0	0	0	0	0	0	12	1457
6	161	596	145	207	0	0	0	0	0	0	9	0	0	0	0	1119
7	66	157	71	17	0	0	0	0	0	0	0	0	0	0	0	310
8	62	160	136	99	0	0	0	0	0	0	0	0	0	0	0	457
9	152	352	117	117	5	0	0	0	0	0	0	0	0	0	0	743
10	35	189	63	74	0	0	0	0	0	0	0	0	0	0	0	361
11	68	257	144	47	0	10	0	0	0	0	0	0	0	0	0	526
12	11	84	18	9	0	0	0	0	0	0	0	0	0	0	0	123
13	20	103	74	45	0	0	0	0	0	0	0	0	0	0	0	242
14	17	94	17	2	0	0	0	0	0	0	0	0	0	0	0	130
15	59	196	148	57	0	0	0	0	0	0	0	0	0	0	0	460
Total	6387	13999	9398	8142	1496	998	472	393	971	293	535	110	215	429	735	44573

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3987	7717	9354	4140	819	547	356	288	1357	273	558	68	442	1841	856	32606
2	9142	22183	15021	18818	3351	3133	1140	878	2179	894	1100	366	1122	1221	1747	82296
3	12416	13569	15720	7355	1479	1566	488	564	2073	512	692	146	1183	1252	1046	60063
4	4954	21120	7668	6706	1251	1502	235	507	788	481	524	120	504	194	518	47072
5	959	4244	1662	1290	16	0	0	0	8	10	0	0	0	0	62	8251
6	663	2728	854	1405	0	0	0	0	0	0	26	0	0	0	0	5675
7	415	1238	616	239	0	0	0	0	0	0	0	0	0	0	0	2509
8	407	818	371	474	0	0	0	0	0	0	0	0	0	0	7	2078
9	1089	1529	786	651	5	0	0	0	0	0	0	0	0	0	0	4060
10	184	478	182	314	7	0	0	0	0	0	0	0	0	0	0	1165
11	529	1123	464	433	0	22	0	0	0	0	0	0	0	0	0	2571
12	63	371	96	104	0	0	0	0	0	0	0	0	0	0	0	635
13	292	489	321	248	0	0	0	0	0	0	0	0	0	0	0	1350
14	124	238	141	90	0	0	0	0	0	0	0	0	0	0	0	593
15	501	1134	496	365	34	0	0	6	0	0	0	0	0	0	0	2536
Total	35725	78981	53753	42633	6962	6770	2218	2244	6406	2170	2901	701	3252	4508	4235	253460

Base-2009 BUS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	66	338	139	10	16	16	3	1	3	0	41	0	0	0	21	654
2	713	1155	348	56	418	140	25	6	55	0	21	2	0	0	3	2940
3	396	367	677	17	7	19	4	3	6	0	6	0	1	0	1	1504
4	125	156	74	1022	261	131	3	0	9	0	25	0	0	0	9	1814
5	58	140	21	83	338	66	106	2	0	0	2	0	0	0	0	816
6	30	70	12	87	264	234	21	27	0	0	0	0	0	0	0	745
7	16	41	7	3	312	13	0	0	0	0	0	0	0	0	0	392
8	1	4	2	0	9	39	0	3	0	0	0	0	0	0	0	58
9	2	8	8	4	0	0	0	0	0	0	0	0	0	0	0	21
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	23	8	5	24	2	0	0	0	0	0	0	0	0	0	27	89
12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	6	1	1	3	0	0	0	0	0	0	24	0	0	0	0	35
Total	1436	2290	1292	1309	1626	658	162	41	73	0	119	2	1	0	61	9071

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	169	1256	730	167	78	25	19	4	2	0	41	0	0	0	45	2537
2	972	1763	709	335	267	210	51	5	7	0	19	1	0	0	7	4346
3	664	792	1206	159	26	23	4	2	5	0	10	0	0	0	0	2890
4	169	456	179	1290	243	251	2	1	3	0	32	0	0	0	12	2638
5	90	789	47	151	551	305	256	8	0	0	3	0	0	0	0	2200
6	49	190	26	189	171	457	16	31	0	0	0	0	0	0	0	1129
7	18	49	12	1	220	37	2	0	0	0	0	0	0	0	0	338
8	5	4	4	2	10	62	0	5	0	0	0	0	0	0	0	92
9	2	12	3	1	0	0	0	0	0	0	0	0	0	0	0	18
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	37	9	7	31	2	0	0	0	0	0	0	0	0	0	58	145
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	21	0	0	8	0	0	0	0	0	0	29	0	0	0	0	58
Total	2195	5320	2925	2334	1568	1370	351	56	17	0	134	1	0	0	122	16391

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	5	51	41	6	5	2	1	0	0	0	1	0	0	0	1	111
2	19	45	18	8	5	1	1	0	0	0	0	0	0	0	0	98
3	23	31	47	2	1	0	0	0	0	0	0	0	0	0	0	105
4	3	4	2	37	6	6	0	0	0	0	1	0	0	0	0	59
5	2	7	0	6	8	5	12	0	0	0	0	0	0	0	0	41
6	0	5	1	6	3	11	1	1	0	0	0	0	0	0	0	27
7	0	2	0	0	5	0	0	0	0	0	0	0	0	0	0	7
8	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
9	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	2	0	0	0	0	0	0	0	0	0	0	2	6
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
Total	55	145	110	69	33	28	14	2	0	0	3	0	0	0	3	462

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	240	1645	909	183	98	43	23	5	5	0	83	0	0	0	67	3302
2	1704	2963	1075	398	690	352	77	11	62	0	40	3	0	0	10	7385
3	1083	1189	1930	178	34	42	9	5	12	0	15	0	1	0	1	4498
4	296	616	256	2349	509	388	5	1	12	0	58	0	0	0	21	4512
5	150	935	69	240	897	376	374	10	0	0	5	0	0	0	0	3057
6	79	266	38	282	438	702	38	59	0	0	0	0	0	0	0	1902
7	34	91	19	4	537	50	2	0	0	0	0	0	0	0	0	737
8	6	8	6	2	19	103	0	9	0	0	0	0	0	0	0	152
9	4	20	11	7	0	0	0	0	0	0	0	0	0	0	0	42
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	61	18	12	57	4	0	0	0	0	0	0	0	0	0	87	240
12	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	28	1	1	12	0	0	0	0	0	0	54	0	0	0	0	95
Total	3686	7755	4327	3713	3227	2056	526	99	90	0	255	3	1	0	187	25925

2021-DM

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	69	334	144	47	16	16	3	1	0	0	21	0	0	0	14	665
2	718	1110	361	269	433	138	27	6	1	0	14	1	0	0	3	3080
3	412	361	649	131	7	18	4	2	0	0	2	0	0	0	0	1587
4	168	405	183	1224	313	155	6	4	0	0	13	2	0	0	9	2481
5	54	125	20	104	351	63	110	2	0	0	0	0	0	0	0	830
6	26	59	10	108	256	226	20	28	0	0	0	0	0	0	0	733
7	14	35	7	5	311	12	0	0	0	0	0	0	0	0	0	384
8	1	4	2	3	10	44	0	3	0	0	0	0	0	0	0	67
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	18	4	3	26	2	0	0	0	0	0	0	0	0	0	0	52
12	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	4	0	1	4	0	0	0	0	0	0	0	0	0	0	0	9
Total	1484	2439	1379	1921	1700	672	170	46	1	0	51	3	0	0	26	9890

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	176	1219	738	228	81	24	19	5	0	0	17	0	0	0	33	2539
2	1034	1687	729	646	275	204	55	5	0	0	10	1	0	0	4	4651
3	684	782	1163	373	26	21	4	2	0	0	2	0	0	0	0	3058
4	244	789	458	1671	303	289	7	7	0	0	18	3	0	0	15	3804
5	90	760	47	191	595	295	283	9	0	0	1	0	0	0	0	2272
6	43	171	23	214	167	429	16	34	0	0	0	0	0	0	0	1097
7	17	45	10	5	231	34	2	0	0	0	0	0	0	0	0	343
8	5	4	4	7	12	68	0	5	0	0	0	0	0	0	0	106
9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	21	5	2	23	1	0	0	0	0	0	0	0	0	0	0	52
12	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	15	0	0	10	0	0	0	0	0	0	0	0	0	0	0	25
Total	2328	5462	3173	3372	1694	1364	387	67	1	0	48	3	0	0	52	17951

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	6	51	41	11	5	2	1	0	0	0	0	0	0	0	1	116
2	20	47	19	31	5	2	1	0	0	0	0	0	0	0	0	126
3	24	30	46	16	1	0	0	0	0	0	0	0	0	0	0	118
4	9	34	36	65	8	8	0	0	0	0	1	0	0	0	0	162
5	2	7	0	9	9	5	14	1	0	0	0	0	0	0	0	47
6	0	4	1	7	4	11	1	1	0	0	0	0	0	0	0	29
7	0	2	0	0	5	0	0	0	0	0	0	0	0	0	0	8
8	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	63	175	143	142	38	30	16	2	0	0	1	0	0	0	1	611

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	251	1603	922	286	102	41	23	5	0	0	38	0	0	0	48	3321
2	1773	2843	1109	946	714	344	83	11	1	0	24	2	0	0	7	7857
3	1120	1173	1858	520	35	39	8	4	0	0	4	0	0	0	0	4762
4	420	1228	677	2960	625	453	13	11	0	0	32	4	0	0	24	6447
5	145	892	67	304	956	364	407	12	0	0	1	0	0	0	0	3149
6	70	234	34	329	427	666	37	62	0	0	0	0	0	0	0	1859
7	31	81	17	10	548	46	2	0	0	0	0	0	0	0	0	734
8	6	9	6	10	23	113	0	9	0	0	0	0	0	0	0	175
9	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	39	10	4	50	3	0	0	0	0	0	0	0	0	0	0	106
12	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	5
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	20	0	1	15	0	0	0	0	0	0	0	0	0	0	0	35
Total	3875	8075	4695	5435	3431	2066	573	115	2	0	100	6	0	0	80	28452

2021-DS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	69	337	142	59	16	16	5	1	0	0	21	0	0	0	14	679
2	708	1089	357	384	421	135	31	6	1	0	13	1	0	0	2	3149
3	405	363	643	162	7	18	4	2	0	0	2	0	0	0	0	1608
4	172	455	182	1330	319	179	14	7	0	0	13	2	0	0	8	2683
5	53	124	20	118	341	62	109	2	0	0	0	0	0	0	0	829
6	26	58	10	131	249	222	21	27	0	0	0	0	0	0	0	743
7	23	41	11	15	343	14	0	0	0	0	0	0	0	0	0	447
8	1	4	2	7	10	43	0	3	0	0	0	0	0	0	0	70
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	18	4	2	27	2	0	0	0	0	0	0	0	0	0	0	52
12	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	9
Total	1479	2475	1369	2239	1708	689	184	48	1	0	50	3	0	0	25	10272

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	174	1218	729	260	81	24	20	5	0	0	17	0	0	0	34	2562
2	1008	1642	711	821	270	194	63	5	0	0	10	1	0	0	4	4728
3	673	780	1148	418	26	21	4	2	0	0	2	0	0	0	0	3076
4	246	822	454	1897	298	301	17	11	0	0	17	3	0	0	13	4077
5	89	753	47	220	579	287	286	9	0	0	1	0	0	0	0	2270
6	42	167	23	261	162	414	17	32	0	0	0	0	0	0	0	1118
7	15	52	10	16	232	35	1	0	0	0	0	0	0	0	0	362
8	5	4	4	14	12	67	0	5	0	0	0	0	0	0	0	111
9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	21	5	2	24	1	0	0	0	0	0	0	0	0	0	0	53
12	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	15	0	0	10	0	0	0	0	0	0	0	0	0	0	0	26
Total	2288	5445	3127	3945	1660	1341	408	69	1	0	47	4	0	0	51	18386

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	7	51	41	12	5	2	1	0	0	0	0	0	0	0	1	118
2	20	46	19	38	5	1	1	0	0	0	0	0	0	0	0	131
3	24	30	46	18	1	0	0	0	0	0	0	0	0	0	0	119
4	9	40	34	72	9	10	1	1	0	0	1	0	0	0	0	178
5	2	7	0	10	9	5	14	1	0	0	0	0	0	0	0	48
6	0	4	0	9	3	11	1	1	0	0	0	0	0	0	0	30
7	0	2	0	1	6	0	0	0	0	0	0	0	0	0	0	9
8	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	63	181	141	162	39	31	17	3	0	0	1	0	0	0	1	639

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	249	1607	911	331	101	41	25	5	0	0	38	0	0	0	49	3359
2	1736	2778	1087	1243	696	330	95	11	1	0	23	2	0	0	7	8009
3	1102	1174	1837	598	35	40	8	4	0	0	4	0	0	0	0	4803
4	427	1317	670	3299	626	490	32	19	0	0	31	5	0	0	21	6938
5	144	883	67	348	928	354	409	11	0	0	1	0	0	0	0	3146
6	68	229	33	401	414	647	38	60	0	0	0	0	0	0	0	1891
7	38	95	21	32	581	50	1	0	0	0	0	0	0	0	0	817
8	6	9	6	21	22	111	0	8	0	0	0	0	0	0	0	183
9	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	39	9	4	52	3	0	0	0	0	0	0	0	0	0	0	107
12	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0	6
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	20	0	1	15	0	0	0	0	0	0	0	0	0	0	0	36
Total	3830	8102	4637	6346	3407	2062	609	120	2	0	98	7	0	0	77	29296

Base-2009 RAIL

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	9	23	47	29	15	37	21	5	284	11	5	2	3	0	7	499
2	97	24	93	27	44	91	9	35	3217	8	5	0	15	15	7	3686
3	474	58	143	45	8	49	1	3	1310	2	8	0	10	3	5	2118
4	335	30	37	20	1	19	0	4	375	0	9	0	0	1	5	835
5	132	51	16	7	0	1	0	1	220	0	0	0	15	4	0	447
6	350	253	93	25	0	0	0	0	12	0	0	0	0	0	0	733
7	265	4	155	5	0	0	0	0	4	0	0	0	0	0	0	433
8	79	51	56	0	0	0	0	0	3	0	0	0	0	0	0	189
9	362	355	269	85	12	4	1	0	52	0	0	0	1	0	7	1147
10	12	1	0	0	0	0	0	0	1	0	0	0	0	0	0	14
11	35	0	1	0	0	1	0	0	1	0	0	0	0	0	0	37
12	20	2	4	0	0	0	0	0	0	0	0	0	0	0	0	26
13	61	0	6	2	0	0	0	0	0	0	0	0	0	0	0	69
14	0	61	62	0	0	0	0	0	0	0	0	0	0	0	0	123
15	6	30	26	13	1	0	0	0	4	0	0	0	0	0	0	80
Total	2236	943	1006	258	80	201	31	48	5483	21	28	2	44	23	31	10434

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	16	26	59	104	33	92	33	34	188	4	3	0	11	26	6	633
2	181	17	47	84	1	52	0	31	307	1	3	0	17	15	16	771
3	72	29	50	26	8	60	1	20	241	0	3	1	17	11	2	539
4	168	66	56	15	9	8	3	13	81	0	1	0	4	5	9	439
5	16	4	27	6	0	0	0	0	15	0	0	0	0	0	0	67
6	95	42	55	6	0	0	0	0	3	0	0	0	0	0	0	202
7	53	7	11	3	3	0	0	0	0	0	0	0	0	0	0	76
8	15	4	8	3	0	0	0	0	6	0	0	0	0	0	0	36
9	176	292	140	46	6	16	0	6	0	6	0	0	0	0	0	688
10	13	10	2	0	0	0	0	0	4	0	0	0	0	3	0	32
11	9	6	2	2	0	0	0	0	0	0	0	0	0	0	0	19
12	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
13	18	20	8	3	9	0	0	0	0	0	0	0	0	0	0	58
14	4	38	35	2	0	0	0	0	0	5	0	0	0	0	0	83
15	8	0	0	6	0	0	0	0	0	0	0	0	0	0	4	19
Total	847	561	499	306	69	229	37	105	845	15	9	1	49	60	36	3668

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	10	57	47	93	40	148	92	36	162	8	5	8	17	4	4	731
2	79	9	45	14	15	39	1	10	163	11	9	0	12	27	0	434
3	47	31	78	28	5	45	15	9	99	0	7	1	9	3	10	387
4	47	23	12	11	1	7	5	1	53	0	1	0	2	0	1	164
5	5	3	2	0	0	0	0	1	10	0	0	0	0	0	0	21
6	16	30	14	3	0	2	0	0	1	0	0	0	0	0	0	66
7	7	5	2	0	0	0	0	0	0	0	0	0	0	0	0	14
8	2	40	5	0	0	0	0	0	0	0	0	0	0	0	0	47
9	130	640	343	109	36	2	1	1	0	0	0	0	1	0	0	1262
10	3	3	1	0	0	0	0	0	5	0	0	0	0	0	0	12
11	5	1	1	2	0	0	0	0	0	5	0	0	0	0	0	13
12	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6
13	5	6	9	4	0	0	0	0	0	0	0	0	0	0	0	24
14	11	2	0	1	2	0	0	0	0	0	0	0	0	0	0	15
15	4	3	13	0	1	0	0	0	5	0	0	0	0	0	0	26
Total	374	854	571	264	100	243	113	57	498	24	22	9	42	34	16	3221

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	34	106	153	226	88	277	145	74	635	23	13	9	31	30	17	1863
2	356	50	185	125	60	182	10	75	3687	19	16	0	44	57	24	4891
3	593	118	270	99	20	155	17	33	1650	2	17	2	36	16	17	3044
4	550	118	105	46	11	34	8	18	509	1	11	0	7	6	15	1438
5	153	58	45	13	0	1	0	2	245	0	0	0	15	4	0	536
6	460	325	162	34	0	2	0	0	16	0	0	0	0	0	0	1001
7	324	16	168	7	3	0	0	0	4	0	0	0	0	0	0	523
8	96	95	69	3	0	0	0	0	9	0	0	0	0	0	0	272
9	667	1287	752	239	53	22	2	6	52	6	0	0	2	0	7	3096
10	28	14	3	0	0	0	0	0	9	0	0	0	0	3	0	57
11	48	7	4	4	0	1	0	0	1	5	0	0	0	0	0	69
12	29	3	4	0	0	0	0	0	0	0	0	0	0	0	0	36
13	85	26	23	9	9	0	0	0	0	0	0	0	0	0	0	151
14	15	101	96	3	2	0	0	0	0	5	0	0	0	0	0	221
15	18	33	39	20	2	0	0	0	10	0	0	0	0	0	4	125
Total	3457	2358	2077	828	248	674	182	209	6826	60	58	11	134	117	83	17322

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AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1	23	48	41	16	40	24	5	332	12	6	2	3	0	8	560
2	105	19	104	63	50	102	10	39	3425	8	6	0	16	17	6	3969
3	499	58	119	133	8	53	1	3	1377	2	8	0	8	3	5	2276
4	408	75	132	80	9	49	3	8	379	3	14	3	0	1	6	1171
5	145	53	15	15	0	1	0	1	228	0	0	0	17	4	0	479
6	355	260	101	46	0	0	0	0	12	0	0	0	0	0	0	774
7	292	5	154	7	0	0	0	0	4	0	0	0	0	0	0	461
8	89	52	64	3	0	0	0	0	3	0	0	0	0	0	0	211
9	414	379	277	91	12	4	1	0	0	0	0	0	0	0	0	1178
10	12	1	0	3	0	0	0	0	0	0	0	0	0	0	0	15
11	46	0	1	6	0	1	0	0	0	0	0	0	0	0	0	54
12	18	2	4	2	0	0	0	0	0	0	0	0	0	0	0	26
13	58	0	5	0	0	0	0	0	0	0	0	0	0	0	0	63
14	0	46	64	0	0	0	0	0	0	0	0	0	0	0	0	110
15	5	25	20	14	1	0	0	0	0	0	0	0	0	0	0	66
Total	2447	997	1109	504	96	250	40	56	5759	25	34	4	44	25	25	11415

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	8	27	55	145	41	99	36	38	218	4	3	0	12	32	6	723
2	55	9	50	106	1	55	0	29	348	1	3	0	21	18	19	715
3	68	28	19	55	9	62	1	19	265	0	3	1	19	13	2	563
4	219	87	93	46	14	20	2	15	68	2	2	1	4	6	10	589
5	19	1	27	9	0	0	0	0	14	0	0	0	0	0	0	70
6	91	40	67	17	0	0	0	0	4	0	0	0	0	0	0	219
7	53	6	10	3	0	0	0	0	0	0	0	0	0	0	0	72
8	17	4	8	4	0	0	0	0	7	0	0	0	0	0	0	40
9	185	292	138	54	7	17	0	6	0	0	0	0	0	0	0	700
10	13	10	3	1	0	0	0	0	0	0	0	0	0	0	0	26
11	10	23	2	11	0	0	0	0	0	0	0	0	0	0	0	45
12	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5
13	17	15	7	3	9	0	0	0	0	0	0	0	0	0	0	51
14	4	30	26	1	0	0	0	0	0	0	0	0	0	0	0	61
15	7	0	0	6	0	0	0	0	0	0	0	0	0	0	0	14
Total	771	572	504	463	81	255	39	108	923	6	11	2	55	69	37	3896

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	4	61	46	112	47	150	110	41	174	8	6	7	20	4	4	795
2	88	4	51	26	16	42	1	11	178	10	9	0	13	35	0	483
3	43	32	70	54	5	52	16	9	109	0	7	1	11	3	12	425
4	58	40	43	29	6	18	5	2	40	1	3	1	1	0	1	248
5	6	3	2	3	0	0	0	1	11	0	0	0	0	0	0	26
6	17	31	15	12	0	0	0	0	1	0	0	0	0	0	0	74
7	7	5	2	1	0	0	0	0	0	0	0	0	0	0	0	16
8	2	43	5	1	0	0	0	0	0	0	0	0	0	0	0	51
9	147	671	353	109	42	2	1	1	0	0	0	0	0	0	0	1326
10	4	3	1	1	0	0	0	0	0	0	0	0	0	0	0	8
11	5	1	1	4	0	0	0	0	0	0	0	0	0	0	0	12
12	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	6
13	5	5	6	1	0	0	0	0	0	0	0	0	0	0	0	17
14	10	2	0	1	2	0	0	0	0	0	0	0	0	0	0	15
15	3	3	15	1	0	0	0	0	0	0	0	0	0	0	0	22
Total	405	904	611	356	118	265	133	65	512	19	24	9	44	43	17	3526

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	13	110	149	298	104	290	170	84	724	24	14	9	35	37	18	2078
2	248	31	205	194	67	199	11	79	3950	19	17	0	49	70	26	5167
3	610	118	209	242	22	168	17	32	1751	2	18	2	38	19	19	3265
4	685	202	269	156	29	87	10	25	487	6	19	4	5	7	17	2009
5	170	57	45	27	0	1	0	2	252	0	0	0	17	4	0	575
6	462	331	182	75	0	0	0	0	17	0	0	0	0	0	0	1067
7	353	16	165	11	0	0	0	0	4	0	0	0	0	0	0	549
8	108	99	77	8	0	0	0	0	10	0	0	0	0	0	0	303
9	746	1342	768	255	61	24	2	7	0	0	0	0	0	0	0	3205
10	29	13	3	5	0	0	0	0	0	0	0	0	0	0	0	50
11	61	24	4	21	0	1	0	0	0	0	0	0	0	0	0	112
12	27	3	4	3	0	0	0	0	0	0	0	0	0	0	0	38
13	80	20	17	4	9	0	0	0	0	0	0	0	0	0	0	131
14	14	77	90	3	2	0	0	0	0	0	0	0	0	0	0	186
15	16	29	35	21	2	0	0	0	0	0	0	0	0	0	0	102
Total	3623	2473	2224	1323	295	770	211	229	7195	50	69	15	143	137	80	18836

2021-DS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1	22	48	39	16	40	11	5	332	12	6	2	3	0	8	544
2	103	18	100	55	48	99	4	38	3401	8	6	0	15	17	7	3918
3	497	57	118	123	8	52	0	3	1380	2	8	0	8	3	5	2264
4	380	62	107	82	6	40	0	6	376	3	14	2	0	1	6	1086
5	141	52	15	13	0	1	0	1	226	0	0	0	16	4	0	469
6	348	256	97	41	0	0	0	0	12	0	0	0	0	0	0	753
7	201	3	118	4	0	0	0	0	3	0	0	0	0	0	0	329
8	87	50	63	2	0	0	0	0	3	0	0	0	0	0	0	205
9	410	376	276	91	12	4	1	0	0	0	0	0	0	0	0	1171
10	12	1	0	3	0	0	0	0	0	0	0	0	0	0	0	15
11	45	0	1	7	0	1	0	0	0	0	0	0	0	0	0	54
12	18	1	4	2	0	0	0	0	0	0	0	0	0	0	0	26
13	57	0	5	0	0	0	0	0	0	0	0	0	0	0	0	62
14	0	45	64	0	0	0	0	0	0	0	0	0	0	0	0	110
15	5	25	20	14	1	0	0	0	0	0	0	0	0	0	0	65
Total	2303	969	1036	475	91	238	16	53	5733	25	34	4	43	24	25	11070

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	7	26	53	142	41	98	30	37	215	4	3	0	12	32	6	707
2	53	8	49	102	1	53	0	28	341	1	3	0	18	17	18	692
3	67	27	19	50	9	62	1	19	261	0	3	1	18	13	2	553
4	197	80	74	46	13	18	1	14	67	2	3	1	3	6	9	533
5	18	1	27	9	0	0	0	0	14	0	0	0	0	0	0	69
6	87	39	65	15	0	0	0	0	4	0	0	0	0	0	0	209
7	57	6	11	3	0	0	0	0	0	0	0	0	0	0	0	76
8	16	4	8	3	0	0	0	0	6	0	0	0	0	0	0	37
9	185	290	138	54	7	17	0	6	0	0	0	0	0	0	0	696
10	12	10	3	2	0	0	0	0	0	0	0	0	0	0	0	26
11	9	23	2	11	0	0	0	0	0	0	0	0	0	0	0	45
12	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5
13	17	15	7	3	9	0	0	0	0	0	0	0	0	0	0	51
14	4	30	26	1	0	0	0	0	0	0	0	0	0	0	0	61
15	7	0	0	6	0	0	0	0	0	0	0	0	0	0	0	14
Total	742	560	479	448	79	248	32	104	908	6	11	2	52	68	36	3776

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	4	60	46	111	46	149	105	41	174	8	6	7	20	4	4	784
2	86	3	50	24	16	41	0	10	174	10	9	0	12	35	0	472
3	43	32	70	53	5	52	15	9	108	0	7	1	11	3	12	421
4	55	37	37	31	5	17	4	2	39	1	3	1	1	0	1	234
5	6	3	2	3	0	0	0	1	11	0	0	0	0	0	0	25
6	16	30	14	11	0	0	0	0	1	0	0	0	0	0	0	72
7	5	4	2	0	0	0	0	0	0	0	0	0	0	0	0	11
8	2	43	5	1	0	0	0	0	0	0	0	0	0	0	0	50
9	146	667	352	110	42	2	1	1	0	0	0	0	0	0	0	1322
10	4	3	1	1	0	0	0	0	0	0	0	0	0	0	0	8
11	5	1	1	5	0	0	0	0	0	0	0	0	0	0	0	12
12	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	6
13	5	5	6	1	0	0	0	0	0	0	0	0	0	0	0	17
14	10	2	0	1	2	0	0	0	0	0	0	0	0	0	0	15
15	3	3	15	1	0	0	0	0	0	0	0	0	0	0	0	22
Total	395	894	601	353	116	261	126	63	506	19	24	9	43	42	17	3471

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	12	109	147	292	102	287	147	83	721	24	14	9	35	37	18	2035
2	242	30	199	182	65	194	4	76	3916	18	18	0	46	68	25	5082
3	607	117	207	226	22	166	16	31	1750	2	18	2	37	18	19	3237
4	633	179	219	158	24	75	6	22	483	6	19	4	4	7	16	1854
5	165	55	44	24	0	1	0	2	250	0	0	0	16	4	0	563
6	451	325	176	67	0	0	0	0	16	0	0	0	0	0	0	1034
7	263	13	131	7	0	0	0	0	3	0	0	0	0	0	0	415
8	105	97	75	6	0	0	0	0	10	0	0	0	0	0	0	292
9	740	1333	766	256	61	24	2	7	0	0	0	0	0	0	0	3189
10	28	13	3	5	0	0	0	0	0	0	0	0	0	0	0	50
11	60	24	3	22	0	1	0	0	0	0	0	0	0	0	0	110
12	27	3	4	3	0	0	0	0	0	0	0	0	0	0	0	37
13	79	20	17	4	9	0	0	0	0	0	0	0	0	0	0	130
14	14	77	90	3	2	0	0	0	0	0	0	0	0	0	0	186
15	15	28	35	21	2	0	0	0	0	0	0	0	0	0	0	101
Total	3440	2423	2117	1276	286	748	175	221	7148	50	68	15	138	134	78	18317

Base-2009

ALL MODES

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	654	1720	1484	1960	172	296	70	80	433	79	241	13	16	32	215	7466
2	3302	9883	5784	4421	1535	1594	364	340	3772	409	344	118	210	162	316	32553
3	4204	4301	6379	2207	444	849	123	233	1799	216	251	57	114	60	164	21401
4	2529	6148	2214	2677	642	455	38	89	549	116	59	0	105	26	69	15716
5	632	1551	917	455	338	67	106	3	226	0	2	0	15	4	0	4315
6	605	959	527	431	264	234	21	27	12	0	12	0	0	0	0	3091
7	411	491	433	113	312	13	0	0	4	0	0	0	0	0	0	1777
8	235	263	182	153	9	39	0	3	3	0	0	0	0	0	0	886
9	552	650	578	246	12	4	1	0	52	0	0	0	1	0	7	2102
10	71	109	58	32	0	0	0	0	1	0	0	0	6	0	0	278
11	264	336	127	128	2	11	0	0	1	0	0	0	0	0	27	896
12	53	175	42	43	0	0	0	0	0	0	0	0	0	0	0	314
13	104	69	99	84	0	0	0	0	0	0	0	0	0	0	6	360
14	44	80	92	32	0	0	0	0	0	0	0	0	0	0	0	248
15	228	305	149	105	9	0	0	0	4	0	24	0	0	0	0	823
Total	13887	27040	19065	13087	3739	3562	723	776	6855	819	933	187	466	284	804	92226

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	2448	5907	6127	1603	519	343	265	135	698	96	241	48	156	94	209	18890
2	5784	10852	7782	8584	2033	1586	585	331	910	164	399	126	286	79	460	39960
3	6459	8283	8319	3260	736	632	265	210	808	110	280	62	321	105	300	30150
4	2135	9306	3136	4419	736	661	95	185	360	141	278	26	106	42	265	21889
5	486	2684	632	664	567	305	256	8	15	6	3	0	0	0	19	5646
6	411	1662	349	648	171	457	16	31	3	0	0	0	0	0	0	3750
7	272	611	274	90	223	37	2	0	0	0	0	0	0	0	0	1509
8	150	329	90	170	10	62	0	5	6	0	0	0	0	0	5	827
9	749	939	380	353	6	16	0	6	14	6	14	0	0	0	0	2483
10	94	169	54	165	7	0	0	0	4	0	0	0	0	3	0	496
11	253	437	168	248	2	0	0	0	13	0	5	0	0	0	64	1189
12	29	112	42	26	0	0	0	0	0	0	0	0	0	0	0	209
13	196	284	124	115	9	0	0	0	0	0	0	0	0	0	0	728
14	40	133	84	55	0	0	0	0	0	5	0	0	0	0	0	317
15	192	516	173	250	20	0	0	5	0	0	36	0	0	0	4	1195
Total	19697	42224	27734	20649	5038	4100	1484	916	2831	527	1257	261	869	322	1325	129236

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	779	1953	2306	959	339	272	176	106	293	42	105	20	39	23	82	7493
2	1724	3082	2313	3306	549	346	179	90	295	74	158	45	34	32	168	12395
3	2191	2215	2132	1134	409	306	118	74	282	64	111	21	74	28	103	9259
4	776	2960	1356	1121	171	168	63	90	138	16	94	22	44	6	45	7069
5	152	900	259	157	8	5	12	1	10	0	0	0	0	0	5	1509
6	189	643	176	121	3	13	1	1	1	0	8	0	0	0	0	1156
7	74	160	78	4	5	0	0	0	0	0	0	0	0	0	0	321
8	58	178	128	59	0	1	0	0	0	0	0	0	0	0	0	425
9	253	931	452	212	38	2	1	1	0	0	0	0	1	0	0	1891
10	39	183	63	56	0	0	0	0	5	0	0	0	0	0	0	345
11	74	233	147	38	0	8	0	0	0	5	0	0	0	0	2	507
12	17	85	20	0	0	0	0	0	0	0	0	0	0	0	0	122
13	23	97	66	55	0	0	0	0	0	6	0	0	0	0	0	246
14	21	78	12	18	2	0	0	0	0	0	0	0	0	0	0	130
15	58	180	155	50	1	0	0	0	5	0	1	0	6	0	0	455
Total	6428	13877	9662	7288	1525	1122	549	363	1028	207	476	108	197	88	405	43322

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3881	9581	9918	4522	1030	911	512	321	1425	217	587	80	210	148	506	33849
2	10809	23817	15879	16311	4117	3525	1128	761	4978	646	901	289	530	272	943	84908
3	12854	14799	16829	6600	1590	1787	505	517	2888	389	642	139	509	193	567	60810
4	5441	18414	6705	8217	1548	1285	195	363	1047	273	431	48	255	74	378	44674
5	1271	5135	1807	1276	913	377	374	12	250	6	5	0	15	4	24	11470
6	1205	3264	1052	1200	438	704	38	59	16	0	20	0	0	0	0	7997
7	757	1262	785	207	540	50	2	0	4	0	0	0	0	0	0	3606
8	443	769	400	381	19	103	0	9	9	0	0	0	0	0	5	2137
9	1553	2521	1410	811	56	22	2	6	66	6	14	0	2	0	7	6475
10	204	461	175	252	7	0	0	0	9	0	0	0	6	3	0	1118
11	591	1006	442	414	4	19	0	0	13	5	5	0	0	0	93	2593
12	99	372	105	69	0	0	0	0	0	0	0	0	0	0	0	645
13	322	450	288	254	9	0	0	0	0	6	0	0	0	0	6	1334
14	104	291	189	105	2	0	0	0	0	5	0	0	0	0	0	695
15	478	1000	477	404	29	0	0	5	10	0	61	0	6	0	4	2473
Total	40012	83141	56461	41024	10303	8784	2756	2055	10714	1553	2666	556	1532	695	2533	264785

2021-DM

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	740	1678	1590	1864	153	256	67	77	563	92	256	13	59	820	393	8622
2	3375	10360	5734	5461	1506	1655	393	405	4369	555	420	147	511	900	518	36309
3	4629	4377	6875	2642	393	806	117	258	2016	235	258	55	251	401	293	23606
4	2608	7263	2770	3275	741	733	61	175	623	231	94	29	168	8	119	18897
5	599	1532	833	546	351	64	110	3	236	0	0	0	17	4	0	4296
6	582	946	506	618	256	226	20	28	12	0	18	0	0	0	0	3213
7	429	502	417	118	311	12	0	0	4	0	0	0	0	0	0	1791
8	270	307	201	187	10	44	0	3	3	0	0	0	0	0	0	1026
9	625	747	629	299	12	4	1	0	0	0	0	0	0	0	0	2317
10	71	118	58	51	0	0	0	0	0	0	0	0	0	0	0	297
11	268	383	125	142	2	13	0	0	0	0	0	0	0	0	0	933
12	49	174	39	54	0	0	0	0	0	0	0	0	0	0	0	316
13	109	81	107	84	0	0	0	0	0	0	0	0	0	0	0	382
14	56	70	114	25	0	0	0	0	0	0	0	0	0	0	0	266
15	252	354	150	82	12	0	0	0	0	0	0	0	0	0	0	851
Total	14661	28892	20148	15449	3747	3814	769	949	7826	1113	1046	244	1007	2134	1323	103122

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	2674	5797	6435	1854	504	327	271	164	1127	150	232	44	361	804	366	21110
2	6031	11387	8221	10614	2049	1677	636	446	1357	271	533	175	623	339	913	45273
3	7222	8152	8827	4164	670	588	253	238	1266	146	325	73	853	718	576	34073
4	2518	11500	4332	5415	938	1073	135	253	457	228	368	68	273	187	388	28132
5	508	2776	636	878	612	296	283	9	14	11	1	0	0	0	50	6073
6	407	1719	353	998	167	429	16	34	4	0	0	0	0	0	0	4126
7	282	659	276	123	231	34	2	0	0	0	0	0	0	0	0	1607
8	177	415	101	208	12	68	0	5	7	0	0	0	0	0	7	1001
9	880	1110	427	391	7	17	0	6	0	0	0	0	0	0	0	2839
10	96	183	56	195	7	0	0	0	0	0	0	0	0	0	0	536
11	255	517	195	319	1	0	0	0	0	0	0	0	0	0	0	1287
12	23	117	41	47	0	0	0	0	0	0	0	0	0	0	0	229
13	232	323	144	123	9	0	0	0	0	0	0	0	0	0	0	832
14	53	149	98	66	0	0	0	0	0	0	0	0	0	0	0	366
15	205	608	209	267	25	0	0	7	0	0	0	0	0	0	0	1320
Total	21564	45412	30351	25662	5233	4509	1596	1163	4231	806	1459	360	2110	2048	2301	148804

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	870	2017	2502	984	341	270	201	125	352	46	100	18	45	248	140	8257
2	1809	3248	2383	3879	569	375	199	119	407	108	191	46	41	65	347	13785
3	2375	2233	2285	1464	387	312	122	77	472	118	124	21	93	143	184	10409
4	877	3712	1730	1254	234	275	67	121	211	35	118	34	71	6	54	8800
5	150	923	246	215	9	5	14	2	11	0	0	0	0	0	12	1586
6	184	649	168	232	4	11	1	1	1	0	9	0	0	0	0	1259
7	76	168	76	19	5	0	0	0	0	0	0	0	0	0	0	344
8	66	209	148	100	0	1	0	0	0	0	0	0	0	0	0	525
9	302	1036	475	230	47	2	1	1	0	0	0	0	0	0	0	2095
10	40	196	69	75	0	0	0	0	0	0	0	0	0	0	0	381
11	76	264	166	52	0	10	0	0	0	0	0	0	0	0	0	567
12	16	87	20	10	0	0	0	0	0	0	0	0	0	0	0	133
13	25	112	82	47	0	0	0	0	0	0	0	0	0	0	0	267
14	27	97	18	3	2	0	0	0	0	0	0	0	0	0	0	147
15	64	202	176	59	0	0	0	0	0	0	0	0	0	0	0	502
Total	6959	15152	10543	8625	1598	1263	605	445	1453	307	542	118	250	462	738	49060

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	4283	9491	10527	4703	998	853	540	366	2041	288	587	75	465	1873	898	37990
2	11215	24996	16338	19954	4123	3707	1228	969	6133	934	1144	368	1174	1303	1779	95367
3	14227	14761	17987	8270	1450	1706	492	573	3754	499	707	149	1197	1262	1053	68088
4	6003	22474	8832	9944	1913	2082	262	549	1290	494	580	131	513	202	562	55830
5	1256	5230	1715	1639	973	365	407	14	261	11	1	0	17	4	62	11955
6	1173	3314	1027	1849	427	666	37	62	17	0	27	0	0	0	0	8598
7	787	1329	769	260	548	46	2	0	4	0	0	0	0	0	0	3743
8	513	931	451	496	23	113	0	9	10	0	0	0	0	0	7	2552
9	1807	2893	1531	920	66	24	2	7	0	0	0	0	0	0	0	7251
10	207	497	183	321	7	0	0	0	0	0	0	0	0	0	0	1215
11	599	1164	485	513	3	23	0	0	0	0	0	0	0	0	0	2787
12	88	378	101	111	0	0	0	0	0	0	0	0	0	0	0	678
13	367	516	334	254	9	0	0	0	0	0	0	0	0	0	0	1480
14	137	317	229	94	2	0	0	0	0	0	0	0	0	0	0	779
15	521	1164	535	408	37	0	0	7	0	0	0	0	0	0	0	2673
Total	43183	89456	61042	49736	10579	9586	2970	2557	13510	2225	3047	722	3367	4644	4361	300985

2021-DS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	732	1688	1568	1895	157	263	57	80	570	94	262	13	63	818	400	8660
2	3398	10359	5826	5584	1485	1629	394	403	4344	536	413	144	505	889	517	36427
3	4583	4405	6790	2647	411	826	120	268	2040	242	261	55	255	403	297	23603
4	2659	7313	2836	3361	740	733	64	174	612	227	91	29	164	8	118	19129
5	608	1527	882	563	341	63	109	3	234	0	0	0	16	4	0	4352
6	589	937	541	625	249	222	21	27	12	0	17	0	0	0	0	3239
7	354	514	409	129	343	14	0	0	3	0	0	0	0	0	0	1766
8	274	305	207	192	10	43	0	3	3	0	0	0	0	0	0	1036
9	634	738	648	301	12	4	1	0	0	0	0	0	0	0	0	2339
10	75	117	64	51	0	0	0	0	0	0	0	0	0	0	0	306
11	283	378	135	143	2	13	0	0	0	0	0	0	0	0	0	953
12	50	171	41	55	0	0	0	0	0	0	0	0	0	0	0	318
13	109	80	111	86	0	0	0	0	0	0	0	0	0	0	0	386
14	57	70	116	25	0	0	0	0	0	0	0	0	0	0	0	268
15	263	352	160	83	12	0	0	0	0	0	0	0	0	0	0	869
Total	14668	28952	20332	15741	3761	3810	767	958	7819	1098	1044	242	1004	2124	1332	103650

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	2655	5753	6368	1864	512	334	270	168	1147	155	240	46	369	806	377	21064
2	5947	11387	8162	10759	2054	1657	642	444	1348	270	537	178	622	336	914	45259
3	7181	8200	8718	4055	705	608	262	247	1293	150	323	72	867	720	575	33976
4	2506	11560	4198	5555	923	1060	141	251	449	225	362	67	271	186	383	28135
5	516	2769	655	889	595	287	286	9	14	10	1	0	0	0	49	6079
6	415	1714	362	1021	162	414	17	32	4	0	0	0	0	0	0	4141
7	291	670	287	130	232	35	1	0	0	0	0	0	0	0	0	1646
8	179	416	105	210	12	67	0	5	6	0	0	0	0	0	7	1007
9	898	1105	436	378	7	17	0	6	0	0	0	0	0	0	0	2848
10	98	182	58	193	7	0	0	0	0	0	0	0	0	0	0	539
11	270	520	192	312	1	0	0	0	0	0	0	0	0	0	0	1294
12	24	119	41	47	0	0	0	0	0	0	0	0	0	0	0	231
13	237	322	147	120	9	0	0	0	0	0	0	0	0	0	0	835
14	54	149	98	64	0	0	0	0	0	0	0	0	0	0	0	365
15	211	612	208	260	23	0	0	6	0	0	0	0	0	0	0	1321
Total	21482	45478	30035	25856	5243	4479	1620	1169	4260	809	1463	363	2129	2048	2305	148739

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	861	1992	2476	1005	354	277	200	129	361	48	108	18	46	254	146	8276
2	1776	3244	2320	3900	572	371	203	118	404	106	191	46	40	64	347	13702
3	2362	2254	2256	1478	419	338	130	85	490	123	130	21	99	147	193	10525
4	848	3744	1523	1247	238	274	67	123	211	35	121	34	73	6	55	8600
5	144	887	235	211	9	5	14	2	11	0	0	0	0	0	12	1530
6	177	631	160	227	3	11	1	1	1	0	9	0	0	0	0	1221
7	71	162	73	18	6	0	0	0	0	0	0	0	0	0	0	330
8	64	203	140	100	0	1	0	0	0	0	0	0	0	0	0	509
9	298	1020	469	228	47	2	1	1	0	0	0	0	0	0	0	2065
10	39	192	64	75	0	0	0	0	0	0	0	0	0	0	0	370
11	73	259	145	52	0	10	0	0	0	0	0	0	0	0	0	540
12	16	85	18	10	0	0	0	0	0	0	0	0	0	0	0	129
13	25	108	80	46	0	0	0	0	0	0	0	0	0	0	0	260
14	27	96	17	3	2	0	0	0	0	0	0	0	0	0	0	145
15	63	199	163	58	0	0	0	0	0	0	0	0	0	0	0	483
Total	6845	15075	10140	8658	1651	1291	615	459	1478	312	560	119	258	471	753	48684

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	4248	9433	10412	4764	1022	875	528	377	2078	297	610	77	477	1878	923	38000
2	11120	24990	16308	20243	4112	3657	1239	965	6097	912	1141	368	1168	1289	1779	95387
3	14125	14859	17764	8179	1535	1771	512	600	3823	514	715	148	1221	1271	1065	68103
4	6013	22616	8557	10164	1901	2067	272	548	1271	487	574	130	508	201	555	55864
5	1268	5183	1772	1663	945	355	409	14	258	10	1	0	16	4	62	11961
6	1181	3282	1063	1872	414	647	38	60	16	0	26	0	0	0	0	8600
7	716	1346	768	278	581	50	1	0	3	0	0	0	0	0	0	3742
8	518	923	452	502	22	111	0	8	10	0	0	0	0	0	7	2553
9	1830	2863	1553	907	66	24	2	7	0	0	0	0	0	0	0	7252
10	212	491	185	319	7	0	0	0	0	0	0	0	0	0	0	1215
11	627	1156	472	507	3	23	0	0	0	0	0	0	0	0	0	2787
12	90	375	101	112	0	0	0	0	0	0	0	0	0	0	0	678
13	372	509	339	252	9	0	0	0	0	0	0	0	0	0	0	1480
14	138	315	231	92	2	0	0	0	0	0	0	0	0	0	0	779
15	537	1162	531	401	36	0	0	6	0	0	0	0	0	0	0	2673
Total	42995	89505	60507	50255	10655	9579	3002	2585	13556	2220	3067	723	3390	4643	4390	301074

Base-2009 CAR

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	648	1528	1469	2160	159	265	53	79	165	73	219	12	15	37	211	7092
2	2733	9834	5879	4831	1194	1480	373	325	545	439	351	128	210	165	331	28818
3	3649	4282	6223	2332	474	834	131	243	510	223	252	61	112	64	169	19557
4	2223	6569	2287	1797	412	322	37	94	171	128	26	0	109	26	61	14262
5	469	1483	949	396	0	0	0	0	5	0	0	0	0	0	0	3302
6	236	683	451	345	0	0	0	0	0	0	13	0	0	0	0	1727
7	137	494	295	111	0	0	0	0	0	0	0	0	0	0	0	1037
8	160	223	129	169	0	0	0	0	0	0	0	0	0	0	0	682
9	197	306	327	176	0	0	0	0	0	0	0	0	0	0	0	1005
10	61	120	63	33	0	0	0	0	0	0	0	0	6	0	0	284
11	217	351	127	114	0	10	0	0	0	0	0	0	0	0	0	820
12	34	181	40	45	0	0	0	0	0	0	0	0	0	0	0	300
13	44	71	96	87	0	0	0	0	0	0	0	0	0	0	6	304
14	50	19	33	33	0	0	0	0	0	0	0	0	0	0	0	135
15	232	296	131	92	10	0	0	0	0	0	0	0	0	0	0	761
Total	11090	26440	18498	12721	2248	2912	594	741	1396	863	860	201	452	292	778	80085

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3207	6599	7570	1908	565	318	307	140	721	134	276	69	194	94	218	22321
2	6606	12950	9984	11625	2507	1841	764	407	824	236	535	177	382	91	597	49525
3	8125	10600	9923	4330	999	768	362	264	782	153	375	89	423	128	402	37722
4	2584	12462	4080	4408	667	544	126	240	363	178	323	35	142	50	324	26526
5	536	2672	802	699	24	0	0	0	0	9	0	0	0	0	29	4771
6	385	1977	369	611	0	0	0	0	0	0	0	0	0	0	0	3343
7	292	797	357	121	0	0	0	0	0	0	0	0	0	0	0	1566
8	189	441	107	228	0	0	0	0	0	0	0	0	0	0	7	972
9	819	871	323	404	0	0	0	0	16	0	18	0	0	0	0	2450
10	119	231	71	210	10	0	0	0	0	0	0	0	0	0	0	641
11	288	597	222	280	0	0	0	0	17	0	8	0	0	0	7	1419
12	35	158	61	35	0	0	0	0	0	0	0	0	0	0	0	289
13	250	374	155	153	0	0	0	0	0	0	0	0	0	0	0	931
14	49	137	70	76	0	0	0	0	0	0	0	0	0	0	0	332
15	231	708	233	314	28	0	0	8	0	0	8	0	0	0	0	1530
Total	23714	51576	34325	25402	4800	3471	1558	1058	2723	711	1542	370	1140	364	1585	154339

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1579	4292	5049	2068	657	358	221	207	362	106	266	41	74	36	220	15536
2	3224	6618	4967	7441	1253	726	399	227	361	160	377	143	75	8	366	26344
3	4176	4792	4173	2584	933	668	249	129	387	146	256	64	145	61	234	18995
4	1457	6187	2849	2305	370	384	131	185	189	51	202	77	96	20	119	14621
5	296	1852	543	332	0	0	0	0	0	0	0	0	0	0	9	3031
6	372	1503	422	286	0	0	0	0	0	0	11	0	0	0	0	2594
7	130	346	148	11	0	0	0	0	0	0	0	0	0	0	0	634
8	117	385	257	120	0	0	0	0	0	0	0	0	0	0	0	880
9	254	653	258	205	8	0	0	0	0	0	0	0	0	0	0	1378
10	84	428	155	124	0	0	0	0	0	0	0	0	0	0	0	791
11	152	545	334	92	0	20	0	0	0	0	0	0	0	0	0	1143
12	35	195	48	0	0	0	0	0	0	0	0	0	0	0	0	278
13	34	200	119	123	0	0	0	0	0	8	0	0	0	0	0	485
14	21	160	27	28	0	0	0	0	0	0	0	0	0	0	0	235
15	115	403	267	127	0	0	0	0	0	0	0	0	8	0	0	920
Total	12046	28559	19615	15846	3221	2154	999	748	1299	471	1113	324	398	124	948	87865

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	5434	12419	14088	6136	1381	941	580	427	1248	313	761	122	283	166	650	44949
2	12563	29402	20830	23896	4954	4047	1536	959	1730	836	1263	447	666	264	1294	104687
3	15950	19674	20319	9246	2405	2270	742	636	1679	522	883	213	679	253	805	76275
4	6264	25218	9216	8511	1450	1250	293	519	723	357	551	112	347	96	503	55410
5	1300	6007	2293	1427	24	0	0	0	5	9	0	0	0	0	37	11104
6	993	4163	1242	1242	0	0	0	0	0	0	24	0	0	0	0	7664
7	558	1637	800	242	0	0	0	0	0	0	0	0	0	0	0	3237
8	466	1049	494	517	0	0	0	0	0	0	0	0	0	0	7	2533
9	1269	1830	908	785	8	0	0	0	16	0	18	0	0	0	0	4833
10	265	780	289	367	10	0	0	0	0	0	0	0	6	0	0	1716
11	657	1494	684	486	0	30	0	0	17	0	8	0	0	0	7	3382
12	105	534	149	80	0	0	0	0	0	0	0	0	0	0	0	868
13	328	645	369	363	0	0	0	0	0	8	0	0	0	0	6	1720
14	120	316	129	137	0	0	0	0	0	0	0	0	0	0	0	702
15	578	1408	631	533	38	0	0	8	0	0	8	0	8	0	0	3211
Total	46849	106575	72439	53969	10270	8537	3151	2547	5419	2045	3515	895	1989	780	3310	322289

2021-DM

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	734	1698	1752	2298	178	273	60	97	199	79	240	13	26	129	279	8054
2	2815	10523	5924	6150	1265	1524	420	370	693	507	389	139	287	282	408	31696
3	3864	4619	6743	2801	515	844	148	273	608	252	268	58	151	119	217	21481
4	2423	7533	2829	2159	476	542	59	149	227	159	70	23	126	9	74	16859
5	446	1477	892	443	0	0	0	0	6	0	0	0	0	0	1	3266
6	240	743	471	469	0	0	0	0	0	0	14	0	0	0	0	1937
7	136	506	281	104	0	0	0	0	0	0	0	0	0	0	0	1026
8	195	276	159	180	0	0	0	0	0	0	0	0	0	0	0	809
9	237	403	378	183	0	0	0	0	0	0	0	0	0	0	0	1201
10	67	157	71	61	0	0	0	0	0	0	0	0	0	0	0	356
11	243	406	143	106	0	12	0	0	0	0	0	0	0	0	0	909
12	32	182	40	50	0	0	0	0	0	0	0	0	0	0	0	304
13	53	103	115	84	0	0	0	0	0	0	0	0	0	0	0	355
14	70	54	55	26	0	0	0	0	0	0	0	0	0	0	0	205
15	276	350	148	67	10	0	0	0	0	0	0	0	0	0	0	851
Total	11831	29031	20001	15181	2443	3195	687	889	1734	997	980	233	590	539	980	89309

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3416	7023	8399	2713	633	351	318	195	897	149	315	54	268	173	317	25220
2	6832	15316	10691	14557	2701	1881	863	512	999	279	632	200	448	127	787	56828
3	8306	11301	11324	5444	1077	713	404	263	886	157	369	81	490	207	467	41490
4	3219	14804	5404	5081	853	959	162	278	395	219	386	70	168	72	311	32380
5	558	2772	874	864	20	0	0	0	0	10	0	0	0	0	34	5133
6	407	2159	571	974	0	0	0	0	0	0	2	0	0	0	0	4113
7	293	857	359	140	0	0	0	0	0	0	0	0	0	0	0	1649
8	211	564	201	261	0	0	0	0	0	0	0	0	0	0	8	1245
9	913	1112	573	395	1	0	0	0	0	0	0	0	0	0	0	2994
10	135	349	128	254	10	0	0	0	0	0	0	0	0	0	0	876
11	352	676	307	342	0	3	0	0	0	0	0	0	0	0	0	1680
12	35	186	70	60	0	0	0	0	0	0	0	0	0	0	0	351
13	266	464	281	165	0	0	0	0	0	0	0	0	0	0	0	1176
14	125	222	144	74	0	0	0	0	0	0	0	0	0	0	0	565
15	321	817	339	305	28	0	0	7	0	0	0	0	0	0	0	1817
Total	25389	58623	39665	31630	5322	3907	1747	1257	3176	813	1704	406	1373	580	1924	177517

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1544	3914	5007	2329	569	314	204	225	412	93	260	36	96	56	253	15311
2	3153	7585	5348	8339	1504	939	468	309	519	172	452	168	154	50	462	29623
3	3823	5733	5223	3254	852	520	270	161	396	115	225	52	147	73	217	21063
4	1746	7402	3281	2579	469	521	109	187	203	83	168	63	94	36	118	17058
5	288	1622	580	469	3	0	0	0	1	1	0	0	0	0	13	2976
6	302	1500	696	569	0	0	0	0	0	0	11	0	0	0	0	3078
7	133	386	179	61	0	0	0	0	0	0	0	0	0	0	0	759
8	125	383	293	171	0	0	0	0	0	0	0	0	0	0	2	973
9	323	712	573	247	8	0	0	0	0	0	0	0	0	0	0	1863
10	95	423	239	137	1	0	0	0	0	0	0	0	0	0	0	896
11	186	475	340	130	0	13	0	0	0	0	0	0	0	0	0	1144
12	27	156	62	30	0	0	0	0	0	0	0	0	0	0	0	276
13	61	238	202	124	0	0	0	0	0	0	0	0	0	0	0	625
14	67	173	82	19	0	0	0	0	0	0	0	0	0	0	0	342
15	174	456	309	127	7	0	0	2	0	0	0	0	0	0	0	1075
Total	12047	31158	22414	18585	3414	2307	1051	885	1530	464	1117	320	491	216	1064	97063

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	5693	12635	15158	7340	1379	938	581	518	1508	321	815	104	389	359	848	48586
2	12800	33425	21963	29047	5470	4344	1752	1191	2211	957	1473	507	889	460	1657	118146
3	15994	21654	23289	11500	2444	2077	823	698	1889	525	862	192	788	400	902	84034
4	7389	29739	11514	9819	1798	2022	329	614	825	461	624	156	388	117	504	66297
5	1292	5871	2346	1777	22	0	0	0	7	11	0	0	0	0	48	11376
6	948	4402	1738	2012	0	0	0	0	0	0	27	0	0	0	0	9127
7	562	1748	819	305	0	0	0	0	0	0	0	0	0	0	0	3435
8	530	1224	652	612	0	0	0	0	0	0	0	0	0	0	9	3027
9	1474	2227	1524	825	9	0	0	0	0	0	0	0	0	0	0	6059
10	297	929	438	452	11	0	0	0	0	0	0	0	0	0	0	2128
11	780	1557	789	578	0	29	0	0	0	0	0	0	0	0	0	3733
12	94	524	172	140	0	0	0	0	0	0	0	0	0	0	0	931
13	380	805	597	373	0	0	0	0	0	0	0	0	0	0	0	2155
14	262	450	281	119	0	0	0	0	0	0	0	0	0	0	0	1112
15	770	1623	796	499	45	0	0	9	0	0	0	0	0	0	0	3742
Total	49267	118812	82079	65397	11178	9410	3485	3030	6440	2275	3801	959	2454	1334	3968	363889

2021-DS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	732	1704	1747	2307	179	275	60	98	202	80	243	13	26	129	281	8075
2	2839	10546	5985	6165	1261	1518	422	369	691	502	386	138	286	281	407	31795
3	3856	4635	6726	2794	520	849	150	275	611	254	268	58	151	120	218	21485
4	2473	7580	2888	2155	475	536	58	148	224	158	70	23	124	9	74	16996
5	454	1485	915	447	0	0	0	0	6	0	0	0	0	0	1	3309
6	246	746	488	466	0	0	0	0	0	0	13	0	0	0	0	1959
7	140	514	292	107	0	0	0	0	0	0	0	0	0	0	0	1053
8	198	278	162	182	0	0	0	0	0	0	0	0	0	0	0	819
9	243	403	386	185	0	0	0	0	0	0	0	0	0	0	0	1218
10	69	157	74	61	0	0	0	0	0	0	0	0	0	0	0	361
11	250	406	148	107	0	12	0	0	0	0	0	0	0	0	0	923
12	33	181	41	50	0	0	0	0	0	0	0	0	0	0	0	306
13	53	103	117	85	0	0	0	0	0	0	0	0	0	0	0	358
14	70	54	56	26	0	0	0	0	0	0	0	0	0	0	0	206
15	281	351	153	68	10	0	0	0	0	0	0	0	0	0	0	863
Total	11938	29143	20180	15204	2445	3190	691	890	1734	993	980	232	588	538	981	89726

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3412	7012	8389	2715	635	354	319	197	902	150	318	55	269	174	320	25220
2	6815	15320	10688	14542	2701	1878	865	512	998	278	633	201	448	127	787	56792
3	8300	11327	11306	5400	1090	721	409	266	893	158	368	81	493	208	467	41487
4	3219	14800	5356	5049	850	952	162	277	393	218	383	70	167	72	310	32276
5	559	2766	880	859	19	0	0	0	0	10	0	0	0	0	34	5127
6	410	2155	576	966	0	0	0	0	0	0	2	0	0	0	0	4109
7	295	858	361	140	0	0	0	0	0	0	0	0	0	0	0	1654
8	211	564	203	260	0	0	0	0	0	0	0	0	0	0	7	1245
9	917	1110	577	391	1	0	0	0	0	0	0	0	0	0	0	2996
10	136	348	129	253	10	0	0	0	0	0	0	0	0	0	0	875
11	356	676	306	339	0	3	0	0	0	0	0	0	0	0	0	1680
12	35	186	70	60	0	0	0	0	0	0	0	0	0	0	0	351
13	267	463	282	164	0	0	0	0	0	0	0	0	0	0	0	1176
14	125	222	145	73	0	0	0	0	0	0	0	0	0	0	0	565
15	323	817	338	302	28	0	0	7	0	0	0	0	0	0	0	1815
Total	25379	58624	39605	31510	5333	3908	1755	1259	3186	815	1704	406	1377	581	1925	177368

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1539	3909	4993	2352	576	320	208	228	418	95	266	37	97	57	257	15353
2	3130	7584	5315	8349	1504	937	472	310	519	171	452	168	153	50	462	29575
3	3817	5757	5214	3262	869	535	278	165	404	117	228	53	150	74	220	21143
4	1726	7400	3169	2567	471	520	110	188	203	83	168	63	95	36	118	16918
5	286	1607	576	467	3	0	0	0	1	1	0	0	0	0	13	2954
6	300	1491	694	563	0	0	0	0	0	0	11	0	0	0	0	3060
7	133	385	179	60	0	0	0	0	0	0	0	0	0	0	0	757
8	125	380	289	170	0	0	0	0	0	0	0	0	0	0	2	966
9	323	706	572	244	8	0	0	0	0	0	0	0	0	0	0	1854
10	95	420	237	136	1	0	0	0	0	0	0	0	0	0	0	890
11	186	473	330	128	0	13	0	0	0	0	0	0	0	0	0	1130
12	27	156	61	30	0	0	0	0	0	0	0	0	0	0	0	274
13	61	236	201	123	0	0	0	0	0	0	0	0	0	0	0	622
14	67	173	83	19	0	0	0	0	0	0	0	0	0	0	0	342
15	174	454	304	125	7	0	0	2	0	0	0	0	0	0	0	1066
Total	11990	31129	22217	18597	3440	2325	1068	894	1544	468	1126	322	495	217	1071	96901

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	5683	12624	15130	7374	1390	949	587	523	1522	325	828	105	392	360	858	48648
2	12783	33449	21988	29055	5466	4333	1760	1191	2208	951	1471	507	887	458	1656	118163
3	15973	21719	23247	11457	2479	2105	836	706	1907	529	864	192	794	402	905	84115
4	7418	29780	11413	9771	1796	2007	330	614	820	458	621	156	387	116	502	66189
5	1299	5858	2372	1772	22	0	0	0	7	11	0	0	0	0	48	11389
6	956	4392	1758	1995	0	0	0	0	0	0	26	0	0	0	0	9127
7	567	1757	832	307	0	0	0	0	0	0	0	0	0	0	0	3464
8	534	1223	654	612	0	0	0	0	0	0	0	0	0	0	9	3030
9	1484	2220	1536	820	9	0	0	0	0	0	0	0	0	0	0	6068
10	300	924	440	450	11	0	0	0	0	0	0	0	0	0	0	2126
11	792	1554	783	574	0	28	0	0	0	0	0	0	0	0	0	3733
12	95	523	172	140	0	0	0	0	0	0	0	0	0	0	0	930
13	381	802	601	372	0	0	0	0	0	0	0	0	0	0	0	2156
14	263	449	283	118	0	0	0	0	0	0	0	0	0	0	0	1113
15	778	1623	795	495	45	0	0	9	0	0	0	0	0	0	0	3744
Total	49307	118896	82002	65312	11218	9424	3514	3042	6464	2275	3810	960	2460	1336	3978	363995

Base-2009 BUS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	70	365	150	11	17	17	4	1	3	0	44	0	0	0	23	704
2	765	1256	373	60	459	150	27	7	58	0	22	2	0	0	3	3182
3	425	398	736	19	7	21	4	3	7	0	6	0	1	0	1	1629
4	134	168	80	1103	283	142	3	0	9	0	27	0	0	0	10	1958
5	63	151	23	90	366	72	115	2	0	0	2	0	0	0	0	883
6	32	76	12	94	286	253	23	29	0	0	0	0	0	0	0	806
7	18	44	7	3	338	14	0	0	0	0	0	0	0	0	0	424
8	1	5	2	0	9	42	0	3	0	0	0	0	0	0	0	62
9	2	8	8	4	0	0	0	0	0	0	0	0	0	0	0	23
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	24	9	5	26	2	0	0	0	0	0	0	0	0	0	29	96
12	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	6	1	1	3	0	0	0	0	0	0	26	0	0	0	0	38
Total	1542	2483	1398	1413	1768	710	175	45	77	0	127	2	1	0	66	9807

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	247	1808	1058	242	115	38	27	5	2	0	69	0	0	0	66	3677
2	1404	2576	1038	503	385	312	75	7	13	0	28	2	0	0	10	6352
3	953	1168	1756	235	38	34	7	3	8	0	14	0	0	0	0	4218
4	247	677	264	1889	347	366	2	1	6	0	47	0	0	0	18	3865
5	129	1141	69	213	802	444	373	11	0	0	4	0	0	0	0	3186
6	67	286	38	272	249	665	24	45	0	0	0	0	0	0	0	1646
7	26	73	20	2	320	53	3	0	0	0	0	0	0	0	0	497
8	7	7	6	3	15	91	0	7	0	0	0	0	0	0	0	136
9	3	22	6	2	0	0	0	0	0	0	0	0	0	0	0	33
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	63	14	11	45	3	0	0	0	0	0	0	0	0	0	84	221
12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	30	0	1	12	0	0	0	0	0	0	42	0	0	0	0	84
Total	3175	7772	4268	3418	2274	2003	511	81	29	0	204	2	0	0	178	23915

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	101	1031	542	166	60	32	16	0	3	0	24	0	0	0	14	1990
2	271	884	282	229	119	54	33	3	5	0	8	0	0	0	0	1887
3	186	522	531	69	24	5	4	1	4	0	4	0	0	0	0	1350
4	25	144	52	755	108	114	2	1	3	0	19	0	0	0	3	1225
5	16	191	10	98	145	89	212	8	0	0	1	0	0	0	0	770
6	14	143	22	108	61	196	9	19	0	0	0	0	0	0	0	572
7	5	30	3	3	88	8	0	0	0	0	0	0	0	0	0	136
8	1	7	2	6	3	23	0	7	0	0	0	0	0	0	0	48
9	3	52	6	11	0	0	0	0	0	0	0	0	0	0	0	72
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	33	17	6	31	2	0	0	0	0	0	0	0	0	0	42	132
12	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	17	1	1	8	0	0	0	0	0	0	17	0	0	0	0	44
Total	671	3024	1456	1484	610	521	276	38	15	0	73	0	0	0	60	8228

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	418	3204	1750	420	192	87	47	6	9	0	137	0	0	0	103	6371
2	2440	4716	1693	792	963	515	134	16	75	0	58	4	1	0	13	11421
3	1564	2088	3023	322	70	60	15	7	19	0	24	0	1	0	2	7197
4	407	989	396	3747	738	621	7	2	18	0	92	0	0	0	31	7049
5	207	1483	102	401	1312	605	700	21	0	0	8	0	0	0	0	4839
6	113	505	73	474	596	1114	56	94	0	0	0	0	0	0	0	3024
7	48	147	30	8	746	75	3	0	0	0	0	0	0	0	0	1057
8	9	18	11	8	27	156	0	18	0	0	0	0	0	0	0	246
9	8	82	20	17	0	0	0	0	0	0	0	0	0	0	0	127
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11	120	41	22	103	8	0	0	0	0	0	0	0	0	0	155	449
12	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	53	2	2	24	0	0	0	0	0	0	85	0	0	0	0	166
Total	5388	13280	7122	6315	4651	3234	962	164	121	0	405	4	1	0	303	41950

2021-DM

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	74	385	173	59	20	17	4	1	0	0	22	0	0	0	15	770
2	744	1208	392	298	443	143	30	7	1	0	14	1	0	0	3	3284
3	423	386	707	145	9	19	4	2	0	0	2	0	0	0	0	1697
4	171	424	192	1320	322	163	6	4	0	0	15	2	0	0	9	2628
5	55	170	20	131	381	85	136	3	0	0	0	0	0	0	0	980
6	26	68	11	120	261	245	21	31	0	0	0	0	0	0	0	784
7	14	37	8	5	320	14	0	0	0	0	0	0	0	0	0	398
8	1	5	2	3	10	46	0	4	0	0	0	0	0	0	0	71
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	19	5	3	27	2	0	0	0	0	0	0	0	0	0	32	87
12	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	2
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	6	0	1	5	0	0	0	0	0	0	28	0	0	0	0	39
Total	1533	2689	1508	2114	1768	731	201	51	1	0	82	3	0	0	59	10742

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	245	1690	1049	342	120	41	27	7	0	0	24	0	0	0	39	3583
2	1489	2507	1069	982	554	273	79	8	1	0	12	1	0	0	4	6978
3	956	1092	1707	553	44	29	9	4	0	0	3	0	0	0	0	4398
4	324	1050	597	2480	384	380	9	10	0	0	32	4	0	0	19	5289
5	118	968	56	361	871	412	432	16	0	0	2	0	0	0	0	3236
6	54	265	34	342	276	620	30	66	0	0	0	0	0	0	0	1688
7	23	68	12	8	349	44	2	0	0	0	0	0	0	0	0	507
8	6	7	5	10	16	86	0	8	0	0	0	0	0	0	0	138
9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	28	11	3	32	1	0	0	0	0	0	0	0	0	0	82	157
12	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	4
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	29	2	0	18	0	0	0	0	0	0	59	0	0	0	0	108
Total	3272	7662	4533	5131	2616	1884	588	117	1	0	132	5	0	0	144	26086

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	81	613	392	146	49	23	11	1	0	0	17	0	0	0	6	1340
2	446	896	359	405	236	70	26	2	0	0	3	0	0	0	0	2444
3	252	372	581	206	22	11	7	2	0	0	2	0	0	0	0	1454
4	85	313	181	996	94	104	4	3	0	0	18	1	0	0	4	1804
5	27	228	10	209	296	155	201	8	0	0	1	0	0	0	0	1134
6	13	125	15	144	99	210	13	36	0	0	0	0	0	0	0	655
7	6	27	3	4	117	13	0	0	0	0	0	0	0	0	0	171
8	1	5	2	4	3	21	0	3	0	0	0	0	0	0	0	38
9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	18	10	2	11	0	0	0	0	0	0	0	0	0	0	21	61
12	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	14	2	0	8	0	0	0	0	0	0	29	0	0	0	0	53
Total	943	2591	1545	2134	917	606	263	56	1	0	70	2	0	0	31	9159

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	400	2688	1615	546	189	81	42	9	0	0	64	0	0	0	60	5693
2	2679	4611	1819	1685	1233	486	135	16	2	0	29	3	0	0	7	12706
3	1631	1851	2995	903	75	58	20	8	1	0	7	0	0	0	0	7549
4	579	1787	970	4796	800	648	19	18	1	0	64	7	0	0	33	9721
5	200	1366	87	701	1549	651	769	26	0	0	3	0	0	0	0	5350
6	93	458	61	606	637	1075	64	134	0	0	0	0	0	0	0	3127
7	44	132	23	18	786	70	3	0	0	0	0	0	0	0	0	1076
8	8	16	9	17	29	153	0	14	0	0	0	0	0	0	0	246
9	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	4
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	65	25	7	70	3	0	0	0	0	0	0	0	0	0	135	306
12	0	3	0	6	0	0	0	0	0	0	0	0	0	0	0	9
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	49	5	1	30	0	0	0	0	0	0	117	0	0	0	0	200
Total	5748	12942	7587	9379	5302	3222	1051	224	3	0	284	9	0	0	235	45986

2021-DS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	73	387	171	71	19	17	6	1	0	0	22	0	0	0	15	782
2	735	1185	388	417	432	140	35	6	1	0	13	1	0	0	3	3355
3	417	388	700	175	9	19	4	2	0	0	2	0	0	0	0	1717
4	176	485	194	1438	329	190	15	8	0	0	15	2	0	0	9	2863
5	54	167	20	145	369	83	137	3	0	0	0	0	0	0	0	979
6	26	66	11	146	255	240	22	30	0	0	0	0	0	0	0	796
7	23	43	11	16	353	16	0	0	0	0	0	0	0	0	0	461
8	1	4	2	8	10	45	0	3	0	0	0	0	0	0	0	73
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	19	4	3	28	2	0	0	0	0	0	0	0	0	0	32	87
12	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	5	0	0	5	0	0	0	0	0	0	28	0	0	0	0	38
Total	1530	2732	1501	2450	1777	750	219	54	1	0	81	4	0	0	59	11157

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	243	1677	1035	374	120	40	29	7	0	0	25	0	0	0	40	3589
2	1463	2440	1051	1178	545	261	90	8	1	0	11	1	0	0	4	7053
3	941	1084	1685	595	44	29	9	4	0	0	3	0	0	0	0	4395
4	340	1179	617	2815	392	412	26	18	0	0	31	4	0	0	17	5852
5	117	955	56	389	847	400	443	15	0	0	2	0	0	0	0	3223
6	53	257	34	399	267	599	31	64	0	0	0	0	0	0	0	1704
7	23	78	12	25	350	46	2	0	0	0	0	0	0	0	0	536
8	6	7	5	19	15	84	0	7	0	0	0	0	0	0	0	144
9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	28	10	3	33	1	0	0	0	0	0	0	0	0	0	82	157
12	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	5
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	30	2	0	17	0	0	0	0	0	0	59	0	0	0	0	108
Total	3244	7691	4499	5848	2582	1871	629	122	1	0	131	5	0	0	143	26767

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	80	604	387	150	49	23	16	1	0	0	17	0	0	0	6	1333
2	447	877	359	441	234	68	31	2	0	0	3	0	0	0	0	2464
3	248	366	575	208	22	11	9	2	0	0	2	0	0	0	0	1442
4	98	406	202	1092	107	126	12	7	0	0	18	2	0	0	4	2073
5	27	222	10	211	287	150	217	8	0	0	1	0	0	0	0	1133
6	13	121	15	158	96	205	15	35	0	0	0	0	0	0	0	658
7	8	32	3	11	118	13	0	0	0	0	0	0	0	0	0	185
8	1	5	2	7	3	20	0	3	0	0	0	0	0	0	0	40
9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	18	9	2	11	0	0	0	0	0	0	0	0	0	0	21	61
12	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	14	2	0	7	0	0	0	0	0	0	29	0	0	0	0	53
Total	954	2644	1555	2297	916	616	300	58	1	0	71	2	0	0	31	9446

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	396	2667	1593	596	188	81	51	9	0	0	64	0	0	0	61	5704
2	2645	4502	1799	2036	1210	469	156	16	2	0	28	3	0	0	7	12872
3	1606	1837	2961	978	75	58	23	8	1	0	7	0	0	0	0	7554
4	614	2070	1013	5345	829	728	53	33	1	0	65	8	0	0	30	10788
5	198	1344	86	745	1503	633	797	26	0	0	3	0	0	0	0	5335
6	92	444	60	703	618	1044	68	130	0	0	0	0	0	0	0	3159
7	53	153	26	52	821	75	2	0	0	0	0	0	0	0	0	1183
8	8	16	9	34	28	149	0	13	0	0	0	0	0	0	0	257
9	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	4
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	65	24	7	71	3	0	0	0	0	0	0	0	0	0	135	305
12	0	2	0	8	0	0	0	0	0	0	0	0	0	0	0	10
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	50	4	1	28	0	0	0	0	0	0	117	0	0	0	0	199
Total	5728	13067	7555	10596	5275	3237	1148	234	3	0	283	11	0	0	233	47371

Base-2009 RAIL

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	9	27	44	30	15	36	22	5	292	12	5	2	3	0	8	508
2	100	38	153	36	46	95	9	39	3380	8	6	0	16	16	8	3950
3	455	118	154	52	8	52	1	3	1367	2	7	0	10	3	5	2237
4	341	42	56	20	1	19	0	4	392	0	9	0	0	1	5	890
5	130	70	38	8	0	1	0	1	232	0	0	0	12	5	0	497
6	331	254	113	26	0	0	0	0	13	0	0	0	0	0	0	737
7	263	17	163	5	0	0	0	0	4	0	0	0	0	0	0	452
8	74	59	63	0	0	0	0	0	3	0	0	0	0	0	0	200
9	374	379	270	87	12	4	1	0	55	0	0	0	1	0	7	1190
10	12	14	3	0	0	0	0	0	1	0	0	0	0	0	0	31
11	33	2	13	0	0	1	0	0	1	0	0	0	0	0	0	49
12	21	9	9	0	0	0	0	0	0	0	0	0	0	0	0	39
13	66	0	6	2	0	0	0	0	0	0	0	0	0	0	0	74
14	0	69	67	0	0	0	0	0	0	0	0	0	0	0	0	136
15	6	23	29	11	1	0	0	0	4	0	0	0	0	0	0	74
Total	2216	1122	1180	278	83	207	33	52	5744	22	26	2	43	24	34	11065

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	23	49	95	169	61	152	57	47	292	7	6	0	25	36	8	1026
2	220	33	108	171	9	131	7	56	572	9	6	4	33	29	27	1416
3	120	94	87	54	29	109	3	56	442	2	12	4	22	14	4	1052
4	321	144	106	29	12	18	4	25	116	0	2	0	8	9	17	812
5	31	9	57	6	0	0	0	0	22	0	0	0	0	0	0	125
6	158	93	98	14	0	0	0	0	6	0	0	0	0	0	0	369
7	96	15	27	5	4	0	0	0	0	0	0	0	0	0	0	147
8	30	8	17	6	0	0	0	0	12	0	0	0	0	0	0	74
9	267	655	274	94	14	33	0	12	1	11	0	0	0	0	0	1362
10	22	11	2	0	0	0	0	0	7	0	0	0	0	6	0	49
11	16	13	3	4	0	0	0	0	0	0	0	0	0	0	0	36
12	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
13	27	35	15	7	10	0	0	0	0	0	0	0	0	0	0	93
14	10	77	57	4	0	0	0	0	0	9	0	0	0	0	0	157
15	12	1	0	13	1	0	0	0	1	0	0	0	0	0	7	35
Total	1358	1235	946	576	140	444	72	196	1471	38	27	8	89	94	63	6758

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	15	131	129	304	134	383	369	91	374	23	25	24	27	7	16	2053
2	167	18	101	42	29	105	3	28	398	29	17	2	19	50	2	1010
3	102	72	132	82	28	125	57	46	192	1	16	5	16	7	17	897
4	92	34	35	37	2	23	11	4	114	0	3	0	5	0	4	365
5	9	6	10	0	0	0	0	1	28	0	0	0	0	0	0	53
6	27	85	47	10	0	12	0	0	4	0	0	0	0	0	0	184
7	20	12	10	0	0	0	0	0	0	0	0	0	0	0	0	41
8	5	100	14	0	0	0	0	0	0	0	0	0	0	0	0	120
9	361	2426	1336	407	166	10	5	2	1	2	0	0	1	0	1	4718
10	9	4	3	0	0	0	0	0	22	0	0	0	0	0	0	39
11	6	5	2	5	0	0	0	0	0	8	0	0	0	0	0	26
12	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	13
13	7	11	17	4	2	0	0	0	0	0	0	0	0	0	0	41
14	11	4	0	3	4	0	0	0	0	0	0	0	0	0	0	20
15	7	11	30	1	1	0	0	0	9	0	0	0	0	0	0	59
Total	843	2926	1865	894	366	658	444	172	1142	64	61	31	69	63	41	9638

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	47	206	267	503	210	571	447	142	958	42	37	26	55	42	33	3587
2	487	89	361	249	84	332	20	122	4350	46	29	6	69	94	37	6376
3	677	285	372	189	65	286	60	105	2001	5	35	9	49	24	26	4186
4	754	220	197	86	15	60	15	33	621	1	14	0	13	10	26	2066
5	170	85	105	14	0	1	0	2	282	0	0	0	12	5	0	675
6	516	432	258	51	0	12	0	0	22	0	0	0	0	0	0	1291
7	378	44	200	10	4	0	0	0	4	0	0	0	0	0	0	640
8	109	167	95	6	0	0	0	0	15	0	0	0	0	0	0	393
9	1002	3460	1880	588	192	47	6	15	57	13	0	0	2	0	9	7270
10	44	30	9	0	0	0	0	0	31	0	0	0	0	6	0	119
11	55	20	18	9	0	1	0	0	1	8	0	0	0	0	0	112
12	32	15	9	0	0	0	0	0	0	0	0	0	0	0	0	57
13	100	46	37	12	12	0	0	0	0	0	0	0	0	0	0	207
14	21	150	124	6	4	0	0	0	0	9	0	0	0	0	0	314
15	25	35	59	24	3	0	0	0	14	0	0	0	0	0	7	167
Total	4416	5283	3991	1748	590	1310	548	420	8357	124	115	41	201	181	137	27461

2021-DM

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1	28	88	67	27	67	42	11	352	12	8	3	8	0	8	722
2	107	21	108	69	58	140	10	45	3451	8	6	0	16	24	10	4073
3	503	68	125	140	9	63	8	5	1393	2	8	0	9	8	8	2349
4	410	79	142	86	11	52	4	8	383	4	14	3	0	1	8	1203
5	146	55	16	16	0	1	0	1	228	0	0	0	17	4	0	483
6	358	265	104	49	0	0	0	0	12	0	0	0	0	0	0	788
7	294	6	154	7	0	0	0	0	4	0	0	0	0	0	0	463
8	89	57	65	4	0	0	0	0	3	0	0	0	0	0	0	217
9	432	553	343	109	24	5	1	0	65	0	0	0	1	0	8	1540
10	12	1	0	3	0	0	0	0	1	0	0	0	0	0	0	17
11	46	0	2	7	0	1	0	0	1	0	0	0	0	0	0	58
12	19	2	4	2	0	0	0	0	0	0	0	0	0	0	0	27
13	58	2	5	0	1	0	0	0	0	0	0	0	0	0	0	67
14	0	47	65	0	0	0	0	0	0	0	0	0	0	0	0	112
15	7	25	20	15	1	0	0	0	6	0	0	0	0	0	0	74
Total	2481	1207	1240	574	132	329	65	70	5899	26	37	6	50	37	42	12194

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	10	62	197	301	82	205	111	62	321	8	15	4	31	34	10	1453
2	68	19	69	147	22	168	2	47	507	1	12	0	25	46	29	1161
3	93	69	40	112	21	111	31	32	356	0	4	2	22	41	10	945
4	264	125	139	78	19	34	4	17	97	3	7	1	4	6	17	817
5	33	9	32	13	0	0	0	0	18	0	0	0	1	0	0	109
6	124	76	87	33	1	0	0	0	11	0	0	0	0	0	0	332
7	70	8	10	4	0	0	0	0	0	0	0	0	0	0	0	93
8	24	28	13	11	0	0	0	0	9	0	0	0	0	0	0	86
9	290	1017	456	133	56	20	1	9	17	8	0	0	0	0	1	2008
10	16	10	3	3	0	0	0	0	7	0	0	0	0	5	0	44
11	13	25	5	15	0	0	0	0	0	0	0	0	0	0	0	57
12	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6
13	23	28	15	4	12	0	0	0	0	0	0	0	0	0	0	84
14	8	40	28	3	1	0	0	0	0	6	0	0	0	0	0	86
15	12	9	2	12	0	0	0	0	3	0	0	0	0	0	6	44
Total	1054	1524	1097	870	215	538	149	167	1346	27	38	8	84	132	73	7324

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	7	149	301	372	120	301	277	84	400	17	31	17	47	6	10	2137
2	109	10	91	82	27	116	2	39	524	11	15	1	17	52	6	1103
3	81	95	106	151	22	105	109	52	331	0	8	4	16	30	19	1129
4	125	92	124	84	11	48	10	5	101	3	9	2	1	1	6	621
5	30	31	10	10	0	0	0	1	28	0	0	0	1	0	1	112
6	68	103	59	44	0	0	0	0	8	0	1	0	0	0	0	284
7	47	12	6	4	0	0	0	0	0	0	0	0	0	0	0	69
8	14	65	14	8	0	0	0	0	2	0	0	0	0	0	0	102
9	358	2673	1185	338	174	10	4	4	24	3	0	0	1	0	5	4779
10	14	4	2	3	0	0	0	0	7	0	1	0	0	1	0	32
11	9	6	5	12	0	0	0	0	0	6	0	0	0	0	0	38
12	7	1	0	2	0	0	0	0	0	0	0	0	0	0	0	10
13	12	18	16	2	2	0	0	0	0	0	0	0	0	0	0	50
14	14	16	3	2	3	0	0	0	0	1	0	0	0	0	0	40
15	8	12	19	5	0	0	0	0	8	0	0	0	0	0	1	53
Total	903	3287	1939	1119	361	581	401	185	1433	41	65	24	82	90	48	10559

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	17	239	586	739	229	573	430	156	1073	38	54	24	86	39	28	4312
2	284	50	268	298	107	424	15	131	4483	20	32	2	57	122	45	6337
3	677	232	271	403	52	280	148	90	2080	2	20	5	46	79	37	4423
4	799	295	405	248	41	134	18	30	580	9	31	6	6	8	32	2641
5	210	95	58	39	0	1	0	2	274	0	0	0	19	5	1	704
6	551	444	249	126	1	0	0	0	31	0	1	0	0	0	0	1403
7	411	25	170	15	0	0	0	0	4	0	0	0	0	0	0	625
8	127	150	92	23	0	0	0	0	14	0	0	0	0	0	0	406
9	1080	4243	1984	580	254	34	5	14	105	11	0	0	2	0	14	8326
10	43	16	5	8	0	0	0	0	15	0	1	0	0	6	0	94
11	68	32	13	34	0	1	0	0	1	6	0	0	0	0	0	153
12	30	3	5	6	0	0	0	0	0	0	0	0	0	0	0	44
13	93	48	36	7	16	0	0	0	1	0	0	0	0	0	0	201
14	22	103	96	5	5	0	0	0	0	7	0	0	0	0	0	238
15	27	46	42	32	2	0	0	0	17	0	0	0	0	0	7	172
Total	4438	6018	4277	2563	707	1447	615	423	8679	93	140	37	216	260	163	30077

2021-DS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1	28	88	63	27	66	22	11	352	12	8	3	8	0	8	695
2	105	20	104	61	56	137	4	43	3427	8	6	0	15	23	10	4020
3	501	66	123	129	9	62	5	5	1397	2	8	0	8	8	8	2332
4	383	65	117	87	7	43	1	6	379	4	14	3	0	1	8	1116
5	142	54	15	14	0	1	0	1	226	0	0	0	16	4	0	473
6	350	260	100	43	0	0	0	0	12	0	0	0	0	0	0	766
7	201	3	118	4	0	0	0	0	3	0	0	0	0	0	0	329
8	87	55	63	2	0	0	0	0	3	0	0	0	0	0	0	210
9	428	548	342	109	24	5	1	0	65	0	0	0	1	0	8	1530
10	12	1	0	3	0	0	0	0	1	0	0	0	0	0	0	17
11	45	0	2	8	0	1	0	0	1	0	0	0	0	0	0	57
12	18	1	4	2	0	0	0	0	0	0	0	0	0	0	0	26
13	58	2	5	0	1	0	0	0	0	0	0	0	0	0	0	66
14	0	47	65	0	0	0	0	0	0	0	0	0	0	0	0	112
15	6	25	20	15	1	0	0	0	6	0	0	0	0	0	0	74
Total	2336	1176	1167	539	125	314	32	67	5873	25	37	6	49	37	42	11824

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	9	60	195	284	80	200	85	61	317	8	14	4	31	34	10	1392
2	65	18	67	139	21	164	2	44	499	1	12	0	23	45	28	1127
3	92	67	39	96	21	109	24	32	353	0	4	2	22	41	10	910
4	241	115	117	78	18	31	3	16	96	3	8	2	4	6	16	751
5	33	9	32	12	0	0	0	0	18	0	0	0	1	0	0	106
6	120	73	84	29	0	0	0	0	11	0	0	0	0	0	0	318
7	70	6	11	3	0	0	0	0	0	0	0	0	0	0	0	90
8	23	27	13	10	0	0	0	0	9	0	0	0	0	0	0	82
9	288	1007	456	132	56	20	0	9	17	8	0	0	0	0	1	1993
10	16	10	3	3	0	0	0	0	7	0	0	0	0	5	0	44
11	12	25	5	15	0	0	0	0	0	0	0	0	0	0	0	57
12	5	0	0	2	0	0	0	0	0	0	0	0	0	0	0	6
13	23	27	15	4	12	0	0	0	0	0	0	0	0	0	0	82
14	8	39	28	3	1	0	0	0	0	6	0	0	0	0	0	86
15	12	8	2	11	0	0	0	0	3	0	0	0	0	0	6	43
Total	1016	1492	1066	819	211	524	114	161	1329	27	38	8	81	131	71	7087

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	6	146	300	352	117	296	230	82	397	17	31	16	46	6	10	2052
2	107	9	90	72	27	114	2	38	519	10	15	1	16	52	6	1077
3	80	93	105	133	21	102	89	51	329	0	8	4	15	30	19	1082
4	120	85	112	86	10	44	7	4	100	3	9	2	1	1	6	589
5	30	30	10	8	0	0	0	1	28	0	0	0	1	0	1	108
6	67	101	58	39	0	0	0	0	8	0	1	0	0	0	0	273
7	38	6	5	2	0	0	0	0	0	0	0	0	0	0	0	51
8	14	63	13	6	0	0	0	0	2	0	0	0	0	0	0	99
9	356	2656	1187	338	173	10	3	4	24	3	0	0	1	0	5	4760
10	14	4	2	3	0	0	0	0	7	0	1	0	0	1	0	32
11	9	7	5	12	0	0	0	0	0	6	0	0	0	0	0	38
12	7	1	0	2	0	0	0	0	0	0	0	0	0	0	0	10
13	12	17	16	2	2	0	0	0	0	0	0	0	0	0	0	49
14	14	16	3	2	3	0	0	0	0	1	0	0	0	0	0	39
15	7	12	19	5	0	0	0	0	8	0	0	0	0	0	1	52
Total	881	3246	1923	1061	354	566	332	180	1423	40	64	24	81	89	48	10312

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	16	234	582	699	224	562	337	154	1066	37	53	23	85	39	27	4139
2	277	47	260	271	104	415	8	126	4445	19	33	2	54	120	45	6225
3	673	226	268	358	51	273	119	88	2079	2	20	5	46	79	37	4324
4	743	264	345	251	35	117	11	25	575	9	31	6	5	8	30	2457
5	204	93	57	34	0	1	0	2	272	0	0	0	19	5	1	687
6	538	434	242	111	1	0	0	0	31	0	1	0	0	0	0	1357
7	308	16	134	9	0	0	0	0	3	0	0	0	0	0	0	470
8	124	145	89	18	0	0	0	0	14	0	0	0	0	0	0	391
9	1073	4211	1985	578	252	34	4	14	105	11	0	0	2	0	14	8283
10	42	15	5	9	0	0	0	0	15	0	1	0	0	6	0	93
11	66	32	12	34	0	1	0	0	1	6	0	0	0	0	0	152
12	30	3	5	6	0	0	0	0	0	0	0	0	0	0	0	43
13	92	46	36	6	16	0	0	0	1	0	0	0	0	0	0	197
14	22	102	95	5	5	0	0	0	0	7	0	0	0	0	0	236
15	26	45	42	31	2	0	0	0	17	0	0	0	0	0	7	170
Total	4234	5913	4157	2419	690	1404	478	408	8624	92	139	37	210	258	161	29223

Base-2009 ALL MODES COMBINED

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	727	1919	1662	2201	191	318	78	85	460	84	268	14	18	37	242	8304
2	3599	11128	6405	4927	1699	1725	410	370	3983	447	378	130	227	181	342	35950
3	4529	4798	7113	2403	489	907	136	249	1884	226	265	61	123	67	175	23423
4	2698	6780	2423	2920	696	483	40	98	572	128	62	0	109	27	76	17111
5	661	1704	1010	495	366	72	115	3	238	0	2	0	12	5	0	4682
6	599	1013	577	465	286	253	23	29	13	0	13	0	0	0	0	3271
7	418	555	466	119	338	14	0	0	4	0	0	0	0	0	0	1913
8	236	287	194	169	9	42	0	3	3	0	0	0	0	0	0	943
9	572	694	605	267	12	4	1	0	55	0	0	0	1	0	7	2218
10	74	135	67	33	0	0	0	0	1	0	0	0	6	0	0	315
11	275	362	145	140	2	11	0	0	1	0	0	0	0	0	29	965
12	56	191	49	45	0	0	0	0	0	0	0	0	0	0	0	341
13	110	71	102	89	0	0	0	0	0	0	0	0	0	0	6	378
14	50	89	99	33	0	0	0	0	0	0	0	0	0	0	0	271
15	244	320	161	106	11	0	0	0	4	0	26	0	0	0	0	872
Total	14847	30046	21076	14412	4099	3829	801	838	7217	885	1013	205	496	316	878	100957

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3476	8456	8723	2319	742	508	391	192	1016	141	351	69	219	130	292	27024
2	8230	15559	11130	12298	2901	2284	846	470	1409	246	569	183	415	120	634	57293
3	9198	11862	11766	4619	1066	911	372	323	1233	155	401	92	445	143	407	42993
4	3152	13283	4451	6326	1027	928	132	266	485	178	372	35	150	60	359	31203
5	696	3822	928	917	826	445	373	11	22	9	4	0	0	0	29	8082
6	610	2356	505	898	249	665	24	45	6	0	0	0	0	0	0	5357
7	413	885	404	127	324	53	3	0	0	0	0	0	0	0	0	2209
8	226	455	131	237	15	91	0	7	12	0	0	0	0	0	7	1181
9	1089	1548	602	500	14	33	0	12	16	11	18	0	0	0	0	3845
10	142	242	73	210	10	0	0	0	7	0	0	0	0	6	0	690
11	367	625	236	330	3	0	0	0	17	0	8	0	0	0	91	1676
12	40	159	61	35	0	0	0	0	0	0	0	0	0	0	0	295
13	277	409	169	159	10	0	0	0	0	0	0	0	0	0	0	1024
14	60	214	127	80	0	0	0	0	0	9	0	0	0	0	0	489
15	273	709	233	339	29	0	0	8	1	0	50	0	0	0	7	1649
Total	28247	60583	39539	29396	7215	5919	2141	1335	4224	750	1773	380	1229	458	1825	185012

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1696	5454	5720	2538	851	773	606	298	739	129	316	65	101	42	251	19579
2	3662	7520	5349	7712	1401	885	434	257	764	189	402	144	94	58	368	29240
3	4464	5387	4836	2735	985	798	309	176	583	146	276	69	161	67	251	21242
4	1575	6365	2936	3097	481	521	143	189	306	51	223	77	102	20	125	16211
5	320	2049	562	431	145	89	212	9	28	0	1	0	0	0	9	3854
6	413	1730	491	404	61	208	9	19	4	0	11	0	0	0	0	3350
7	154	388	160	14	88	8	0	0	0	0	0	0	0	0	0	811
8	123	492	274	126	3	23	0	7	0	0	0	0	0	0	0	1047
9	618	3131	1600	622	174	10	5	2	1	2	0	0	1	0	1	6168
10	93	433	158	124	0	0	0	0	22	0	0	0	0	0	0	830
11	190	567	342	128	2	20	0	0	0	8	0	0	0	0	42	1301
12	42	204	48	0	0	0	0	0	0	0	0	0	0	0	0	294
13	41	211	136	127	2	0	0	0	0	8	0	0	0	0	0	526
14	31	163	27	30	4	0	0	0	0	0	0	0	0	0	0	255
15	139	415	298	136	1	0	0	0	9	0	17	0	8	0	0	1024
Total	13559	34509	22937	18224	4198	3334	1719	958	2456	534	1248	355	467	187	1048	105732

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	5899	15829	16105	7059	1783	1600	1075	575	2214	355	935	147	338	209	785	54907
2	15490	34207	22884	24938	6001	4894	1690	1097	6156	882	1350	457	736	359	1344	122483
3	18191	22047	23714	9757	2539	2616	817	748	3699	527	942	222	729	277	832	87658
4	7424	26427	9810	12344	2203	1931	315	554	1362	358	656	112	360	106	560	64525
5	1677	7575	2500	1843	1336	606	700	23	288	9	8	0	12	5	37	16618
6	1622	5099	1573	1767	596	1126	56	94	22	0	24	0	0	0	0	11979
7	985	1828	1030	260	750	75	3	0	4	0	0	0	0	0	0	4934
8	584	1234	599	532	27	156	0	18	15	0	0	0	0	0	7	3172
9	2279	5372	2808	1389	201	47	6	15	72	13	18	0	2	0	9	12231
10	308	809	298	367	10	0	0	0	31	0	0	0	6	6	0	1836
11	832	1554	724	598	8	30	0	0	17	8	8	0	0	0	163	3942
12	137	554	158	80	0	0	0	0	0	0	0	0	0	0	0	929
13	428	692	407	375	12	0	0	0	0	8	0	0	0	0	6	1928
14	141	466	253	144	4	0	0	0	0	9	0	0	0	0	0	1015
15	656	1444	692	581	41	0	0	8	14	0	93	0	8	0	7	3544
Total	56653	125138	83552	62032	15511	13081	4660	3131	13896	2169	4034	939	2191	961	3751	391700

2021-DM

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	809	2111	2014	2423	225	357	106	109	551	92	270	16	33	129	302	9545
2	3667	11753	6424	6517	1766	1807	460	421	4145	515	409	140	303	306	421	39053
3	4790	5073	7574	3086	532	926	160	281	2001	254	278	58	159	128	225	25528
4	3003	8036	3163	3565	809	757	68	161	610	163	100	27	126	9	92	20690
5	646	1702	928	590	381	85	136	4	235	0	0	0	17	4	1	4730
6	624	1076	586	639	262	245	21	31	12	0	14	0	0	0	0	3508
7	443	548	442	116	320	14	0	0	4	0	0	0	0	0	0	1887
8	285	337	225	187	10	46	0	4	3	0	0	0	0	0	0	1097
9	670	956	721	292	24	5	1	0	65	0	0	0	1	0	8	2741
10	79	158	72	64	0	0	0	0	1	0	0	0	0	0	0	374
11	309	411	147	140	2	13	0	0	1	0	0	0	0	0	32	1055
12	51	184	45	54	0	0	0	0	0	0	0	0	0	0	0	334
13	111	105	120	84	1	0	0	0	0	0	0	0	0	0	0	422
14	70	101	119	26	0	0	0	0	0	0	0	0	0	0	0	317
15	288	376	169	87	11	0	0	0	6	0	28	0	0	0	0	965
Total	15845	32927	22749	17869	4343	4255	952	1010	7634	1023	1099	242	640	576	1081	112245

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3670	8774	9645	3356	835	597	455	264	1218	157	354	58	299	207	365	30257
2	8389	17841	11829	15687	3276	2322	944	567	1507	280	656	202	473	173	821	64967
3	9355	12462	13070	6109	1143	853	444	299	1242	157	376	83	512	248	477	46832
4	3807	15979	6140	7639	1256	1374	176	305	491	221	425	75	172	78	348	38485
5	710	3750	963	1239	891	412	432	16	18	10	2	0	1	0	35	8478
6	585	2500	693	1349	277	620	30	66	11	0	2	0	0	0	0	6132
7	387	933	381	153	349	44	2	0	0	0	0	0	0	0	0	2249
8	241	600	219	282	16	86	0	8	9	0	0	0	0	0	8	1469
9	1203	2130	1030	528	57	20	1	9	17	8	0	0	0	0	1	5004
10	152	360	131	256	10	0	0	0	7	0	0	0	0	5	0	920
11	392	712	315	389	1	3	0	0	0	0	0	0	0	0	82	1894
12	40	187	70	65	0	0	0	0	0	0	0	0	0	0	0	362
13	289	492	296	169	12	0	0	0	0	0	0	0	0	0	0	1259
14	133	262	172	76	1	0	0	0	0	6	0	0	0	0	0	651
15	362	827	341	334	29	0	0	7	3	0	59	0	0	0	6	1969
Total	29715	67809	45295	37632	8153	6330	2484	1541	4523	840	1874	419	1458	712	2142	210927

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1631	4675	5700	2847	737	639	492	310	812	110	309	53	143	62	268	18789
2	3708	8491	5798	8826	1768	1124	497	350	1044	182	470	170	170	103	468	33169
3	4156	6201	5910	3611	896	636	385	216	727	116	235	56	163	103	237	23646
4	1957	7806	3585	3659	575	673	122	195	304	86	195	67	95	37	129	19484
5	345	1880	600	688	299	155	201	9	29	1	1	0	1	0	14	4223
6	383	1728	770	756	99	210	13	36	8	0	12	0	0	0	0	4017
7	186	424	188	69	117	13	0	0	0	0	0	0	0	0	0	999
8	140	453	308	182	3	21	0	3	2	0	0	0	0	0	2	1114
9	681	3385	1758	586	182	10	4	4	24	3	0	0	1	0	5	6643
10	109	427	241	140	1	0	0	0	7	0	1	0	0	1	0	928
11	213	491	347	153	0	13	0	0	0	6	0	0	0	0	21	1243
12	34	159	62	34	0	0	0	0	0	0	0	0	0	0	0	289
13	73	255	217	127	2	0	0	0	0	0	0	0	0	0	0	675
14	81	190	85	21	3	0	0	0	0	1	0	0	0	0	0	382
15	195	470	329	140	8	0	0	2	8	0	29	0	0	0	1	1181
Total	13893	37036	25898	21838	4692	3493	1715	1126	2964	505	1252	346	573	306	1144	116781

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	6110	15561	17359	8626	1797	1592	1053	683	2581	359	933	127	475	398	936	58591
2	15764	38085	24050	31030	6810	5254	1901	1338	6695	977	1535	512	946	581	1709	137189
3	18302	23736	26555	12807	2571	2415	990	796	3970	527	890	197	834	479	939	96006
4	8767	31821	12889	14863	2640	2804	366	662	1405	470	719	169	394	124	568	78660
5	1701	7332	2491	2517	1571	652	769	29	281	11	3	0	19	5	49	17430
6	1592	5304	2048	2744	638	1075	64	134	31	0	27	0	0	0	0	13657
7	1017	1905	1012	338	786	70	3	0	4	0	0	0	0	0	0	5135
8	666	1390	752	652	29	153	0	14	14	0	0	0	0	0	9	3680
9	2554	6471	3509	1406	263	34	5	14	105	11	0	0	2	0	14	14388
10	340	945	443	460	11	0	0	0	15	0	1	0	0	6	0	2222
11	914	1613	809	681	3	30	0	0	1	6	0	0	0	0	135	4192
12	125	529	177	153	0	0	0	0	0	0	0	0	0	0	0	984
13	473	853	633	380	16	0	0	0	1	0	0	0	0	0	0	2356
14	284	553	377	123	5	0	0	0	0	7	0	0	0	0	0	1350
15	845	1673	839	560	47	0	0	9	17	0	117	0	0	0	7	4114
Total	59453	137772	93942	77339	17188	14079	5151	3677	15122	2368	4225	1006	2670	1594	4366	439953

2021-DS

AM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	806	2119	2005	2441	225	358	88	109	553	92	273	16	34	129	304	9552
2	3679	11751	6478	6642	1749	1795	460	419	4119	510	406	139	301	304	420	39171
3	4773	5089	7550	3098	538	930	160	283	2008	256	278	59	160	128	226	25534
4	3032	8130	3199	3680	811	769	74	162	604	161	99	28	125	9	91	20974
5	650	1706	951	606	369	84	137	4	232	0	0	0	16	4	1	4762
6	622	1072	599	656	255	240	22	30	12	0	14	0	0	0	0	3521
7	364	561	422	126	353	16	0	0	3	0	0	0	0	0	0	1844
8	285	337	227	192	10	45	0	3	3	0	0	0	0	0	0	1103
9	671	952	729	293	24	5	1	0	65	0	0	0	1	0	8	2749
10	81	158	74	64	0	0	0	0	1	0	0	0	0	0	0	378
11	314	410	153	142	2	13	0	0	1	0	0	0	0	0	32	1067
12	51	183	46	55	0	0	0	0	0	0	0	0	0	0	0	335
13	111	105	122	85	1	0	0	0	0	0	0	0	0	0	0	424
14	70	101	120	26	0	0	0	0	0	0	0	0	0	0	0	318
15	293	377	174	87	11	0	0	0	6	0	28	0	0	0	0	975
Total	15804	33050	22848	18193	4348	4255	942	1010	7607	1018	1097	241	637	575	1081	112708

Inter Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	3663	8749	9619	3374	835	595	432	264	1219	159	358	59	300	207	369	30201
2	8343	17777	11805	15858	3267	2302	957	564	1498	279	656	202	470	172	820	64972
3	9333	12478	13030	6090	1155	859	442	301	1246	158	375	83	515	249	477	46791
4	3799	16094	6089	7943	1260	1395	190	311	488	220	422	75	171	78	343	38880
5	709	3730	968	1260	866	400	443	15	18	10	2	0	1	0	34	8455
6	583	2486	694	1394	268	599	31	64	11	0	2	0	0	0	0	6131
7	387	943	384	168	350	46	2	0	0	0	0	0	0	0	0	2281
8	241	599	221	288	15	84	0	7	9	0	0	0	0	0	7	1471
9	1206	2118	1033	522	57	20	0	9	17	8	0	0	0	0	1	4991
10	152	358	132	255	10	0	0	0	7	0	0	0	0	5	0	919
11	396	711	314	387	1	3	0	0	0	0	0	0	0	0	82	1894
12	40	187	70	65	0	0	0	0	0	0	0	0	0	0	0	362
13	290	490	297	168	12	0	0	0	0	0	0	0	0	0	0	1258
14	133	261	173	76	1	0	0	0	0	6	0	0	0	0	0	650
15	364	828	340	330	28	0	0	7	3	0	59	0	0	0	6	1966
Total	29639	67807	45170	38178	8126	6303	2498	1542	4516	841	1874	419	1458	712	2139	211222

PM Peak Period

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1626	4658	5680	2855	741	640	454	312	815	112	314	54	143	62	273	18738
2	3684	8470	5764	8862	1765	1119	506	350	1038	182	469	170	170	102	468	33116
3	4146	6216	5895	3603	912	648	375	218	733	118	238	56	165	104	240	23667
4	1944	7890	3482	3744	589	689	129	199	304	86	196	67	97	37	129	19580
5	343	1859	596	686	290	150	217	9	28	1	1	0	1	0	13	4195
6	380	1713	767	760	96	205	15	35	8	0	12	0	0	0	0	3991
7	178	422	187	73	118	13	0	0	0	0	0	0	0	0	0	992
8	140	449	304	183	3	20	0	3	2	0	0	0	0	0	2	1105
9	680	3363	1759	582	181	10	3	4	24	3	0	0	1	0	5	6615
10	109	424	239	139	1	0	0	0	7	0	1	0	0	1	0	922
11	213	488	337	151	0	13	0	0	0	6	0	0	0	0	21	1229
12	34	158	61	34	0	0	0	0	0	0	0	0	0	0	0	287
13	73	253	217	125	2	0	0	0	0	0	0	0	0	0	0	671
14	81	189	85	21	3	0	0	0	0	1	0	0	0	0	0	381
15	196	468	323	137	8	0	0	2	8	0	29	0	0	0	1	1171
Total	13825	37019	25696	21955	4709	3507	1700	1132	2968	508	1260	347	576	306	1151	116659

12 hrs

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	6095	15525	17305	8669	1802	1592	975	685	2588	363	944	128	477	399	945	58491
2	15705	37998	24047	31362	6781	5217	1923	1333	6654	971	1531	511	941	578	1707	137259
3	18252	23783	26475	12792	2604	2437	977	802	3986	531	891	198	839	481	943	95992
4	8775	32114	12771	15367	2660	2853	393	672	1396	467	717	170	393	124	563	79435
5	1702	7295	2515	2551	1525	634	797	28	279	11	3	0	19	5	49	17412
6	1585	5270	2060	2809	619	1044	68	130	31	0	27	0	0	0	0	13643
7	929	1926	993	368	821	75	2	0	3	0	0	0	0	0	0	5117
8	665	1384	752	664	28	149	0	13	14	0	0	0	0	0	9	3678
9	2557	6433	3521	1398	261	34	4	14	105	11	0	0	2	0	14	14354
10	342	940	445	459	11	0	0	0	15	0	1	0	0	6	0	2219
11	924	1609	803	680	3	29	0	0	1	6	0	0	0	0	135	4190
12	125	528	177	154	0	0	0	0	0	0	0	0	0	0	0	984
13	474	848	636	378	16	0	0	0	1	0	0	0	0	0	0	2353
14	285	551	378	123	5	0	0	0	0	7	0	0	0	0	0	1349
15	853	1672	837	554	46	0	0	9	17	0	117	0	0	0	7	4113
Total	59269	137877	93714	78326	17183	14064	5140	3685	15091	2367	4231	1007	2670	1593	4371	440589

Appendix C. Public Transport Data

C.1. Heat Map Analysis

Route A - Boarding and Alighting AM Peak hour 2021 DS

Towards Rayleigh			
	Alighting	Boarding	Volume
Leigh on Sea	0	3	3
Leigh on Sea Station	0	8	11
Coombes Corner	0	10	20
Kent Elms Corner	0	9	29
Nestuda Way	-4	17	42
Saxon Business Park	-25	17	34
Rectory road	-18	9	25
Hockley Station	-7	8	27
High Street,Hockley	-1	1	26
Hockley Road	-6	16	36
Rayleigh High Street	-26	0	9
Rayleigh Station	-9	0	0
Towards Leigh on Sea			
	Alighting	Boarding	Volume
Rayleigh Station	0	3	3
Rayleigh High Street	0	24	27
Hockley Road	-12	4	19
High Street,Hockley	-1	2	20
Hockley Station	-6	7	22
Rectory road	-12	14	24
Saxon Business Park	-8	30	46
Nestuda Way	-16	7	38
Kent Elms Corner	-8	3	32
Coombes Corner	-7	3	28
Leigh Elms	-17	0	12
Leigh Church	-6	1	6
Leigh on Sea Station	-6	0	0
Leigh on Sea	0	0	0

Route A - Boarding and Alighting PM Peak hour 2021 DS

Towards Rayleigh Station			
	Alighting	Boarding	Volume
Leigh on Sea	0	3	3
Leigh on Sea Station	0	4	7
Coombes Corner	-1	8	13
Kent Elms Corner	-1	9	21
Nestuda Way	-3	12	31
Saxon Business Park	-19	12	24
Rectory road	-9	10	25
Hockley Station	-6	10	29
High Street,Hockley	-2	1	28
Hockley Road	-9	14	32
Rayleigh High Street	-22	0	11
Rayleigh Station	-11	0	0
Towards Leigh on Sea			
	Alighting	Boarding	Volume
Rayleigh Station	0	4	4
Rayleigh High Street	0	18	22
Hockley Road	-8	5	19
High Street,Hockley	-1	2	20
Hockley Station	-5	4	19
Rectory road	-9	17	27
Saxon Business Park	-8	27	46
Nestuda Way	-15	8	39
Kent Elms Corner	-9	4	33
Coombes Corner	-8	1	26
Leigh Elms	-17	0	10
Leigh Church	-5	1	6
Leigh on Sea Station	-6	0	0
Leigh on Sea	0	0	0

Route B - Boarding and Alighting AM Peak hour 2021 DS

Towards Nestuda Way			
	Alighting	Boarding	Volume
Shoeburyness Rly Station	0	2	2
Customs and Excise,Shoeburyness	0	0	2
Waterloo Road	0	1	3
Thorpe Bay	0	2	5
Southchurch Road	-1	2	6
Garon Park	-1	4	9
Eastern Avenue	0	4	13
Prittlewell,Ennismore Garden	0	0	13
Tesco Roundabout	-1	3	15
Nestuda Way	-15	0	0
Cherry Orchard way	0	0	0
Towards Shoeburyness			
	Alighting	Boarding	Volume
Cherry Orchard way	0	2	2
Nestuda Way	0	7	9
Tesco Roundabout	-1	1	10
Prittlewell,Ennismore Garden	-2	0	8
Eastern Avenue	-1	0	7
Garon Park	-3	0	4
Southchurch Road	-2	1	2
Thorpe Bay	-1	0	1
Waterloo Road	-1	0	1
Shoeburyness Rly Station	-1	0	0

Route B - Boarding and Alighting PM Peak hour 2021 DS

Towards Nestuda Way			
	Alighting	Boarding	Volume
Shoeburyness Rly Station	0	2	2
Customs and Excise,Shoeburyness	0	0	2
Waterloo Road	0	1	3
Thorpe Bay	0	2	4
Southchurch Road	-1	1	5
Garon Park	-1	2	6
Eastern Avenue	0	3	9
Prittlewell,Ennismore Garden	0	0	9
Tesco Roundabout	-1	2	9
Nestuda Way	-9	0	0
Cherry Orchard way	0	0	0
Towards Shoeburyness			
	Alighting	Boarding	Volume
Cherry Orchard way	0	3	3
Nestuda Way	0	8	11
Tesco Roundabout	0	2	12
Prittlewell,Ennismore Garden	-3	0	10
Eastern Avenue	-1	0	9
Garon Park	-5	0	5
Southchurch Road	-3	1	3
Thorpe Bay	-2	0	2
Waterloo Road	-1	0	1
Shoeburyness Rly Station	-1	0	0

Route C - Boarding and Alighting AM Peak hour 2021 DS

Towards Southend on Sea, Travel Centre			
	Alighting	Boarding	Volume
Lower Road,Ashingdon	0	0	0
Ashingdon Road	0	1	1
Ashingdon	0	11	12
Rectory Road	-8	13	18
Saxon Business Park	-6	18	30
Nestuda Way	-11	5	24
Tesco Roundabout	-1	3	26
Prittlewell,Carlton Avenue	-5	2	23
Westborough Road	-1	0	22
Helens Road	-13	0	10
Westcliff on Sea	-7	3	5
Sos,Nelson Centre	-5	0	0
SoS,Travel centre	0	0	0
Towards Ashingdon			
	Alighting	Boarding	Volume
SoS,Travel centre	0	1	1
Sos,Nelson Centre	0	3	4
Westcliff on Sea	-1	10	13
Helens Road	-2	6	17
Westborough Road	-1	3	19
Prittlewell,Carlton Avenue	0	3	22
Tesco Roundabout	0	3	24
Nestuda Way	-3	16	36
Saxon Business Park	-18	7	26
Rectory Road	-23	3	6
Ashingdon	-4	0	1
Ashingdon Road	-1	0	0
Lower Road,Ashingdon	0	0	0

Route C - Boarding and Alighting PM Peak hour 2021 DS

Towards Southend on Sea, Travel Centre			
	Alighting	Boarding	Volume
Lower Road,Ashingdon	0	0	0
Ashingdon Road	0	1	1
Ashingdon	0	5	7
Rectory Road	-3	15	19
Saxon Business Park	-6	18	30
Nestuda Way	-10	6	27
Tesco Roundabout	-1	2	27
Prittlewell,Carlton Avenue	-6	1	23
Westborough Road	-1	0	22
Helens Road	-11	0	11
Westcliff on Sea	-8	2	5
Sos,Nelson Centre	-5	0	0
SoS,Travel centre	0	0	0
Towards Ashingdon			
	Alighting	Boarding	Volume
SoS,Travel centre	0	3	3
Sos,Nelson Centre	0	4	7
Westcliff on Sea	-3	7	11
Helens Road	-2	3	13
Westborough Road	-3	1	12
Prittlewell,Carlton Avenue	0	3	14
Tesco Roundabout	-1	2	16
Nestuda Way	-1	11	26
Saxon Business Park	-12	6	20
Rectory Road	-15	2	8
Ashingdon	-7	0	2
Ashingdon Road	-2	0	0
Lower Road,Ashingdon	0	0	0

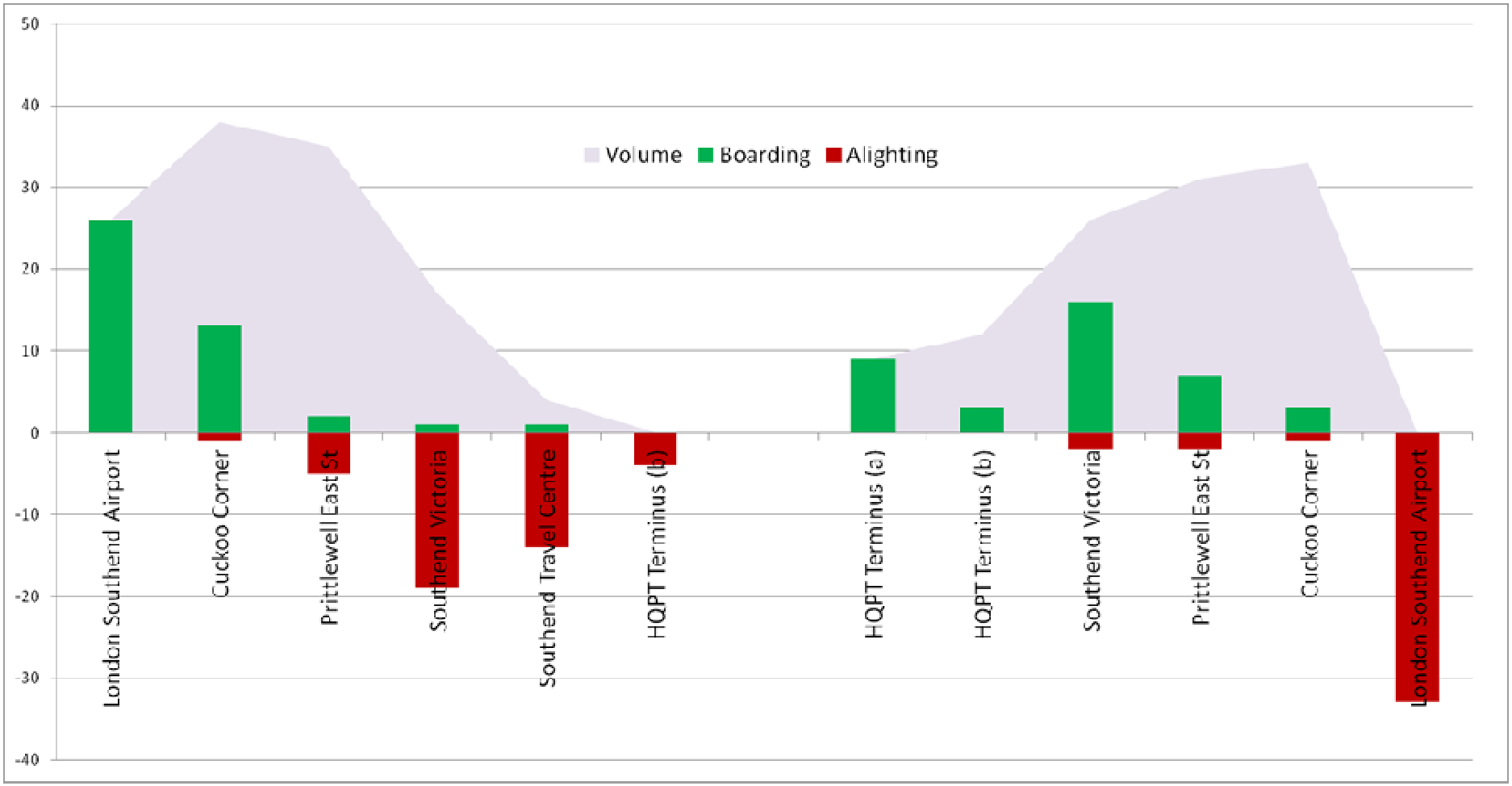
Route D - Boarding and Alighting AM Peak hour 2021 DS

Towards Rochford			
	Alighting	Boarding	Volume
Canvey Island	0	53	53
South Benfleet Rly Stn	-36	5	23
Tarpot's Corner, South Benfleet	-11	11	22
Thundersley	-2	3	23
Weir	-1	0	22
Kent Elms	-4	9	28
Nestuda Way	-6	6	28
Saxon Business Park	-25	5	8
Rochford Rly Station	-3	0	5
Rochford	-5	0	0
Towards Canvey Island			
	Alighting	Boarding	Volume
Rochford	0	4	4
Rochford Rly Station	0	1	5
Saxon Business Park	-2	22	26
Nestuda Way	-6	5	25
Kent Elms	-12	1	15
Weir	0	0	15
Thundersley	-5	3	13
Tarpot's Corner, South Benfleet	-8	0	5
South Benfleet Rly Stn	-2	3	6
Canvey Island	-6	0	0

Route D - Boarding and Alighting PM Peak hour 2021 DS

Towards Rochford			
	Alighting	Boarding	Volume
Canvey Island	0	19	19
South Benfleet Railway Stn	-8	9	20
Tarpot's Corner, South Benfleet	-9	12	24
Thundersley	-2	7	28
Weir	-2	0	26
Kent Elms	-7	8	27
Nestuda Way	-6	5	26
Saxon Business Park	-23	3	5
Rochford Rly Station	-2	0	3
Rochford	-3	0	0
Towards Canvey Island			
	Alighting	Boarding	Volume
Rochford	0	5	5
Rochford Rly Station	0	1	5
Saxon Business Park	-2	22	25
Nestuda Way	-5	7	27
Kent Elms	-12	5	20
Weir	-2	0	19
Thundersley	-4	1	16
Tarpot's Corner,South Benfleet	-7	0	9
South Benfleet Rly Stn	-2	28	35
Canvey Island	-35	0	0

HQPT Boarding and Alighting PM Peak hour 2021



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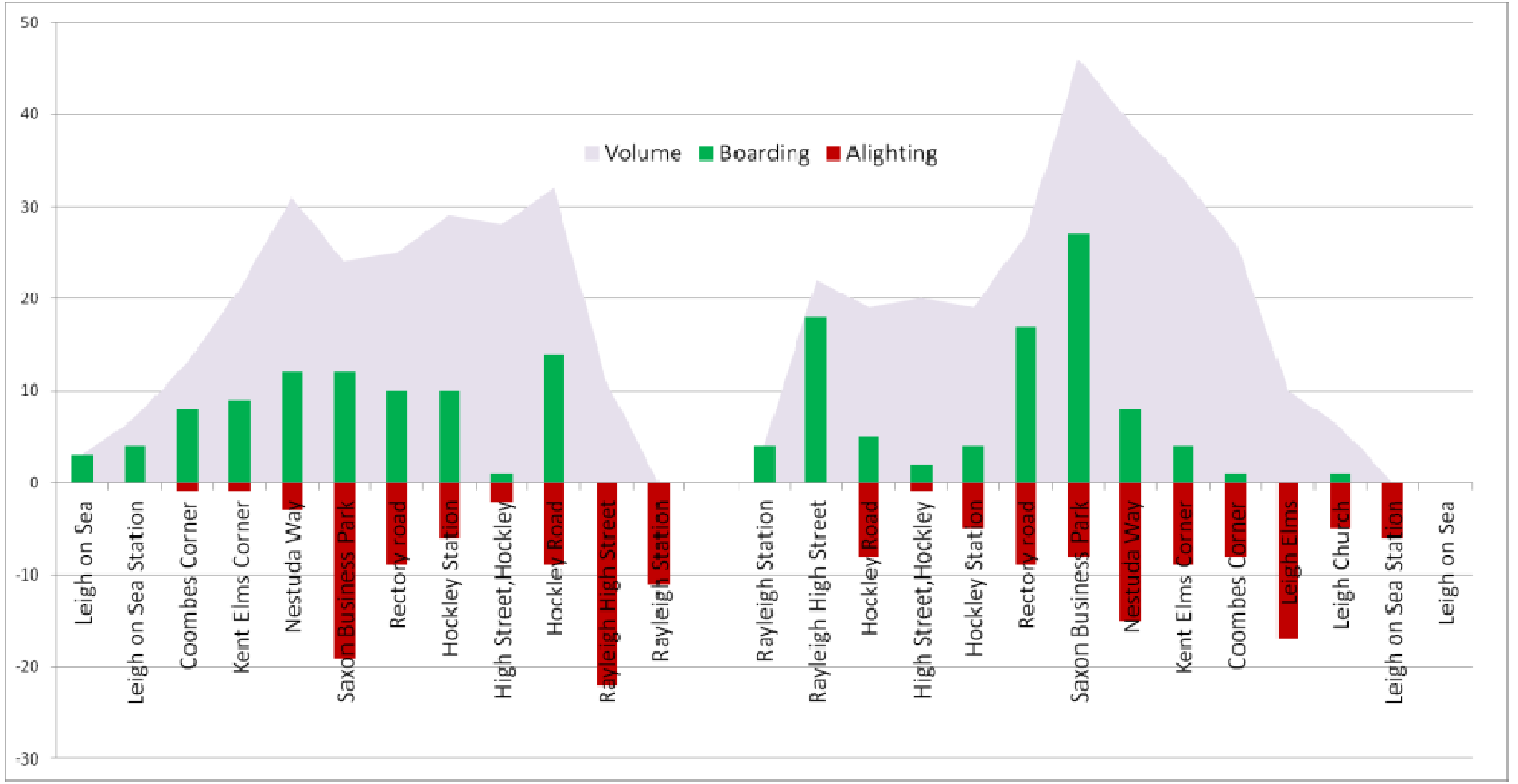

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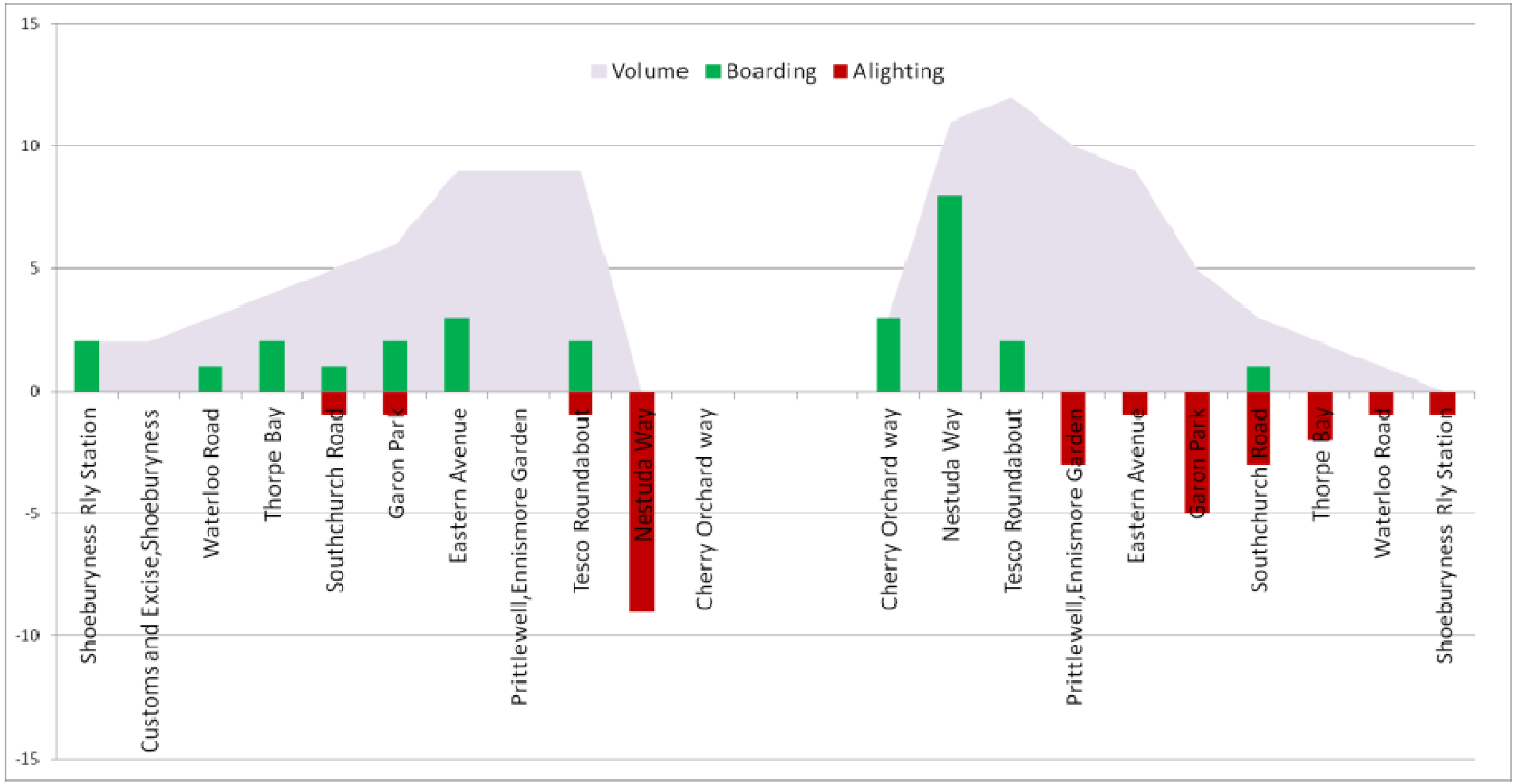

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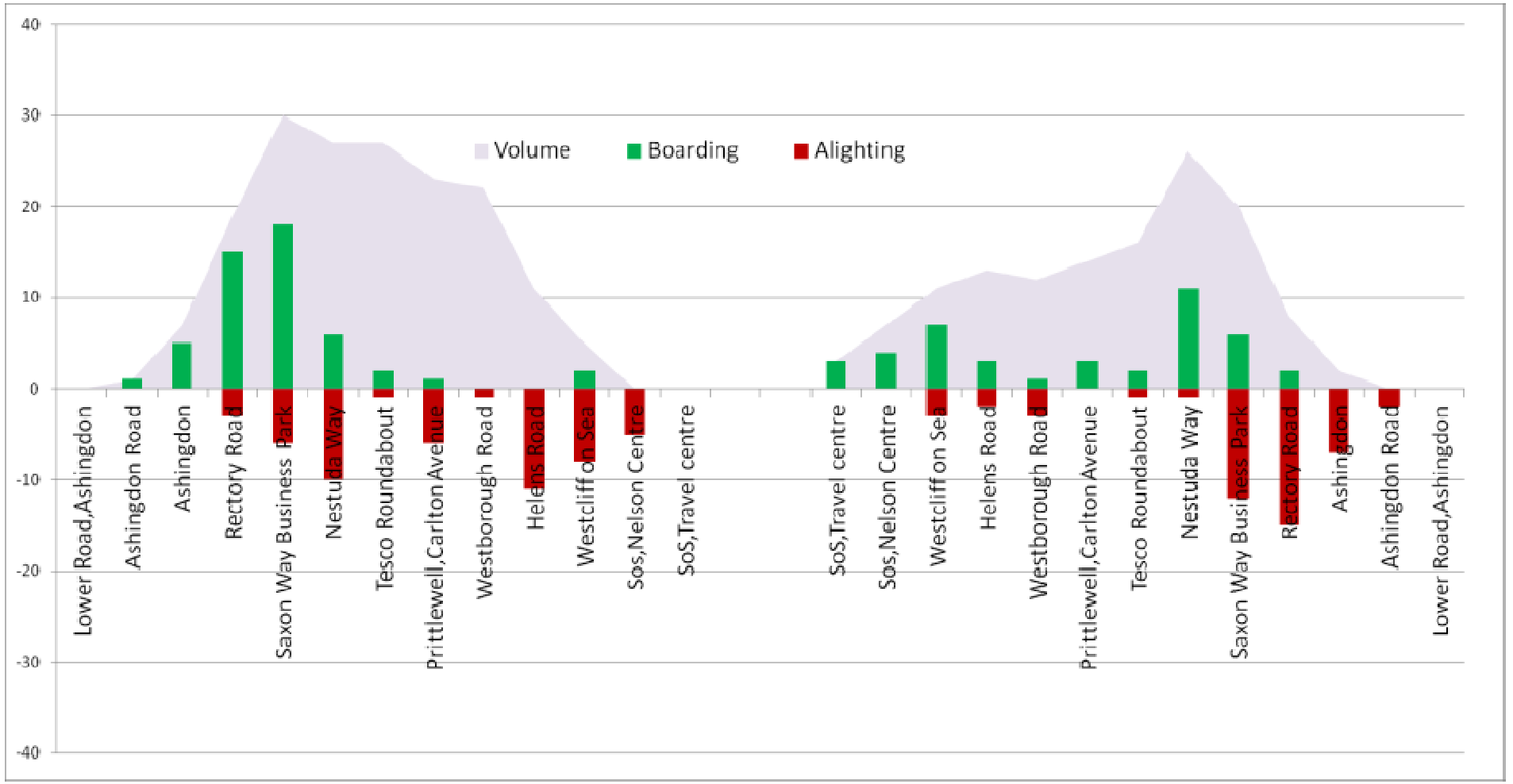

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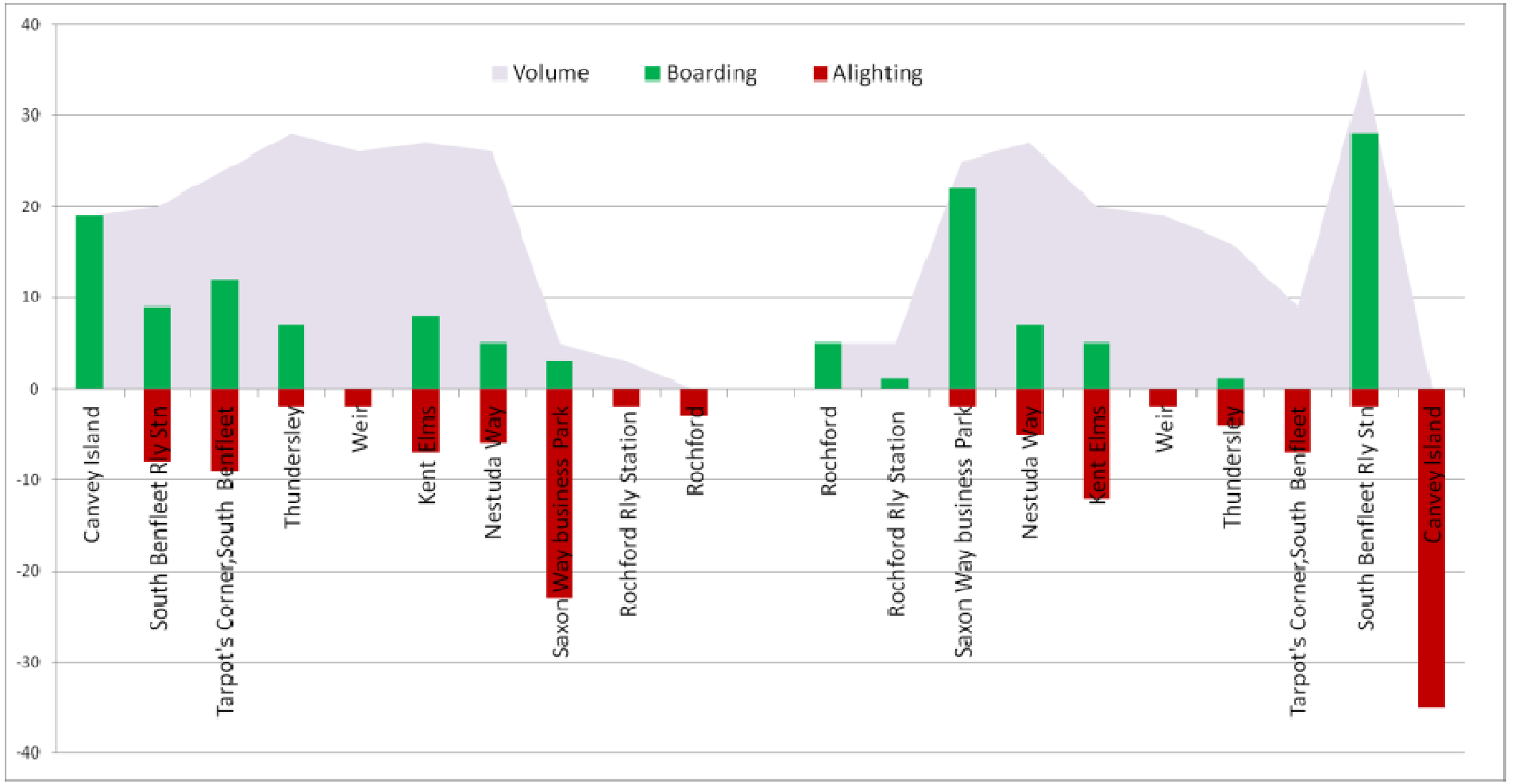

Appendix D. JAAP Transport Assessment

Southend Airport Joint Area Action Plan

Transport Assessment

December 2009

Notice

This document and its contents have been prepared and are intended solely for *Southend-on-Sea Borough Council's* information and use in relation to *the Southend Airport Joint Area Action Plan*.

Atkins Transport Planning & Management assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

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1. Introduction

Atkins has been commissioned by Southend-on-Sea Council to progress a Transport Assessment (TA) to support the Joint Area Action Plan (JAAP) for London Southend Airport and Environs.

A Transport Assessment was originally prepared in September 2008 as a supporting document to the JAAP; however in review and through the public consultation process it was noted that there were a number of deficiencies with the document. In addition the current proposals put forward by the Preferred Options paper differ from the proposals assessed by the 2008 Transport Assessment. As a result of these issues, Atkins has been commissioned to review and progress the TA and to address the deficiencies in the previous document, in particular to include the study an assessment of all transport modes, as required by the Department for Transport (DfT) guidance:

> *'A TA is a comprehensive and systematic process that sets out transport issues relating to a proposed development. It identifies what measures will be taken to deal with the anticipated transport impacts of the scheme and to improve accessibility and safety for all modes of travel, particularly for alternatives to the car such as walking, cycling and public transport'. (Department for Transport, Guidance on Transport Assessment, March 2007).*

From this definition the requirement for considering all modes of travel is clear.

1.1 Proposed Development

Southend-on-Sea is located in Essex on the northern side of the Thames Estuary, approximately 40 miles east of London. London Southend Airport is located on the northern outskirts of the town and whilst Southend-on-Sea is the nearest large town, the majority of the airport itself lies within the administrative boundaries of Rochford District Council. There exists good public transport links into London via London Liverpool Street, plus good road links to the strategic network via the A127 and the A13 linking to the M25. The site location is shown on Figure 1.1.

1.1.1 London Southend Airport

2008 data from the Civil Aviation Authority shows that the airport terminal handled 44,075 passengers and 37,227 flights comprising charter flights, freight movements and private light aircraft. The runway is 1,605m long and can accommodate flights for passenger aircraft with up to 110 seats.

The expansion plans for the airport include the extension of the runway by 300m to enable aircraft of up to 160 seats to use the airport, with an associated increase in passenger numbers to 2 million per annum. In addition to the runway extension the following works would be required to enable the airport to successfully cater for these additional flights and passengers:

- A new railway station adjacent to the airport (*Currently under construction at the time of the publication of this report*);
- A new terminal building;
- Additional secure parking for passengers;
- A new control tower;
- A new hotel; and
- An aviation skills centre.

An application for planning permission has recently been made to Southend on Sea Borough Council to extend the runway by 300m to the south west, including the diversion of Eastwoodbury Lane (09/01960/FULM) and is under consideration.

London Southend Airport is the regional airport for South East Essex and around 1300 people are employed at the airport. The airport includes facilities for chartered flights for passengers and freight, air taxis that operate on request, helicopter flights, private aircraft parking and storage and cargo storage facilities for freight including a 60,000 sq ft warehouse and trailer park and flying lessons.

1.1.2 Business Parks

If the JAAP is realised in full then an additional 124,000sq.m of office, light industrial and general industrial premises will be created adjacent to the airport. The new premises will be accommodated on a site to the north of Aviation Way, with a second smaller site located to the north west corner of the junction of B1013 Nestuda Way and A127 Prince Avenue. 15,000sq.m of additional floorspace will be accommodated through the intensification of the existing Aviation Way Business Park. It is intended that the development of the business parks surrounding the airport occur in conjunction with the expansion of the airport.

1.2 Planning Framework

The potential for expansion of London Southend Airport has been identified in both local and regional planning documents, namely:

- East of England Plan
- Southend-on-Sea Council Local Development Framework Core Strategy; and,
- Rochford District Council Local Plan
- Rochford District Council Development Framework Core Strategy Submission Document.;

In addition, the Government gave support to the development of small regional airports in their 2003 Aviation White Paper.

To assist in achieving appropriate development a planning framework is being prepared, which takes the form of an Area Action Plan (AAP). The airport itself falls within the administrative boundary of Rochford District Council (RDC). However, the administrative boundary between RDC and Southend-on-Sea Borough Council (SoSBC) lies almost immediately to the south of the airport. Therefore, the AAP is being prepared jointly between the two authorities, and is therefore referred to as a Joint Area Action Plan (JAAP).

In 2008 the two authorities published the *London Southend Airport & Environs Joint Area Action Plan: Issues & Options Paper* which set out the vision and objectives of the airport development and sought the opinions of interested parties on a number of development scenarios. Consultation on this document closed in August 2008. Following a review of the comments received from the consultation a document entitled *London Southend Airport and Environs Joint Area Action Plan: Preferred Options* was published for consultation, which ended in May 2009.

Following consultation on the preferred option, a final JAAP will be published, taken through an Inquiry in Public, and finally adopted by both Councils as the planning framework for the airport and the surrounding area.

1.3 Transport Assessment Scope

The report has been prepared in accordance with the Department for Transport (DfT) *Guidance on Transport Assessment* (March 2007) and the Essex County Council Transport Assessment

Guidelines (August 2003). The report provides an assessment of the impact of the proposed airport expansion and business park development, and is intended to cover all modes of travel.

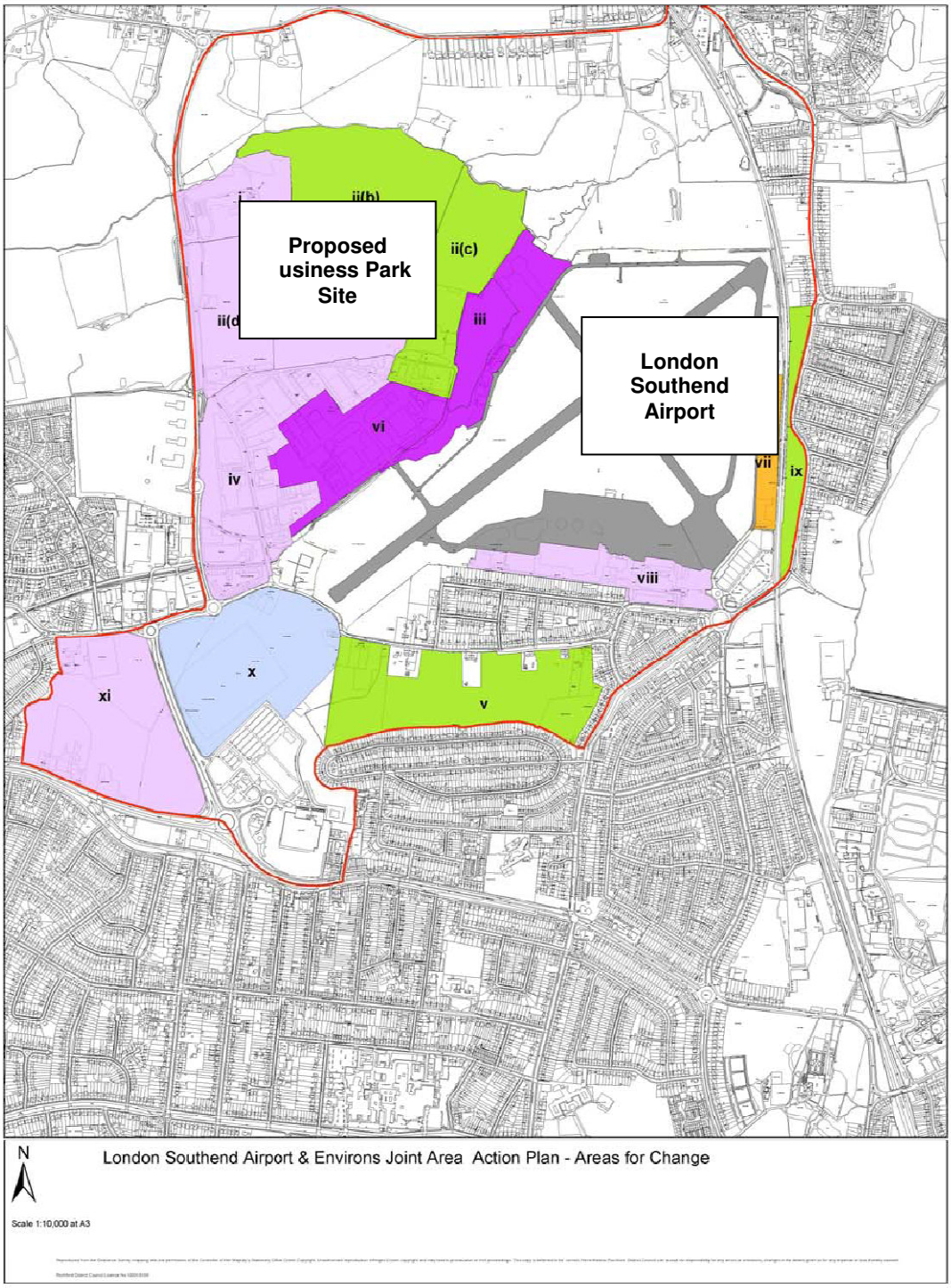
The purpose of this report is to inform the planning framework for the JAAP, and as such is a strategic level document and not intended to be a detailed Transport Assessment of either the airport expansion or the business parks.

1.3.1 Structure of the Report

The remainder of the report is structured as follows:

- Section 2 summarises the planning policy relating to the proposed development;
- Section 3 describes the existing site conditions;
- Section 4 describes the preferred development options;
- Section 5 details the trip generation for the business park sites;
- Section 6 details the trip generation for the airport and Maintenance, Repair and Overhaul (MRO) facilities;
- Section 7 considers the impacts of the proposed development on the study area;
- Section 8 sets out a series of potential mitigation measures; and
- Section 9 provides a summary and concludes the study.

Figure 1.1 – Site Layout Plan



2. Planning Policy Review

2.1 National Planning Policy

2.1.1 Future of Air Transport White Paper (December 2003).

Air travel has expanded five-fold over the last 30 years with the aviation industry making an important contribution to the economy. At the time of publication, predictions estimated an increase of 2-3 times existing demand by 2030. The White Paper set out a strategic framework for the expansion and development of airports and air travel over the coming three decades. Failure to provide for the anticipated growth would reduce the UKs competitiveness in the international market and could limit economic growth.

The report recognised the need to make best use of existing airport capacity rather than constructing new airports and indicated that growth at regional airports will be encouraged, including, where necessary, new runway, terminal and supporting facilities. The report stated that this would help support regional economic development, provide a greater choice for passengers, reduce pressures on over-crowded airports, and would reduce the need for long-distance travel to access major airports.

Chapter 11 of the report dealt specifically with the South East region, where it identified the pressures on existing airport provision is most severe, demand is greatest and high land costs means the impact of airports on residential areas and the green belt is often greater. Some of the most relevant conclusions of the white paper for the South East were as follows:

- There is urgent need for additional runway capacity in the region;
- The first priority is to make best use of the existing runways;
- Further development of Heathrow is supported;
- If required a new runway may be considered after 2019 if a further runway at Heathrow cannot be delivered;
- A new runway should be delivered at Stansted;
- Development of a second runway at Luton is not supported, nor is a new airport at Cliffe;
- There is scope for smaller South East airports to help meet local demand and their development is supported in principle subject to relevant environmental considerations.

Small airports were identified as having an important role to play in the future provision of airport capacity in the South East. The paper stated that there was support from wide range of stakeholders that these smaller airports should be allowed to cater for as much demand as they could attract. To help small airports achieve their development aspirations the white paper stated that regional and local planning frameworks should take account of the benefits expansion would bring, and should include policies to facilitate delivery of any proposals.

There is a specific mention of London Southend Airport within the White Paper:

> *'The operators of Southend, Lydd and Manston argue that their airports could grow substantially and each has plans for development. The potential of other airports, including, Shoreham, and Biggin Hill, should also not be overlooked. We consider that all these airports could play a valuable role in meeting local demand and could contribute to regional economic development. In principle, we would support their development, subject to relevant environmental considerations.'*

2.1.2 Planning Policy Guidance 13 (March 2001)

The overall objective of PPG13 is to fully integrate planning and transport from a national to local level to:

- Promote more sustainable transport choices;
- Improve accessibility to employment, education and services by public transport, walking or cycling; and
- To reduce the need to travel.

To achieve these objectives local authorities should consider the following when preparing development plans and when considering planning applications:

- Managing urban growth, focussing major generators in cities and towns near to public transport interchanges and phase major development with proposed infrastructure improvements;
- Developing facilities which need to be near their clients in locations where they are accessible by walking and cycling;
- Placing new housing within existing urban areas which are highly accessible by sustainable transport modes;
- Ensuring that developments offer realistic alternative transport choices;
- Putting forward strategies which are complementary and that there is a close link between development plans and investment in transport schemes;
- Using parking policies, in combination with other measures to discourage car use;
- Giving priority to people, providing more space for pedestrians, cyclists and public transport;
- Identify the needs of disabled people and ensure these are taken into account in planning policies and when implementing transport schemes; and
- Actively protect sites which may be required to develop infrastructure.

PPG13 also sets the requirement for the preparation of Transport Assessments as part of the planning process for developments likely to have a significant transport impact.

2.1.3 Department for Transport Guidance on Transport Assessment (March 2007)

PPG13 sets out the requirement for Transport Assessments to be submitted with planning applications, if the proposed development is likely to have significant transport implications. The guidance prepared by the DfT is intended to inform when an assessment is required and what the scope of the assessment should be. In preparing a transport assessment the following considerations will therefore be relevant:

- Encouraging Environmental Sustainability
  - Reducing the need to travel, especially reducing single occupancy journeys by car;
  - Reducing the environmental impact of travel by promoting sustainable transport choices;
  - The accessibility of the location, especially by non car modes; and
  - Measures which may assist in influencing travel behaviour, such as car sharing/pooling, High Occupancy Vehicle lanes and parking control.
- Managing the Existing Network

- Making best possible use of existing transport infrastructure, such as intelligent transport systems and public transport priority measures; and
- Managing access to the highway network.

- Mitigating Residual Impacts
  - Introducing demand management to regulate flows;
  - Making improvements to public transport, walking and cycling facilities;
  - If necessary, through minor physical improvements to existing roads and junctions; and
  - Only where other measures are insufficient through provision of new or expanded roads or junction upgrades.

2.2 Regional Planning Policy

2.2.1 East of England Plan 2001-2021

This is the current Regional Spatial Strategy for the area and was published in May 2008. The overall aim of the strategy is that:

> *'By 2021 the East of England will be realising its economic potential and providing a high quality of life for its people, including by meeting their housing needs in sustainable inclusive communities. At the same time it will reduce its impact on climate change and the environment, including through savings in energy and water use and by strengthening its stock of environmental assets.'*

To deliver this aim the Plan has identified five overall objectives. These are:

- To reduce the impact on, and exposure to the effects of climate change;
- To address housing shortages in the region;
- To realise the economic potential of the region;
- To improve the quality of life for the people who live in the East of England; and
- To improve and conserve the region's environment.

Of these objectives the first and third are of most relevance to this study. To achieve these two objectives the plan suggests a number of measures which are summarised in Table 2.1.

Table 2.1 – East of England Plan Objectives and Measures

Objective	Measure
To reduce the impact on, and exposure to the effects of climate change.	Locate development so as to reduce the need to travel; Effect a shift in travel behaviour from car use towards public transport, walking and cycling; Maximise energy efficiency; Reduce the risk and adverse impact of flooding.
To realise the economic potential of the region;	Providing the development needed to support business, improving skills and widening opportunities; Providing for employment growth aligned with growth in housing provision; Maintaining and strengthening inter-regional connections; Ensuring adequate and sustainable transport infrastructure.

The objectives set out a clear ambition for the Plan which is to provide for additional housing and economic development in a sustainable way. This is recognised by the *Policy SS1: Achieving Sustainable Development*.

Section 4 of the Plan deals specifically with economic development within the region, stating that

> *'To ensure the East of England contributes fully to national, regional and local prosperity and improves the quality of life of all who live and work in the region the RSS aims to ensure that the region's economy continues to grow and encourages greater investment'.*

Policy SS3: Key Centres for Development and Change, identifies Southend-on-Sea as a potential location where new development should be concentrated to enable developments to maximise the use of existing infrastructure and any proposed improvements. *Policy ETG5: Employment Generating Development* sets a target of 13,000 jobs for Southend and 3,000 for Rochford.

The plan highlights the importance of the region's tourist industry and *Policy E6: Tourism*, seeks to enhance the region's current tourist provision, which would be helped by an expanded airport which offers a wider number of domestic and foreign routes. *Policy E7: The Region's Airports*, refers to the 2003 White Paper, also giving support to the expansion of London Southend Airport.

Section 7 of the East of England Plan describes the transport strategy for the region. The objectives and desired outcomes of the transport strategy are summarised in Table 2.2.

Table 2.2 – Objectives and Desired Outcome of East of England Plan Transport Strategy

Objective	Outcome
To manage travel behaviour and the demand for transport to reduce the growth of road traffic and greenhouse gas emissions	Improved journey time reliability due to reduced levels of congestion
To encourage efficient use of existing transport infrastructure	Increased use of public transport, walking and cycling
To enable to provision of infrastructure and services required to support existing communities and proposed development	Sustainable access to areas of new development and regeneration
To improve access to jobs, education and services	Safe, efficient and sustainable movement between homes and key destinations and to/from the region's international gateways
	Increased movement of freight by rail
	Economic growth without a corresponding growth in travel
	Improved air quality and reduced greenhouse gas emissions

Within the transport strategy are 15 transport policies which provide additional detail on how specific measures will be used to achieve the objectives and outcomes above. These policies relate to topics such as parking, public transport, walking, cycling and inter-urban transport.

Essex Thames Gateway, which includes Southend-on-Sea and Rochford, is identified as a key area for economic development and regeneration. The strategy for development in this area aims, amongst other things, to create new jobs and to increase the value of the sub-regional economy. *Policy ETG4: Southend on Sea Key Centre for Development and Change*, states that local development documents for Southend-on-Sea should:

- Foster physical, economic and social regeneration;

- Achieve regeneration of the town centre;
- Improve strategic and local public transport accessibility; and
- **Improve surface access to London Southend Airport and support employment uses which would benefit from a location adjacent to an airport.**

2.2.2 Essex County Council Local Transport Plan 2006-2011

Essex County Council has a vision to:

> *"create safe, healthy, diverse and sustainable communities that are open and welcoming to all; where people want to live, work and visit; where people and communities take charge of their lives through active citizenship; where heritage is valued and innovation thrives; where people can travel easily, both locally and through making the most of excellent access to London, the rest of England and Europe"*

The transport vision is:

> *"We can travel safely, sustainably and on time, and where things can be done without the need to travel far."*

The Council recognises that an approach to transport is required which balances demand management and provision of new infrastructure. To achieve this balance, the plan identifies a series of objectives and themes, which are summarised in Table 2.3.

Table 2.3 – Essex Transport Strategy Objectives

Objective	Theme
Reducing the incidence of congestion and its effects on residents and businesses	Demand management – regulation of the use of the network through schemes such as road pricing, car park levies and cycling/walking initiatives.
Enhancing accessibility to education, employment, healthcare and retail facilities	Reducing the need to travel – changing people's travel behaviour through travel planning, awareness campaigns and marketing of sustainable travel.
Improve road safety and promote a safer travelling environment	Traffic Management Act – make best possible use of new and existing infrastructure to manage congestion and prioritise public transport
To improve air quality	Information provision – disseminate travel information
To maintain highways and public rights of way to an appropriate standard	Infrastructure –, e.g. cycle tracks, bus priority measures, and if required new carriageway especially to better serve ports and airports
Improving quality of life, through improved environment, healthier lifestyle, reduced noise and pollution.	Land use – influence the pattern of development to reduce the need to travel, implementing parking standards, raising Section 106 contributions to minimise impact of development and provide funding.
Encouraging economy and growth by providing a transport system able to provide easy access for customers, employees and for the movement of goods.	

The strategy divides Essex into five strategy areas which reflect established transport corridors, and the differences in the characteristics of each area. London Southend Airport and surrounding areas fall within the Basildon and Thames Gateway sub-area and is part of the wider Thames Gateway South Essex (TGSE) development area. The level of development put forward for the area will place additional strain on an already congested road network. Growth and development in this area will need to be underpinned by provision of appropriate sustainable infrastructure.

2.3 Local Planning Policy

The airport site falls within Rochford Borough Council, with Southend-on-Sea Council directly to the south, through which access is gained. The Joint Area Action Plan has been prepared by both Local Planning Authorities. Therefore, for the purpose of reviewing local planning policy it is relevant to consider documents prepared by both Authorities.

2.3.1 Southend-on-Sea Council

2.3.1.1 Core Strategy (Development Plan Document 1) Adopted December 2007

The Core Strategy is the key development document within the Local Development Framework portfolio. The document sets out the vision, objectives and strategy for development within the authority area and the key policies against which all planning applications must be assessed. The document was adopted on 13 December 2007 and covers the period to 2021. The Core Strategy will be supported by a number of other Development Plan Documents, including the Joint Area Action Plan for London Southend Airport and Environs (DPD5).

The overall aim of the Core Strategy is as follows:

> *"To secure a major refocus of function and the long term sustainability of Southend as a significant urban area which serves local people and the Thames Gateway."*

To achieve this, the Council have identified 19 strategic objectives which seek to improve economic prosperity, transport infrastructure and the quality of life of residents, whilst safeguarding and enhancing the town's amenities and the quality of the natural and built environment. Whilst all the strategic objectives are in some way relevant, as they underpin planning policy, the following are most relevant to this study:

- **SO1:** Deliver employment led regeneration, wealth creation and growth across Essex Thames Gateway sub-region.
- **SO5**: Provide for not less than 13,000 net additional jobs in the period 2001 to 2021;
- **SO9**: Secure a 'step change' in the provision of transport infrastructure as an essential concomitant to new development.
- **SO10**: Maximise the effectiveness and integration of key transport corridors and interchanges as a principal focus for development in the urban area.
- **SO11: Secure the regeneration of London Southend Airport to enable it to reach its potential to function as a local regional airport providing for significant new employment opportunities and improved surface access.**

The expansion of the airport and the development of the surrounding area for employment is in itself a strategic objective identified by the Council and is therefore a key scheme the Council is keen to deliver. The opportunity which the proposed development brings for the creation of new jobs, plus the necessary transport infrastructure improvements means that the development can easily contribute towards achieving other strategic objectives.

The aim and the 19 strategic objectives have been distilled into three over-arching key policies. The first key policy (KP1) seeks to achieve "*spatial sustainability"* by concentrating development in the most appropriate areas, including London Southend Airport and adjoining employment areas.

The second, KP2, makes a commitment to creating high quality, distinct and safe urban environments which have been designed in such as way to minimise the use of natural resources and which promotes renewable energy, to avoid or reduce the risk of flooding or pollution, reduce crime and the fear of crime, whilst at the same time providing enhanced environment and amenity value. The Core Strategy cites ways in which this can be achieved including:

- Reducing the need to travel;
- Ensuring good accessibility to local services and the transport network;
- Facilitate modes of transport other than the private car;
- Promote sustainable transport modes; and
- Secure improvements to transport networks, infrastructure and facilities.

Lastly the third policy, KP3 relates to how the strategic objectives can be successfully delivered, including:

- Preparation of Area Action Plans for key areas to ensure appropriate development, one of these areas being London Southend Airport;
- To enter into planning obligations and funding agreements with developers to ensure delivery of transport measures required as a consequence of development; and
- To require all development to have regard to the Local Transport Plan and revisions.

These three key policies in turn inform nine core policies, those of which are directly applicable to this study are detailed in Table 2.4.

Table 2.4 – Relevant Core Policies: Southend-on-Sea Core Strategy

Policy	
CP1: Employment Generating Development	Economic regeneration requires the maximisation of existing employment areas, as well as developing new opportunities. Southend Airport is cited as an area where potential for development should be supported.
CP3: Transport and Accessibility	Improved transport infrastructure is vital to support sustainable delivery of new homes and new jobs. New developments will be required to contribute to the implementation of transport improvements Section 106 Agreements.

Policy CP3 provides a list of transport infrastructure schemes which will help to achieve the required improvements. The key points are:

- Improving the road and rail network to deliver accessibility improvements, improve traffic flow, enhance travel choice and enable better freight distribution. In particular this can be achieved by:
  - Improving the A127/A1159 strategic transport corridor;
  - Improving accessibility to key opportunity sites to support the potential for future growth, including London Southend Airport;
  - Develop high quality transport interchanges;
- Widening sustainable travel choices, including the development of bus priority corridors and cycle routes;

- Provide a more efficient transport system using intelligent transport management systems and communications.

Southend-on-Sea Council is committed to the development of the airport as one of their strategic objectives. The development of the airport would bring additional jobs and investment to the area, which can be used as a catalyst to deliver an improved transport infrastructure and additional housing.

2.3.1.2 Local Transport Plan 2006-2011 (LTP2)

Efficient transport links are seen as critical to achieving the LTP2 vision and in providing in a sustainable way for the 13,000 additional jobs and 6,000 new dwellings identified by the Core Strategy to be provided. Increasing congestion and lack of accessibility to education, employment and health facilities form barriers to the movement of people and goods through the borough, but also to strategic locations such as the airport. The vision of the LTP2 is as follows:

> *"Secure a 'step change' in transport provision and service to deliver quality integrated facilities, improved accessibility and the long term sustainability of Southend necessary to achieving the town's potential for regeneration and growth to provide for a vibrant and prosperous coastal town and a regional centre of cultural and intellectual excellence."*

This LTP2 builds on the success of the previous plan and identifies transport policies and schemes the Council believe are vital to achieve the regeneration of the town and the wider Thames Gateway, for the period to 2011. In particular, the Council is seeking to ensure that:

- there is a reduction in the average vehicle delay experienced by travellers;
- increasing proportions of car trips involve more than one occupant;
- more people are travelling within the Borough and to the town centre by sustainable means;
- bus punctuality and reliability improve, leading to a sustained increase in bus patronage;
- rail services continues to provide a convenient and sustainable means of access travel;
- key destinations are more accessible, including London Southend Airport;
- the transport environment is more accessible to people with limited mobility;
- a minimum of 40% reduction in the number killed or seriously injured in 2010, compared to between 1994 and 1998; and,
- roads and footways are maintained to an appropriate standard.

2.3.2 Rochford District Council

2.3.2.1 Replacement Local Plan, June 2006

The Replacement Local Plan was adopted in June 2006 and contained the policies against which planning decisions in the district would be decided. Under the provision of the Planning and Compulsory Purchase Act (2004), Local Plans are being gradually replaced by Local Development Frameworks and Core Strategy documents. The Replacement Local Plan expired in June 2009, though because the Core Strategy is yet to be adopted policies from the Local Plan which were 'saved' remain planning policy for the district until the Core Strategy is adopted.

The council's vision is:

> *"To make Rochford the place of choice in the Country to live, work and visit."*

To achieve this vision RDC have set a list of six principal aims, which are:

- To provide quality, cost effective services;

- Work towards creating a safer and more caring environment;
- Promote a green and sustainable environment;
- Encourage a thriving local economy;
- Take action to improve the quality of life of the people in the district; and
- Maintain and enhance local heritage.

These have been translated into a series of nine strategic planning objectives, the ones most relevant to the development of London Southend Airport being as follows:

- **I4:** To ensure the availability of land for housing, commercial and industrial uses.
- **I6:** To make provision for transportation improvements to effect the most environmentally sustainable, efficient, convenient movement of goods and people.
- **I8:** To enable the existing business community to function as efficiently as possible and to support economic and regeneration development throughout the district.

In turn these strategic objectives have been translated into a series of core strategies. Those strategies which are of specific relevance to this study are summarised in Table 2.5, though as the core strategies underpin more detailed policies, all bear some relevance to the proposals.

Table 2.5 – Rochford District Council Local Plan Core Strategies

Core Strategy	Detail
CS1: Moving towards sustainable development	Aims to promote only development which balances economic development, social progress and environmental protection.
CS3: Reducing the need to travel	Management of new development to reduce the need to travel, reduce the length of journeys and encourage the use of sustainable transport.
CS5: Encouraging economic regeneration	To encouraging a diverse range of new businesses to a wide variety of locations including business parks and major logistics centres.
CS10: Energy and Water Consumption	The reduction in use of natural resources for the benefit of the local and global environment, and to help tackle climate change. Reducing the need to travel and encouraging energy efficient transport can contribute to this.

With regard to the economy the general strategy is to:

> *"maintain and increase appropriate levels of employment and economic activity in the District commensurate with environmental considerations and the capacity of the infrastructure"*

The council will seek to ensure that a range of business premises are provided from small start-up units to large scale office developments and business parks. Aviation Way and Purdeys industrial estates are cited in the document as land allocated for employment and therefore economic development. Applications for B1, B2 or B8 land uses will be allowed within these employment areas as long as they meet relevant criteria, including the appropriate determination of on-site and offsite traffic generation (Policy EB1).

The Local Plan contains 11 planning objectives within the transport section (Chapter 5). Those most relevant to the expansion of the airport are as follows:

- T1: to reduce the need to travel, in particular reducing reliance on cars and developing sustainable transport alternatives;
- T3: to improve accessibility to services, rather than improving mobility;
- T4: to improve the existing highway network if necessary to facilitate the better movement of people and goods;
- T5: to retain a good bus network and extend into developing rural areas;
- T6: to retain and improve all aspects of rail services;
- T7: to improve transport interchange facilities;
- T8: to implement traffic management schemes to ease vehicle flow, deal with environmental issues and highway congestion;
- T10: to support the development of London Southend Airport as a regional air transport and aircraft maintenance facility;
- T11: to promote walking and cycling as the preferred modes of travel wherever possible.

There are site specific policies within the document relating to London Southend Airport. The council recognises the importance of the airport for local business and employment, therefore plans to expand and maximise the potential of the airport are supported by the council. Planning permission has been granted for a new terminal and rail station to enable an increase in passenger flights. Policy TP9 London Southend Airport states that:

> *"Planning permission will be granted for development that will support the operation of London Southend Airport as a regional air transport and aircraft maintenance facility, including the full realisation of its potential for increases in passenger and freight traffic, subject to:*
>
> *i. There being no serious detriment to the local environment or nature conservation interests;*
>
> *ii. It being shown that there are adequate access arrangements in place or proposed.*
>
> *iii. Plans for future expansion and development will be required to include a satisfactory Surface Access Strategy."*

2.3.2.2 Core Strategy Submission Document, September 2009

The Core Strategy Submission Document was published in September 2009 and is the emerging planning policy for Rochford District Council. The document will go through the Examination in Public process in 2010, prior to being adopted. As emerging planning policy it is an important document to consider, but may be subject to change. The vision of the Council is as follows:

> *'To make Rochford District a place which provides opportunities for the best possible quality of life for all who live, work and visit here'*

To support this, the Council has four main corporate objectives. These are:

- Making a difference to our people;
- Making a difference to our community;
- Making a difference to our environment; and
- Making a difference to our local economy.

In the discussion chapter about economy and employment, London Southend Airport is noted as a potential focus for economic development within the District. This refers not just to the

development of the airport, but also as a catalyst for attracting wider employment which would benefit from the airport expansion.

Car ownership and the dependency on car travel are noted by the submission document. The main settlements are well linked by rail and public transport, though the more rural areas are poorly connected and it is in these areas car travel is high. Cycle facilities are noted as being limited and there being scope for improvement. The Council have identified eight strategic transport objectives which are as follows:

- To ensure that developments reduce reliance on the private car, and that they are accessible by public transport;
- To provide necessary improvements to the road network;
- To identify locations which suffer from poor highway connectivity and congestion, then work with the Highways Authority to identify solutions;
- To support the implementation of the South Essex Rapid Transit system, ensuring that it successfully connects residential and employment areas;
- To ensure that all new developments implement travel plans to reduce the reliance on the private car;
- To ensure that a safe, accessible and convenient network of cycle and pedestrian routes is provided;
- To aid the delivery of greenways identified in the Thames Gateway Green Grid Strategy, alongside Essex County Council and neighbouring authorities; and
- To enforce appropriate car parking provision for new development, balancing the needs of motorists but also ensuring parking does not take up excessive amounts of developable land or discourage alternatives to car use.

These strategic objectives have been translated into eight transport policies, all of which will bear some relevance to the proposed development. The most significant are as follows:

- **Policy T1 – Highways:** this policy states that development will be required to be located and designed in a way to reduce reliance on private car travel. Where impact on the highway is unavoidable the Council will work with developers to implement improvements, with contributions from developers where necessary.
- **Policy T3 – Public Transport:** this policy states that development must be well located relative to public transport provision to ensure there are realistic alternatives to travel by private car. Policy T4 relates solely to the development and support of the SERT scheme.
- **Policy T5 – Travel Plans:** states that all development will require a travel plan;
- **Policy T6 – Cycling and Walking:** this sets out the Council's support to developing cycling and walking facilities across the District, with developers contributing where their proposals create a need for such facilities;
- **Policy T8 – Parking:** states the Council will apply minimum parking standards, with developers required to prove parking provision and servicing arrangements are adequate.

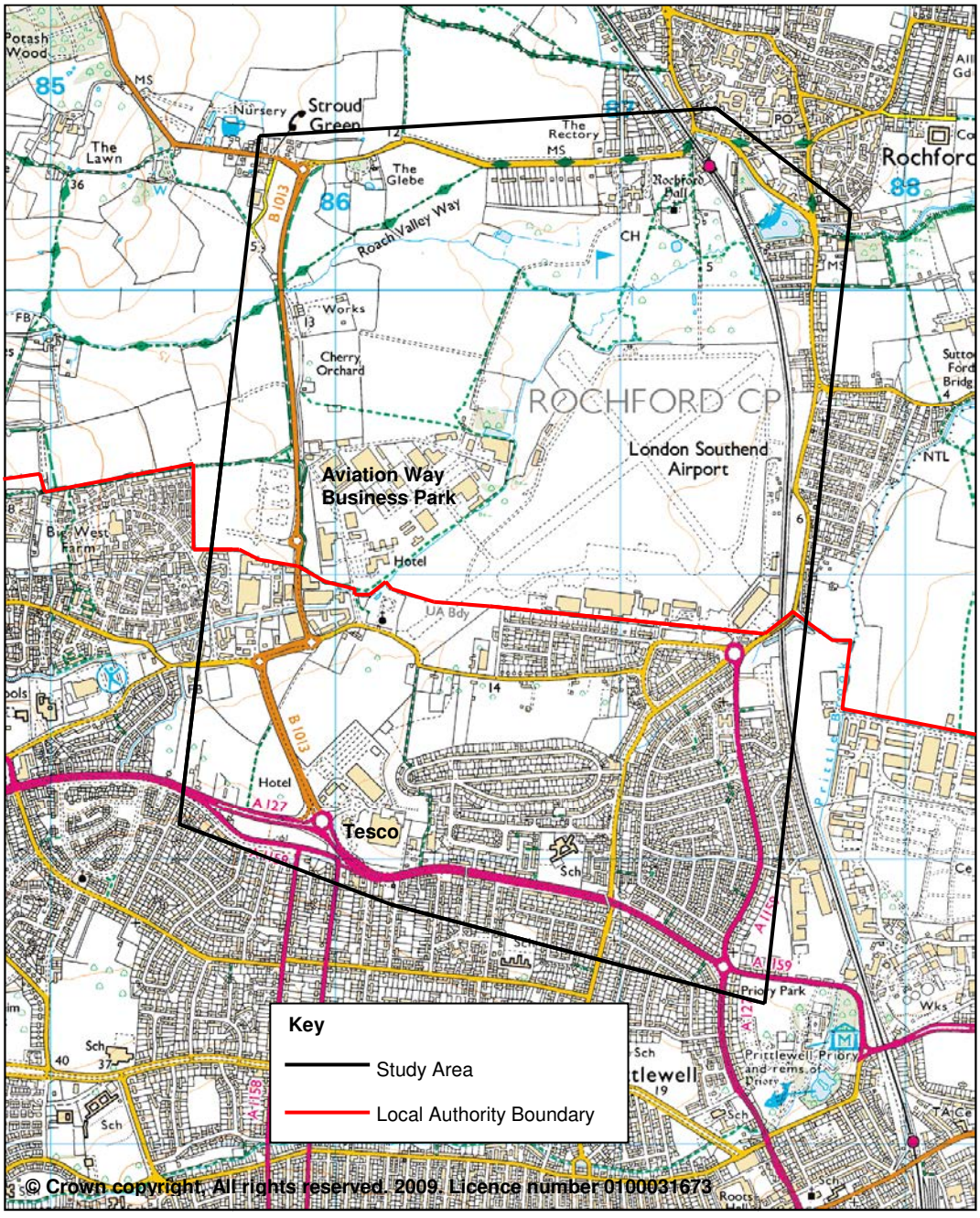
Policy T2 identifies a number of priority highway improvement schemes, two of which are the B1013 and surface access to the airport. Economic policies are designed to facilitate the delivery of 3,000 additional jobs through the plan period. Again London Southend Airport is identified as a focus for employment growth. Policy ED2 specifically sets out the Council's support and aspiration for the development of the airport, including preparation of the JAAP, development of an aviation skills academy and development of business parks to the north of the airport for non-aviation industries.

3. Existing Site Conditions

3.1 Site Location

The site lies either side the administrative boundary between Rochford District Council and Southend-On-Sea Borough Council and forms part of the Thames Gateway area. The centre of Southend is located approximately 1km to the south east of the site and the town of Rochford is situated to the north east corner of the site.

Figure 3.1 – Study Area Location Plan



3.2 London Southend Airport

The airport is located on the northern fringes of Southend-on-Sea in Essex, approximately 40 miles from central London. Approximately 2 million people live within an hour's drive of London Southend Airport. The airport location is shown on Figure 3.1.

The site is bounded to the south by Eastwoodbury Crescent and Wells Avenue both of which are residential; with open space immediately at the end of the runway. To the east is Southend Road, which is also largely residential with Purdeys Industrial Estate and open countryside beyond. Immediately to the north is the town of Rochford, the Rochford Hundred Golf Course, and beyond that open agricultural land. To the west is the Aviation Business Park, the residential areas of Rayleigh and Eastwood, and the open countryside of Cherry Orchard Country Park.

For passengers the main access to the airport is via a priority T-junction from Eastwoodbury Lane, as shown by Figure 3.2. The access carriageway is 7.3m wide with 4.5m wide footways on both sides. A secondary access is provided from the retail park access to the east.

Figure 3.2 – Passenger Access

These access points provide direct vehicle access to the car parks and the terminal building, plus small private flying clubs, which are based at the airport. For freight there is a separate access 140m to the west of the passenger access. This is also a priority T-junction with a carriageway 7.2m wide, though there are no pedestrian footways. The access is shown in Figure 3.3.

Figure 3.3 – Cargo Access

Aviation Way employment area and the Airport Maintenance, Repair and Overhaul (MRO) Northside are existing areas of employment to the south west of the site. Access to individual units is taken from Aviation Way which is accessed via a mini-roundabout from Eastwoodbury Lane, as shown on Figure 3.4.

Figure 3.4 – Roundabout access to Aviation Way Business Park

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3.3 Local Road Network

The study area is bounded by A127/Prince Avenue to the south, Southend Road to the east, Hall Road to the north and Cherry Orchard Way to the west (Figure 3.1). Eastwoodbury Lane runs east to west along the southern boundary of the airport. Roads within the vicinity of the site consist of a mixture of A roads, B roads and residential roads. The main highway features for individual roads are detailed below.

3.3.1 A127 Prince Avenue

The A127 is the major route into Southend-on-Sea from the west, linking to the strategic road network via the A130, the A13 and the M25. The A127 through the study area is referred to as Prince Avenue. The A127 forms the southern boundary of the study area and links the B1013 Nestuda Way/Tesco roundabout in the west to the Prince Avenue/Manners Way/Priory Crescent/Victoria Avenue roundabout in the east. The A127 continues as Victoria Avenue into Southend-on-Sea town centre.

From the Tesco Roundabout to the Rochford Road/Hobleythick Lane/A127 Prince Avenue signalised crossroads, the A127 is a dual carriageway with a 40mph speed restriction and no stopping permitted. Street lighting is located in the centre of the road and there is a speed camera adjacent to Midhurst Avenue on the eastbound carriageway. There is a sign for a speed camera on the western carriageway, but no actual camera was seen. Residential properties line both sides of the carriageway and there are several minor residential roads leading off it.

From the Rochford Road/Hobleythick Lane/A127 Prince Avenue signalised crossroads to the Prince Avenue/Manners Way/Priory Crescent/Victoria Avenue roundabout the road is an dual carriageway, urban clearway, with no stopping Monday to Friday 0730-1030 and 1430-1900, as shown on Figure 3.5. There are double yellow lines on both sides of the road.

Figure 3.5 – A127 Prince Avenue looking east from Rochford Road junction

The carriageway is largely bordered by residential properties; however there are some small commercial units around the Rochford Road junction. There is a lay-by on the northern side of the carriageway, just to the east of Rochford Road which serve the commercial units. Parking restrictions are enforced Monday-Saturday 0900-1800 with a maximum stay of 1 hour with no return permitted within 4 hours. There is no parking charge. There are also some commercial properties at the Prince Avenue/Manners Way/Priory Crescent/Victoria Avenue.

The A1158, which is also referred to as Prince Avenue runs parallel to the A127 Prince Avenue from Queen Anne's Drive to Somerton Avenue with a speed restriction of 30mph. It provides a link from the A127 to Southbourne Grove and Westbourne Grove and would have originally formed the A127 prior to the construction of the B1013 Nestuda Way/Tesco roundabout. For westbound traffic there is a one-way slip road from the A127 to the A1158. The A1158 meets the A127 west of Somerton Avenue at a signalised junction, where there is no access to the eastbound A127.

3.3.2 B1013 Nestuda Way

Nestuda Way is a dual carriageway B road, that links A127 Prince Avenue to the B1013 Cherry Orchard Way and Eastwoodbury Lane. On both sides of Nestuda Way are open fields and sports pitches. Nestuda Way has street lighting on both sides of the road and the traffic heading northbound and southbound is split by a barrier on the central reservation. There are no stopping at any time restrictions on both carriageways and a speed limit of 40mph, as shown by Figure 3.6.

Figure 3.6 – B1013 Nestuda Way southbound carriageway

From the A127 Prince Avenue/B1013 Nestuda Way roundabout there is access to the Tesco superstore and the Royal Bank of Scotland (RBS) offices. There is a secondary access to the RBS car park via a left in, left out priority junction from the Nestuda Way southbound carriageway. Access to the car park is barrier controlled.

3.3.3 B1013 Cherry Orchard Way

The B1013 Cherry Orchard Way is situated between Nestuda Way and Eastwoodbury Lane to the south and Hall Road to the north. Approximately 350m north of the roundabout with Eastwoodbury Lane, there is a roundabout providing access to car retail showrooms.

South of this roundabout, Cherry Orchard Way is a dual carriageway subject to a 40mph speed limit with a no stopping restriction and a central reservation. The carriageway is bordered on both sides by industrial land uses. To the north of the roundabout, Cherry Orchard Way narrows to a single carriageway with a national speed limit restriction, and the road is surrounded by fields and recreational land.

3.3.4 Hall Road

Hall Road runs east/west and provides the northern boundary of the study area. At the eastern end of Hall Road is the town of Rochford, where Hall Road meets Ashingdon Road/West Street at a mini-roundabout. The B1013 Cherry Orchard Way meets Hall Road at a roundabout, and then continues as the B1013 north west towards Hawkwell and Hockley. The eastern section of Hall Road is residential in nature with large detached residential dwellings set back from the road and Rochford Hundred Golf Club. Along the western section of Hall Road the land use is mainly open fields or recreational on both sides of the road.

Hall Road is a single carriageway, subject to a 40mph speed limit, until the residential areas where the speed limit falls to 30mph (Figure 3.7). A red strip is painted across the road to indicate the change in speed. There is also a speed camera on the eastbound side of the road just past Oak Road. On Hall Road there is a weight restriction of 7.5T and a width restriction of 6'6", except for access.

Figure 3.7 – Speed limit change on Hall Lane

At the eastern end of Hall Lane the road passes underneath the London-Southend railway line. There is a height restriction of 4.1m (13-6") underneath the railway bridge.

Ashingdon Road is lined with houses on one side and on the other is a day nursery and Rochford primary school, and hospital. It is an Urban Clearway from Monday – Saturday from 0800-0900 and 1630-1830.

3.3.5 West Street/Bradley Way

West Street runs from the junction with Hall Road south, meeting Bradley Way at another mini roundabout. Along with Bradley Way and Southend Road, West Street forms the eastern boundary of the study area. West Street is a single carriageway with single yellow lines along both sides. The road is subject to a 30mph speed limit with a no waiting restriction in force Monday to Saturday between 0800 and 1800. Access to Rochford Station car park is taken from West Street.

West Street meets Bradley Way at a 3-arm mini-roundabout. The third arm, also called West Street which leads into the town centre and is lined by commercial uses. There is a zebra crossing on the northern arm of the roundabout.

Bradley Way continues south from West Street to another mini roundabout where it meets Southend Road. On the western side of the carriageway there is parkland then the railway line. On the eastern side there is a wedding venue and other large commercial buildings. The road is lit and subject to a 30mph speed limit. There are no waiting restrictions on the highway, but there is a speed camera sign near to the mini roundabout with Southend Road on the northbound side. There are no buses or cycle routes along this stretch of road. The Bradley Way/Southend Road roundabout is a three arm roundabout, with the third arm being South Street. There are two lanes on the approaches from Bradley Way and Southend Road, with ahead and turning lanes marked. There is a one lane approach from South Street.

3.3.6 Southend Road

Southend Road continues south to the junction with Manners Way/Rochford Road/Eastwoodbury Lane, which is referred to as the Harp House roundabout. To the west is a mixture of open space and residential properties, with the railway line beyond. To the east of there are residential dwellings, but also a fire station, pub, garden centre and other commercial uses. The Roach Valley Way and Bridleway 38 cross Southend Road to the north. On the site visit during the daytime it was noted that there was a steady stream of traffic travelling along both sides of the road, making it difficult to cross at times.

As South End Road continues southwards it meets Sutton Road at a mini roundabout with a turning off to Sutton Road. The approaches from the north and south are flared two lane approaches with ahead and turning lanes marked. Sutton Road is a single lane approach providing access to Purdeys Industrial Estate. There is a zebra crossing on the southern arm of the roundabout.

South of the junction with Sutton Road, Southend Road is bordered by open land to the west, with the railway line and airport beyond. To the eastern side are residential dwellings. There is a speed camera on the southbound carriageway. Double yellow lines begin on both sides of the road from the railway bridge and continue southwards to Harp House Roundabout. Between Leicester Avenue and Queen Elizabeth Chase there is a parade of small shops with a parking bay provided in front. Parking restrictions are in place between 0800 and 1800 with a maximum stay of 30 minutes with no return within 1 hour.

3.3.7 A1159 Manners Way

The A1159 links the Harp House Roundabout at the northern end to the A127 Prince Avenue/Victoria Avenue/Priory Crescent roundabout to the south. It is a single carriageway with a 40mph speed limit and a mixture of no restrictions, single and double yellow line restrictions, with a no waiting restriction in force Monday to Saturday between 0800 and 1800 associated with the single yellow lines. Double yellow lines are found mainly approaching junctions or bus stops.

The land use alongside Manners Way is largely residential, though there are allotments to the eastern side close to the Harp House Roundabout. The residential properties take access across the footways on both sides of the carriageway. There are some small shops on Manners Way by the junction with Oaken Grange Drive. In front of the shops a parking bay is provided which can accommodate approximately 7 cars (Figure 3.8). Parking is restricted between 0900 and 1800 to 1 hour only with no return within 1 hour.

Figure 3.8 – Parking Bay on Manners Way

The A1159 Manners Way is the signposted route to London Southend Airport.

3.3.8 Eastwoodbury Crescent

Eastwoodbury Crescent runs between the Harp House Roundabout and Rochford Road. At the junction with Wells Avenue the road bends 90 degrees then runs north-south to Rochford Road. London Southend Airport takes access from the north side of Eastwoodbury Crescent. To the south are residential properties with an access road separated from the main carriageway.

The road is a single carriageway subject to a speed limit of 30mph and a 7.5T weight restriction (except for access). There are double yellow lines along both sides of the carriageway between the Harp House Roundabout and the junction of Eastwoodbury Crescent and Wells Avenue. This is an uncontrolled parking zone despite proximity to the airport, indicating parking at the airport is not significant at present.

Between the junctions with Wells Avenue and the mini-roundabout with Eastwoodbury Lane there is a small parade of shops. Adjacent to the shops there is a parking bay along the eastern side of Eastwoodbury Crescent. The parking bay covers 72m of the kerb, but 6.5m of this is taken up by driveways to the forecourt outside the shops. Parking restrictions are enforced between 0800 and 1800, limited to a maximum stay of 1 hour with no return within 4 hours. A 3-arm mini roundabout links Eastwoodbury Crescent to Eastwoodbury Lane.

3.3.9 Eastwoodbury Lane and Aviation Way

Eastwoodbury Lane links Eastwoodbury Crescent with the B1013 Nestuda Way and Cherry Orchard Way. The eastern section of Eastwoodbury Lane is residential in nature, with accesses to properties taken across the footway. Avro Road, Bristol Road and Vickers Road provide access to the residential areas to the north of Eastwoodbury Lane via T junctions. To the south of Eastwoodbury Lane is open space.

The runway for London Southend Airport runs north-east to south-west, with the south-west end of the runway just 30m from Eastwoodbury Lane. There are two sets of barriers across the road, which go down when a large plane is taking off or landing. There is a 7.5T restriction and double yellow lines on both sides of the road between and around the barriers. On the remainder of the road there are no further restrictions. Both sets of barriers are operated by traffic lights, as shown by Figure 3.9.

Figure 3.9 – Barriers on Eastwoodbury Lane

To the west of the runway barriers Eastwoodbury Lane meets Aviation Way at a three arm mini roundabout. Aviation Way is bordered by industrial land uses and the airport. There is no central divide or restrictions along the road. Cars are parked alongside much of the roadside and on verges. West of Aviation Way Eastwoodbury Lane continues as a single carriageway road with a 30mph speed restriction, before meeting the B1013 Cherry Orchard Way at another, larger roundabout.

3.3.10 Rochford Road

Rochford Road links the A127 Prince Avenue to Southend Road to the north, and is bordered on both sides by residential dwellings. It is a single carriageway with a 30mph speed restriction. On street restrictions are a mixture of double yellow line restrictions around junctions, bus stops and pedestrian crossings, single yellow lines and areas where there are no restrictions. There is a 7.5T weight restriction for all of the side roads off Rochford Road. There is a speed camera sign on the southern side of the road, but no fixed speed camera present.

There is a small parade of shops, including a Somerfield store, at the junction of Rochford Road/Feeches Road, with a zebra crossing outside (Figure 3.10). There are four marked parking bays south of the Somerfield zebra crossing, with a parking restriction operational between 0900 and 1800 with no return within 4 hours. Despite being a more direct route from the A127 to London Southend Airport this is not the signposted route.

Figure 3.10 – Zebra crossing opposite Somerfield

3.3.11 Main Junctions and Roundabouts

Details of the main junctions are listed below:

A127 Prince Avenue/B1013 Nestuda Way/Thanet Grange roundabout

- 2 lane approaches on all arms;
- 2 lane exit to A127 Prince Avenue eastbound, 1 lane exit to other arms;
- Left turn filter lane from A127 Prince Avenue eastbound to B1013 Nestuda Way; and
- Straight through lane on the A127 Prince Avenue westbound.

A127 Prince Avenue/Rochford Road/Hobleythick Lane signalised crossroads

- Two lane approaches eastbound and westbound on A127 Prince Avenue; and
- Two lane approaches from Rochford Road and Hobleythick Lane.

Cuckoo Corner Roundabout (Prince Avenue/Manners Way/Priory Crescent/Victoria Avenue roundabout)

- 3 lane approaches on A1159 Manners Way and A127 Victoria Avenue;
- 2 lane approach from Prince Avenue and Priory Crescent;
- 1 lane exit to A1159 Manners Way and Priory Crescent;
- 2 lane exits to A127 Prince Avenue and Victoria Avenue; and
- Left turn filter lane from A127 Victoria Avenue to A127 Prince Avenue.

Nestuda Way/Eastwoodbury Lane westbound/Comet Road/Eastwoodbury Lane eastbound roundabout

- 3 lane wide circulatory carriageway, unmarked and likely to operate as 2 lanes
- 3 lane approach on B1013 Nestuda Way northbound;
- 2 lane approach on B1013 Nestuda Way westbound;

- 2 lane flared approach on Eastwoodbury Lane eastbound;
- 1 lane approach on Comet Way;
- 2 lane exit to B1013 Nestuda Way and to Nestuda Way eastbound arm; and
- 1 lane exit to westbound arm and Comet Way.

B1039 Eastwoodbury Lane/Cherry Orchard Way/ Eastwoodbury Lane

- 2 lane approaches from Eastwoodbury Lane eastbound arm and Cherry Orchard Way;
- 2 lane flared approach on Eastwoodbury Lane westbound arm;
- 2 lane exits to Cherry Orchard Way and Nestuda Way;
- 1 lane exit to Eastwoodbury Lane;
- 2 lane circulatory carriageway reduced to one lane by hatching.

3.4 Walking

In general footways within the vicinity of the site are of good quality and the key sites within the study area are accessible by foot.

The footways on the major roads within the study are generally of good quality, especially along the A roads. On the A127 Prince Avenue, B1013 Nestuda Way, B1013 Eastwoodbury Lane, West Street, Rochford Road, Eastwoodbury Crescent and A1159 Manners Way the footpaths are around 2-3m wide with a verge. Figure 3.11 shows a good quality shared use footway on B1013 Nestuda Way.

Figure 3.11 – Good quality footpath along Nestuda Way

On the more minor roads the footways are of a poorer quality. On Eastwoodbury Lane the standard of the footpath was variable, with an uneven surface and narrow in sections. Along much of the southern side of Eastwoodbury Lane there was no footway, forcing bus users to stand on a verge to board the bus. On Hall Road, which would become the main pedestrian routes from Rochford railway station to Business Park, there are not always footpaths on both sides of the road. The quality of the footway varies from narrow cracked footways along much of the eastbound carriageway, to a good quality shared use footway on the westbound carriageway.

On Southend Road the footways were noted to be particularly narrow and poor quality, this is illustrated in Figure 3.12 below.

Figure 3.12 – Narrow footway on South End Road

Along the northern section of Cherry Orchard Way there are no footways adjacent to the carriageway. However, Bridleway 47 and Bridleway 48 run alongside Cherry Orchard Way segregated from the carriageway by a fence, and along Cherry Orchard Lane. The bridleways are described in more detail under Section 3.5.1. Crossing at the roundabouts on B1013 Nestuda Way and Cherry Orchard Way was noted as being particularly difficult due to the volume of traffic.

Almost all the crossings within the study occur at the junctions or the roundabouts and uncontrolled crossings. Some uncontrolled crossings have tactile paving and dropped kerbs, whilst others do not. There are a number of zebra crossings within the study area, signal controlled crossings at the junction of A127 Prince Avenue/Rochford Road/Hobleythick Lane, a signal controlled crossing on the A127 Prince Avenue arm of the Cuckoo Corner roundabout, a toucan crossing adjacent to the Tesco superstore and two footbridges which are both located on Prince Avenue.

3.4.1 Public Rights of Way and Bridleways

There are a number of bridleways and public rights of way, which transect the study area. These are shown on Figure 3.13 below which is an extract from the Ordnance Survey 1:25,000 map for the area, and illustrated further on Figure 3.14 and Figure 3.15 -. It is evident from the figures that the paths vary greatly in quality.

Where the footways and bridleways cross B1013 Cherry Orchard Way at the northern limit of the Aviation Way Business Park there is a pedestrian subway. There is a second crossing point further north however this is uncontrolled and it can be difficult to cross in busy times.

Figure 3.13 – Public Rights of Way and Bridleways

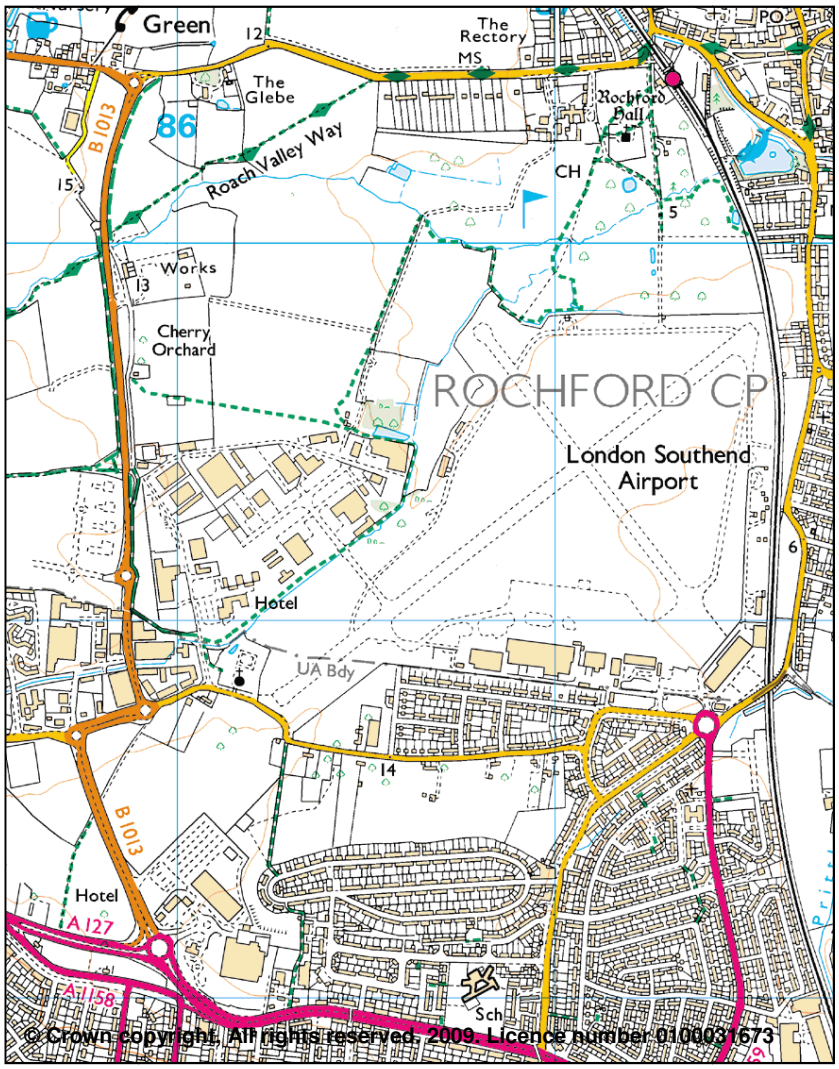


Figure 3.14 – Footpath off Eastwoodbury Lane

Figure 3.15 - Roach Valley Way, from Cherry Orchard Road towards Hall Road

3.5 Cycling

There are no on road cycle routes within the study area, However there are a number of shared use off road cycle routes. Shared use pathways are found along parts of the A127 Prince Avenue, along both sides of the B1013 Nestuda Way, along the majority of the B1013 Cherry Orchard Way, and on both sides of Hall Road. Figure 3.11 above shows a shared use footpath on B1013 Nestuda Way.

Cycle crossings include the toucan crossing just east of Westbourne Grove (Figure 3.16) on A127 Prince Avenue, on Hall Road opposite Rochford station and via a footbridge over the A127 at Richmond Drive.

Figure 3.16 – Toucan Crossing East of Westbourne Grove

3.6 Buses

Figure 3.17 shows the bus routes which operate within the study area. The closest bus stops to the main airport access are between the two airport accesses on Eastwoodbury Crescent and a 1 minute walk along a good quality footway. The closest bus stops to the business parks are on Eastwoodbury Lane, though there are temporary bus stops on B1013 Cherry Orchard Way.

Table 3.1 to Table 3.5 lists the bus services stopping within the vicinity of the site, split according to major roads. The most bus services stop on Prince Avenue, which is located to the south of the site.

Table 3.1 – Bus Services stopping on A127/Prince Street

Service number	Route	Monday – Saturday daytime	Monday – Saturday evening
15 and 15a	Southend – Eastwood - Rayleigh	Mon – Fri rush hour only	None
15b	Southend – Eastwood – Rayleigh – Thundersley - Hayleigh	2 journeys Mon – Fri, rush hour AM	None
15c	Lower Hockley – Rayleigh – Eastwood - Southend	1 journey Mon – Fri AM rush hour	None
16	Southend – Eastwood – Rayleigh – Thundersley - Canvay	1 journey Mon – Fri rush hour	None
17	Southend – Westcliff – Prince Avenue – Tesco	5 journeys Tuesday only	None
X30	Southend – Eastwood – Rayleigh – Chemsford – Stanstead Airport	Every 60 minutes	Every 60 minutes

Table 3.2 – Bus Services Stopping on A1158/Prince Avenue

Service number	Route	Monday – Saturday daytime	Monday – Saturday evening
25	Southend – Eastwood – Rayleigh – Wickford – Basildon	Every 30 minutes	None

Table 3.3 – Bus Services Stopping on Southend Road

Service number	Route	Monday – Saturday daytime	Monday – Saturday evening
7 and 8	Shieburyness – Thorpe Bay – Southend – Rochford – Golden Cross – Hockley – Rayleigh	Every 10-15 minutes	Every 30 - 60 minutes
60	Southend – Temple Farm – Rochford – Great Stambridge – Canewdon - Paglesham	4 –5 journeys a day	None
61	Southend – Fossett's Park, one journey extends to Rochford	Every 30 minutes	3-5 journeys

Figure 3.17 – Bus Route Map

Table 3.4 – Bus Services Stopping on Cherry Tree Way

Service number	Route	Monday – Saturday daytime	Monday – Saturday evening
18	Belfairs - Hawkwell - Hockley - Ashingdon (Circular)	4 services on a Friday	None

Table 3.5 – Bus Services Stopping on Eastwoodbury Lane and Eastwoodbury Crescent

Service number	Route	Monday – Saturday daytime	Monday – Saturday evening
9	Shoeburyness – Thorpe Bay – Southend – Eastwood - Rayleigh	Every 12 minutes	Every 30 – 60 minutes

The facilities at the bus stops within the study area are mixed. Many bus stops on minor routes do not have a shelter or any seating and consist of just a post with no proper crossing to reach the bus stop. Some of the bus stops within the study area, particularly along Southend Road were found to not have a timetable or service number attached to the post. Other stops are of good quality with shelter, seating, lighting and timetable information. These tended to be found on the busier bus routes. Figure 3.18 shows one of the poor bus stops on Southend Road.

Figure 3.18 – Bus stop on Southend Road

3.7 Trains

Rochford is the closest railway station to the airport and is a 2.3km or 28 minute walk to the airport and 1.5km or 19 minute walk to the current Aviation Way business park. It is located to the north east corner of the study area in the town of Rochford. Prittlewell railway station is to the south of the study area to the south east. Employees accessing the Business Park are most likely to alight at Rochford Station as it will be the closest station to the employment area.The airport will have a dedicated station which is currently under construction and due to open in Spring 2010 as part of the Southend Airport developments.

Rochford station is managed by a single operator, National Express East Anglia. The station is on the line from Southend Victoria to London Liverpool Street, providing a regular service into London which takes approximately 50 minutes. Table 3.6 lists the train frequencies for services from Rochford.

Table 3.6 – Train services from Rochester station

Route	Mon-Sat	Evenings	Sundays
London Liverpool Street – Southend Victoria	Every 20 minutes	Every10- 20 minutes	Every 30 minutes
Southend Victoria – London Liverpool Street	Every 20 minutes	Every 15-20 minutes	Every 30 minutes

3.7.1 Rochford Station facilities

Rochford station has two platforms, one for trains to Southend and one for trains to London. CCTV is in operation covering the station, car park and cycle parking.

The station is staffed Monday to Friday from 06:00-17:00, on Saturday from 07:30-14:20 and on Sunday from 09:00-15:00 and the ticket office is open during these times. There is also a self service ticket machine, from which pre-booked tickets can be collected. There are live departure and arrival screens. There is a waiting room and are benches located along both platforms and toilets are provided.

There are two partly sheltered cycle storage areas in the car park providing a total of 19 Sheffield stands or 38 cycle parking spaces. There are a further 10 uncovered Sheffield stands directly outside the station (Figure 3.19).

Figure 3.19 - Cycle parking outside station and access to platform 2

The station car park provides 204 parking spaces, with 4 disabled spaces. The car parking charges are £5 per day during peak times, £3 per day off peak, £20.50 weekly, £79.00 monthly and £820.00 annually. There is a reduced parking tariff after 16:00 Monday to Friday and on Saturdays and Sundays.

There is a taxi rank outside the station, but the closest bus stop is a 5 minute walk away on West Street. Platform 1 serves trains towards Southend Victoria and access to this platform is from

street level, through the ticket office or a gate which leads to the station car park. Platform 2 serves trains to London Liverpool Street and accessed via a footbridge from Platform 1, or from Hall Road via a ramped walkway and an alternative stepped access. Figure 3.20 shows the access to the car park from Platform 1 as well as the footbridge to Platform 2.

Figure 3.20 – Access to the car park on platform 1

4. Proposed Development

4.1 Airport Expansion

Within the original *London Southend Airport and Environs Joint Area Action Plan Issues and Options Report* four development scenarios for the airport were put forward for consultation. These are summarised in Table 4.1.

Table 4.1 – Proposed Airport Expansion Scenarios

Scenario	Airport Development
1 – Low Growth (Do Minimum)	Current airport operation sustained with minimal growth of aircraft maintenance through increased use of currently underutilised space. Passenger traffic would remain marginal to maintenance activity. The approved hotel would become less financially viable.
2(a) – Medium Growth	Current operation maintained as per Scenario 1.
2(b) – Medium Growth with Aviation Cluster	Airport becomes a 'driver' for development. Passenger numbers would be grown to 2 million per annum by 2030 with associated railway, hotel and terminal infrastructure but runway length maintained as existing. Maintenance operations would also be expanded through intensification and also new allocation of 4.05ha to the north of the airport. 2 million passengers per annum equates to approx 1,500 arrivals and 1,500 departures or 66,000 flights per year and 40 flights per day.
3 – High Growth	Extension to the runway to 1,799m to accommodate larger planes with up to 160 seats. Passenger numbers would grow to 2 million per annum which would be realistically achievable considering the investment. Expansion would include new terminal, new rail station, hotel, control tower and ancillary facilities. Maintenance operations would expand with operators based at the airport with increased provision up to 4.05ha. Forecasts of 2 million passengers per annum and up to 85,500 aircraft movements comprising daily flights of around 40 passenger, 2-3 maintenance and 5-6 business flights, equating to 3 flights per hour.

In terms of the objectives set by the JAAP, the final scenario has the closest fit with the airport becoming a driver for other employment development in the area. It is recognised that the extension to the runway is vital in achieving the increase in passenger flights to 2 million passengers per annum. The key elements of the airport expansion are as follows:

- A new railway station to provide quick, direct links into London and Southend;
- A new terminal building to handle passengers with greater speed, efficiency and comfort;
- Additional secure car parking spaces for people using the airport;
- A new control tower;
- Extension of the current runway, to attract new airlines to the airport and operate additional passenger services, particularly to Europe; and
- A new hotel.

4.2 Business Parks

The development of the airport is intended to occur in tandem with the development of employment land around the airport fringes, focussing on the Aviation Way Business Park. Intensification of existing uses and new development to provide B1 Office and Light Industrial uses is proposed. With each scenario for airport expansion there are corresponding proposals for increase in employment as described in Table 4.2.

Table 4.2 – Proposed Employment Land development scenarios

Scenario	Business Development
1 – Low Growth (Do Minimum)	Improvement/intensification of Aviation Way Business Park within existing park boundaries. Could potentially provide 750 additional jobs and 15,000sq.m of new office/light industrial floorspace.
2(a) – Medium Growth	Intensification of existing employment areas plus provision of new employment areas to the north of Aviation Way, able to accommodate 64,000sq.m of additional employment floorspace and 3,200 new jobs.
2(b) – Medium Growth with Aviation Cluster	Employment growth will be associated with the expanded airport and maintenance activity, plus a new allocation of 7ha for 49,000 sq.m of new aviation related business park development accommodating 2,500 new jobs. With the intensification of Aviation Way new floorspace of up to 64,000sq.m accommodating 3,200 new jobs could be provided.
3 – High Growth	Airport employment would rise to 2,100 jobs. Additionally intensification of Aviation Way and new allocation of 21ha to the north of Aviation Way. New development would accommodate 94,000dq.m of floorspace with B1 use and support 3,900 new jobs.

In total 6,000 new jobs could be provided under the high growth scenario, with a reasonable proportion of these related to airport expansion. Clearly the provision of any new development will have some impact on transport and require transport-related infrastructure improvements. Table 4.3 identifies from the JAAP Issues and Options Report what the implications on transport may be.

Table 4.3 – Implications of Scenarios for Transport Provision

Scenario	Transport Improvements and Issues
1 – Low Growth (Do Minimum)	Minimal transport infrastructure improvements to support growth of Aviation Business Park. No additional airport related infrastructure. Eastwoodbury Lane would continue to operate with barriers and delays may increase marginally, as may road noise from intensified Aviation Way Business Park. LTP2 infrastructure improvements required irrespective of development.
2(a) – Medium Growth	No additional airport related infrastructure. Improvements would be required, in addition to LTP2 schemes, to facilitate employment growth including a new roundabout access to Aviation Way from Cherry Orchard Way, upgrading of Aviation Way and Cherry Orchard Way. Eastwoodbury Lane would continue to operate with barriers and delays may increase marginally, as may road noise from intensified Aviation Way Business Park. Public transport initiatives would be implemented to encourage modal shift.
2(b) – Medium Growth with Aviation Cluster	Growth in air traffic and road traffic would impact on noise levels. Increased aircraft movements would require Eastwoodbury Lane to be closed more regularly and by the end of the plan period a revised route would be required. Improvements as per Scenario 2(a) would be required to accommodate business park growth, in addition to LTP2 schemes. New rail station would improve sustainable access.

Scenario	Transport Improvements and Issues
3 – High Growth	With the extension of the airport, Eastwoodbury Lane would need to be closed and diverted. Infrastructure improvements in accordance with LTP2 would need to be supplemented by additional infrastructure to support business park growth. Additional traffic and aircraft movements would have a impact on noise levels and controls may be required through planning conditions or agreements with operators.

To accommodate the growth of the Aviation Way business park the following highway improvements were anticipated as being required by the JAAP Issues and Options document:

- Dualling the remainder of Cherry Orchard Way from the car retailers roundabout to Hall Road;
- Two new access points via roundabouts to Aviation Way direct from Cherry Orchard Way linking to internal road network through new business park;
- Junction improvements at the roundabout of Nestuda Way/Cherry Orchard Way/White House Road
- Upgrading of the existing mini-roundabout at the junction of Aviation Way and Eastwoodbury Road; and
- The extension of the runway would require the diversion of Eastwoodbury Lane to the south of the safety zone, linking to Nestuda Way to the north of the RBS office development.

4.3 Preferred Option

Responses following the public consultation on the *London Southend Airport and Environs Joint Area Action Plan Issues and Options Report* were used to determine a preferred option for expansion of the airport and development of the surrounding area. The *London Southend Airport and Environs Joint Area Action Plan Preferred Options Report* sets out the preferred option for development.

4.3.1 Airport Expansion

The preferred option for the airport proposes the extension of the runway to an overall length of 1,799m, with associated passenger infrastructure including a new terminal and rail station. The improved facilities are anticipated to attract up to three fixed base operators to the airport, who would operate flights to UK and European destinations up to a capped maximum of 2 million passengers per annum. By extending the runway the airport would be able to handle larger aircraft of up to 150 seats.

The expansion of the passenger function of the airport will be accompanied by an expansion and intensification of the maintenance, repair and overhaul (MRO) activity. The preferred options report states that ”considered desirable for the airport to handle significant volumes of freight due to its location and the pressure this would place on the local highway network” (p20).

4.3.2 Business Parks

The preferred option for employment is to pursue a high scale employment growth scenario. This will be a mixture of aviation-related industry plus high-tech industries and offices (B1 and B2 uses). It is proposed that employment land be allocated which is sufficient to accommodate a total of 109,000sq.m of new floorspace and 5,450 new jobs in the period to 2021. In addition 15,000sq.m of floorspace will become available following redevelopment within the Aviation Way Business Park which together with the new employment allocation to the north will provide a total

of 6,200 new jobs. This excludes new employment created as a result of airport expansion. The breakdown of employment locations are provided in Table 4.4

Table 4.4 – Employment Allocation Breakdown

Location	Sub-Area	Use Class	Floorspace (sq.m)	Jobs
Saxon Business Park	Area 1a	B1	20,000	1,000
	Area 1b	B1 and B2	49,000	2,450
	Area 2	B1	30,000	1,500
Aviation Way Business Park	-	B1 and B2	15,000	750
Nestuda Way	-	B1 and B2	10,000	500
		Total	**124,000**	**6,200**

Area 1a would be developed first with a new junction providing direct access onto B1013 Cherry Orchard Way and a new internal road network as required to serve the development. Area 1b may be developed in parallel if a need is demonstrated, with an associated extension to the internal road network. Area 2 will be reserved for development post 2021, unless a need arises sooner.

The report prepared by Halcrow to support the Issues and Options paper assumed a 60% B1 office use and a 40% B1 Light Industrial use. There was no reference at that stage to a B2 use.

4.3.3 Transport Infrastructure

To deliver the preferred development options it is recognised that an appropriate and sustainable transport strategy is required. The following strategy was proposed by the Preferred Option report:

- A new link road from Eastwoodbury Lane to Nestuda Way to allow runway extension;
- A safeguarded route from Nestuda Way to Warners Bridge to improve east-west connectivity;
- Upgrading single lane sections of Cherry Orchard Way to dual standard;
- New layout for Aviation Way/Eastwoodbury Lane junction, plus improved cycling and walking provision;
- Park and Ride facility to the west of Nestuda Way following construction of diverted Eastwoodbury Lane;
- Contribution to establishment of an appropriate bus service, including the South Essex Rapid Transit (SERT) system to meet the need of new employees; and
- New walking and cycling routes, specifically:
  - Routes for walking and cycling which link from the site to Hall Road;
  - Improved cycle and walking linkages; and
  - Enhancements to walking and cycling to the airport from the north and south.

4.4 Parking

4.4.1 Business Parks

Southend-on-Sea Council is currently preparing a new Development Plan Document which will update the existing parking standards for the Borough. For B1 and B2 uses the preferred new standard remains the same as the previous published standard. Rochford District Council

published their parking standards within the 2006 Local Plan as policy TP8. For B1 and B2 land uses the relevant parking standards for both authorities are the same. Therefore the standards being applied for this study are:

- B1 use – 1 space per 30sq.m
- B2 use – 1 space per 50sq.m

Where mixed B1 and B2 uses are proposed it has been assumed there would be provided a range of spaces has been provided. Taking the employment allocations outlined in Table 5.4, the parking spaces which would be required are detailed in Table 5.5.

Table 4.5 – Parking Space Requirements

Location	Sub-Area	Use Class	Floorspace (sq.m)	Parking Spaces
Saxon Business Park	Area 1a	B1	20,000	667
	Area 1b	B1 and B2	49,000	980-1,633
	Area 2	B1	30,000	1,000
Aviation Way Business Park	-	B1 and B2	15,000	300-500
Nestuda Way	-	B1 and B2	10,000	200-333
		Total	**124,000**	**3,147 – 4,133**

Parking requirements for the business parks is substantial and consideration should be given to a parking strategy.

4.4.2 Airport Expansion

The parking requirement for the airport will be dependent on how the airport operates. There will be a need for staff parking, but also for long stay parking if the airport offers European flights. In addition some parking may be provided off site. As airport parking requirements are more complicated there are no published standards to refer to. Parking will need to be agreed on a more bespoke basis.

4.5 Access Arrangements

The following access points have been proposed by the Preferred Options document:

- Areas 1a and 1b will be accessible from Cherry Orchard Way via a new junction, approximately at the location of the former brickworks access.
- If constructed, Area 2 will also be accessed from this junction.
- Nestuda Way Business Park will be accessed via a new junction from Nestuda Way, approximately at the point of access to RBS car parks. A Park and Ride would share this access point.
- Aviation Way will continue to be accessed as present, with an upgraded junction to replace the current arrangements.
- MRO operations on the north side of the airport will be accessed via the new junction serving Saxon Business Park;

- MRO operations on the south side of the airport will be accessed via the existing vehicle access for the airport from Eastwoodbury Crescent;
- Car parking for the airport would be accessible from the Retail Park access off Harp House roundabout.

4.5.1 Saxon Way Business Park

Based on the vehicle generation assessment a new junction to serve Saxon Way Business Park would need to accommodate 1,063 AM Peak Hour arrivals and 197 departures, in addition to the current two-way flows already on Cherry Orchard Way. In the PM flows are slightly lower with 140 vehicle arrivals and 841 departures.

The new junction may also provide access to the MRO operations to the north of the airport boundary, though this may also be accessible via the Aviation Way Business Park. This would generate another 100 two-way movements through the new access junction during peak periods.

4.5.2 Nestuda Way Business Park

This small business park would be accessed from Nestuda Way via a new junction at approximately the same place as the current access to RBS offices. Based on the trip generation exercise this park would generate 100 arrivals in the AM peak hour and 19 departures, with 14 arrivals and 85 departures in the PM peak hour. These would all essentially be new vehicles on the network as the site is currently green field land.

On the proposals plan there is a Park and Ride site allocated to the north of the business park, with access from the same junction. This could significantly raise vehicle movements at this junction depending on the patronage of the service.

4.5.3 Aviation Way Business Park

Aviation Way Business Park will continue to be accessed as existing. However with the diversion of Eastwoodbury Lane the current mini-roundabout will be reconfigured as a T-junction to allow continued access to the St Laurence and All Saints Church. Aviation Way would form the major road. An alternative may be to provide access from the roundabout at Rochford Business Park. Once the additional 15,000sq.m of development at the existing business park is realised, the total vehicle movements (including existing movements) would be 149 arrivals and 29 departures during the AM peak hour, with 21 arrivals and 128 departures during the PM peak hour.

4.5.4 Southside Maintenance Repair and Overhaul

MRO Operations on the southern side of the airport would take access via the existing access points for passengers and cargo, from Eastwoodbury Crescent. Depending on the split of operations between the north side and south side areas, this could equate to about 100 two-way movements in the peak periods. However, because this is already access for the airport the net change in vehicle movements may only be minor.

4.5.5 Airport Terminal and Car Park

Access to the improved airport facilities will be via the Harp House roundabout, which also provides access to the retail park. There will be some reassignment from Eastwoodbury Crescent due to current staff no longer accessing the airport from the existing accesses, however this is likely to be offset by MRO activities developed on the current terminal site.

Expansion of the airport will generate a worst case scenario of 620 arrivals and an equal number of departures during the peak periods.

5. Business Park Trip Generation

The preferred option is to provide an additional 124,000sq.m of employment floorspace of B1 Office, B1 Light Industrial and B2 General Industrial uses, as shown in Table 6.1.

Table 5.1 – Business Park Development Proposals

Location	Sub-Area	Use Class	Floorspace (sq.m)	Jobs
Saxon Business Park	Area 1a	B1	20,000	1,000
	Area 1b	B1 and B2	49,000	2,450
	Area 2	B1	30,000	1,500
Aviation Way Business Park	-	B1 and B2	15,000	750
Nestuda Way	-	B1 and B2	10,000	500
		Total	**124,000**	**6,200**

The previous Transport Assessment prepared by Halcrow assumed that 60% of the allocation would be B1 Office and 40% would be B1 Light Industrial. No reference is made to B2 land uses within the Issue and Options Report document, or within the transport assessment. However the Preferred Development Option identified proposed B2 land use in Table 6.1. In the text of the Preferred Options report there is a statement that B2 uses are

> *'expected to complement the expected role of the new employment land as a high quality business park…'*

Taking account of this, it has been assumed that a share of 20% B2 use can be expected in areas where B1 and B2 uses are proposed. A greater proportion of B2 use is considered to be a significant land use, rather than one which is intended to be complementary to the B1 uses. The remaining 80% has been divided between Office and Light Industrial as per the Halcrow assumptions.

The resulting areas for each land use are shown in Table 5.2.

Table 5.2 – Land Use Breakdown

Location	Sub-Area	Total Floorspace (sq.m)	B1a	B1c	B2
Saxon Business Park	Area 1a	20,000	12,000	8,000	0
	Area 1b	49,000	23,520	15,680	9,800
	Area 2	30,000	18,000	12,000	0
Aviation Way Business Park	-	15,000	7,200	4,800	3,000
Nestuda Way	-	10,000	4,800	3,200	2,000
Total		**124,000**	65,520	43,680	14,800

5.1 Trip Rates

The previous Transport Assessment utilised the 2008(a) version of the TRICS database to calculate vehicle trip rates for B1(a) Office and B1(c) Light Industrial land uses. Since publication

of the previous Transport Assessment more recent versions of TRICS have been released, up to the current 2009(b) v6.4.2, which was released in September 2009. The new database contains more sites and more detail than previous versions, therefore the trip rates have been revised accordingly.

The database contains sites for which there is a Ground Floor Area 'not in use' classification which refers to sites/buildings where parts are not occupied, for example a floor of a large office block. Sites where there are some parts which are unoccupied have been excluded as this can falsely reduce the trip rates calculated.

5.1.1 B1(a) Office Land Use

To be consistent with the Halcrow study, the 02/B 'business park' land use category in TRICS has been utilised, which is defined as 'a collection of office buildings hosting separate organisations'. It is still considered that this classification is most relevant to the proposal for the JAAP.

The newer version of the TRICS database contains 57 business park sites across the UK surveyed from 1988 to 2008. To generate representative trip rates the following filters have been applied:

- Only sites surveyed after 2000 have been included;
- Only sites in locations at the edge of town and free standing (out of town) have been used;
- One site in Ireland was excluded (DL 02 B 01).

Sites were not discounted based on public transport provision as the surface strategy for the development sites will seek to develop a very good network of public transport. In all cases the sites were close to good road links, as is the case for the proposed site.

In total 17 sites were selected, all of which are in edge of town locations. The resulting trip rates for B1 (a) business parks are as shown in Table 5.3.

Table 5.3 – Business Park B1(a) Trip Rates

Per 100sqm	AM Peak (0800-0900	PM Peak (1700-1800)	Daily Total
Arrivals	1.557	0.19	5.514
Departures	0.248	1.242	5.371

These proposed trip rates are marginally higher than the Halcrow trip rates, which is due to sites closer to town centres having been discounted for this study. It is considered that the sites chosen are more representative of the location characteristics of the proposed business parks.

5.1.2 B1(c) Light Industrial and B2 General Industrial Land Use

The previous study by Halcrow stated that the proposed employment allocation would be a mix of B1(a) and B1(c) land uses, whereas the preferred option is for a mix of B1(a), B1(c) and B2 land uses.

As with the Halcrow report, the classification representing the industrial estate is considered most relevant. In the 2009 version of TRICS there are 126 industrial estate sites within the database with surveys dating from 1980 to 2008. The sites contain a mix of light industrial and general industrial uses. To generate representative trip rates the same filters were applied to the sites, as were used for the business park sites. In addition, the following sites were discounted:

- CB 02 D03: Industrial Estate, Brampton and WS 02 D 04: Industrial Estate near Pulborough were discounted as neither had any public transport provision;
- DL 02 D 01 and DL 02 D 02, both industrial estates in Dublin were discounted; and

- LC 02 D 04: Industrial Estate, Garstang was discounted due to 32% of land use being B8 Warehousing which is not proposed for the JAAP.

Once the filters had been applied there were 17 sites remaining, comprising 14 edge of town and 3 free-standing sites, some of which are specified as B1 or B2 land uses and others are unspecified. The resulting trip rates are provided in Table 6.2.

Table 5.4 – Industrial (B1(c) and B2) land uses trip rates

Use Class	Number of Sites	AM Peak (0800-0900		PM Peak (1700-1800)		Daily Total	
		Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
All	17	0.595	0.229	0.14	0.514	4.148	4.165
B2	6	0.378	0.138	0.098	0.328	2.473	2.585
B1	4	0.542	0.141	0.083	0.60	3.161	3.322
Unknown	7	1.146	0.505	0.275	0.897	7.868	7.974

Table 5.4 clearly demonstrates that sites within the TRICS database with a stated B1 industrial land use have a much higher vehicle generation than those with a stated B2 land use. The trip rates for sites with an unspecified use class display trip rates are far higher than those with a specified use class. To determine the most realistic trip generation the B1 and B2 trip rates have been used.

5.1.3 Vehicle Generation

Table 5.5 predicts the vehicle generation as a result of all the development proposed for the JAAP area. Tables 5.6 to 5.10 present the predicted vehicle generation associated with each of the development areas.

Table 5.5 – Total Development Vehicle Generation

Land Use	Proposed Area (sq.m)	AM		PM	
		Arrivals	Departures	Arrivals	Departures
B1a	65,520	1,020	162	124	814
B1c	43,680	237	62	36	262
B2	14,800	56	20	15	49
Total	**124,000**	**1,313**	**245**	**175**	**1,124**

Table 5.6 – Saxon Business Park: Area 1a Vehicle Generation

Land Use	Proposed Area (sq.m)	AM		PM	
		Arrivals	Departures	Arrivals	Departures
B1a	12,000	187	30	23	149
B1c	8,000	43	11	7	48
Total	**20,000**	**230**	**41**	**29**	**197**

Table 5.7 – Saxon Business Park: Area 1b Vehicle Generation

Land Use	Proposed Area (sq.m)	AM		PM	
		Arrivals	Departures	Arrivals	Departures
B1a	23,520	366	58	45	292
B1c	15,680	85	22	13	94
B2	9,800	37	14	10	32
Total	**49,000**	**488**	**94**	**67**	**418**

Table 5.8 – Saxon Business Park: Area 2 Vehicle Generation

Land Use	Proposed Area (sq.m)	AM		PM	
		Arrivals	Departures	Arrivals	Departures
B1a	18,000	280	45	34	224
B1c	12,000	65	17	10	72
Total	**30,000**	**345**	**62**	**44**	**296**

Table 5.9 – Aviation Way Business Park: additional vehicle generation

Land Use	Proposed Area (sq.m)	AM		PM	
		Arrivals	Departures	Arrivals	Departures
B1a	7,200	112	18	14	89
B1c	4,800	26	7	4	29
B2	3,000	11	4	3	10
Total	**15,000**	**149**	**29**	**21**	**128**

Table 5.10 – Nestuda Way Business Park: Vehicle Generation

Land Use	Proposed Area (sq.m)	AM		PM	
		Arrivals	Departures	Arrivals	Departures
B1a	4,800	75	12	9	60
B1c	3,200	17	5	3	19
B2	2,000	8	3	2	7
Total	**10,000**	**100**	**19**	**14**	**85**

These are all additional vehicles on the network as the Saxon Way and Nestuda Way Business Parks are new development on previously undeveloped sites. The floorspace provided within Aviation Way Business Park is in addition to the existing provision, therefore vehicles associated with this floorspace are also additional vehicles on the network. The Preferred Options Report states that Area 2 of Saxon Business Park may not be developed until after 2021. Not developing this area before that date would, in the interim, reduce the total floor space to 94,000sq.m and

reduce the AM vehicle generation by 407 vehicles and the PM generation by 340 vehicles. Excluding Area 2, the total vehicle generation is shown in Table 5.11.

Table 5.11 – Total Vehicle Generation, excluding Area 2

Land Use	Proposed Area (sq.m)	AM		PM	
		Arrivals	Departures	Arrivals	Departures
B1a	47,520	740	118	90	590
B1c	31,680	172	45	26	190
B2	14,800	56	20	15	49
Total	**94,000**	968	183	131	829

For the purpose of this assessment it is considered prudent to assume that the full development outlined in the Preferred Options report will be realised. Therefore the full vehicle generation in Table 5.5 has been taken forward for the remainder of the assessment.

5.2 Mode Share

The Department for Transport Guidance on Transport Assessments places emphasis on assessment of all modes, not just vehicles. Therefore, 2001 Census data has been used to determine a likely mode share for employees at the new business parks. Table 5.12 shows the 2001 Census data for journeys to work in Essex as a whole, Rochford and Southend-on-Sea.

Table 5.12 – 2001 Census Mode Share Data – Travel to Work

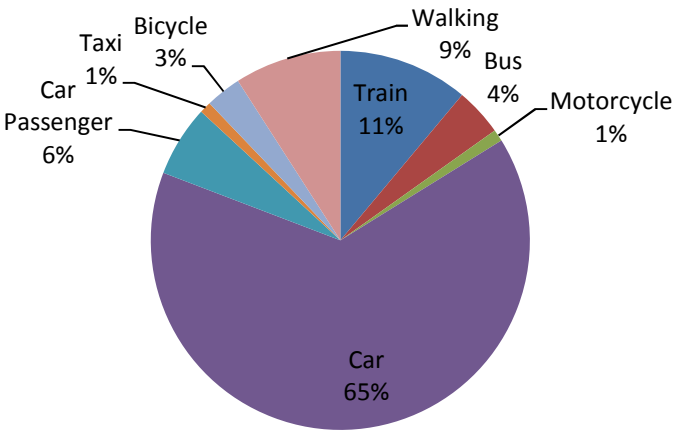
Mode of Transport	Essex	Rochford	Southend-on-Sea
All people	625,189	37,777	70,184
Work mainly at or from home	9%	9%	8%
Underground, metro, light rail, tram	2%	0%	0%
Train	10%	15%	13%
Bus, minibus, coach	3%	4%	6%
Motor cycle, scooter or moped	1%	1%	1%
Driving a car or van	57%	59%	51%
Passenger in a car or van	6%	5%	5%
Taxi or minicab	1%	0%	1%
Bicycle	3%	1%	3%
On foot	8%	5%	11%
Other	0%	0%	0%

Rochford is a rural district with the main urban areas located in the west, close to the boundary with Southend-on-Sea, Rochford, Hockley and Rayleigh all served by the rail line from Southend to London Victoria, making the train a convenient mode of travel. As a result train mode shares are higher than in Essex as a whole and within Southend-on-Sea. However because of the more rural nature of the district, walking and cycling shares are lower, and car shares higher as a result.

Southend-on-Sea is a more urban borough with the main urban areas being Southend itself, Leigh on Sea and Shoebury to the east. Because of the more urban nature of the borough, bus and train mode shares are higher than the Essex data, as are cycling and walking mode shares. The consequence of higher sustainable modes is a lower mode share for car drivers. Train shares are slightly lower than those for Rochford as more people will live and work within Southend making bus and walking modes more convenient.

The business parks are intended to be a regionally important employment area meaning it is likely that people will travel some distance to access employment there. Therefore, the mode share used for this assessment will be the Essex wide mode share, adjusted to remove the 'Underground' and 'Work from Home' mode shares as these are not relevant to the study. Reassigning the Underground and Work from Home mode shares results in the adjusted mode shares as shown in Figure 5.1.

Figure 5.1 – Mode Share



The vehicle trip rates calculated by TRICS include cars, motorcycles and taxis. Therefore the vehicle generation calculated in Section 5.1.3 represents 66% of the total person trips to and from the business parks. Therefore it is possible to calculate the number of trips to and from the site for other modes, as shown in Table 5.13.

Table 5.13 – Multi-modal generation for the proposed business parks

Transport Mode	AM (08:00-09:00)		PM (17:00-18:00)	
	Arrivals	Departures	Arrivals	Departures
Train	224	42	30	192
Bus	78	14	10	66
Vehicles (car, motorcycle, taxi)	1,313	244	175	1,124
Passenger	125	23	17	107
Bicycle	56	10	7	48
Walking	183	34	24	157
Other	9	2	1	8
Total People	1,988	370	265	1,702

6. Airport Trip Generation

There are two different aspects to the expansion of London Southend Airport. The first relates to the expansion of passenger activity to a capped 2 million passengers per annum. The second relates to the expansion of maintenance, repair and overhaul (MRO) industries in areas adjacent to the airport. The JAAP Issues and Options document sets out the following flight scenario for the high growth, which is analogous to what is being taken forward as the preferred option. The forecasts are as follows:

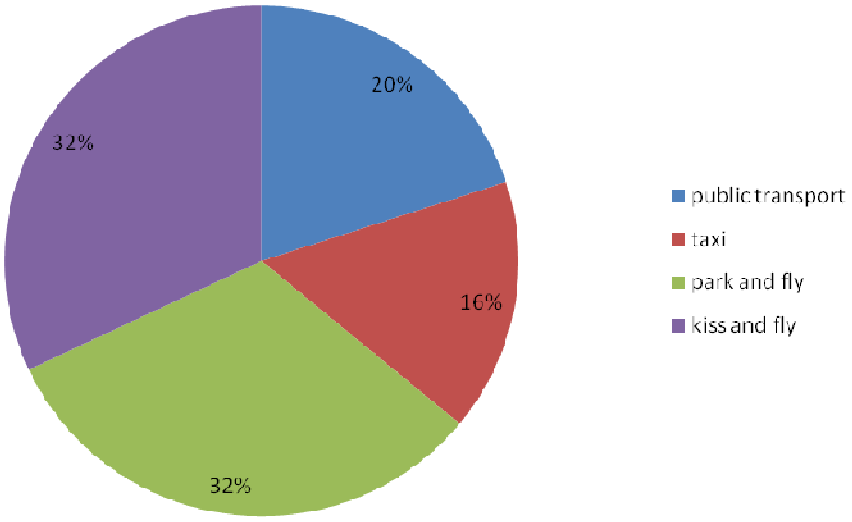
- 2 million passengers per annum;
- Passenger flights restricted to 06:30 to 23:00 Monday to Saturday and 07:00-23:00 on Sunday;
- 1,500 passenger arrivals and 1,500 passenger departures on a daily basis;
- 40 daily passenger flights;
- 5-6 daily business flights;
- 2-3 maintenance, repair and overhaul flights; and
- 3 passenger flights per hour.

Based on these figures a worst case scenario would be three fully laden aircraft arriving and three departing carrying a maximum of 150 passengers per flight. This equates to 900 passenger movements in an hour (450 arrivals and 450 departures).

6.1 Passenger Travel

The Halcrow report makes a comparison between the operation of London Southend, following expansion, and the operation of Southampton Airport. For passengers a mode share as shown in Figure 6.1 has been used.

Figure 6.1 – Predicted Mode Share for Airport Passengers



In the absence of alternative information this is considered suitable to use, and is not an unreasonable mode share for the proposed airport. Considering the investment in a new rail station and therefore the increased ability of passengers to travel by rail from nearby towns, but also from London, a 20% public transport share is acceptable. Assuming 900 passenger movements per hour this results in the following:

- 180 passengers travelling by Public Transport;
- 144 passengers travelling by Taxi;
- 288 passengers travelling by car and parking at the airport; and
- 288 passengers travelling by car and being picked up/dropped off (kiss and fly).

6.1.1 Vehicle Generation

The Halcrow report uses a vehicle occupancy rate of two for cars and taxis. In considering a scenario whereby the highest passenger generation will result from large commercial operator flights, using aircraft up to 150 seats, then this assumption seems valid. Passengers for these flights are most likely to be leisure travellers and therefore likely to travel in groups of two or more. While there may be some single business travellers, there may also be families or larger groups.

Table 6.1 summarises the vehicle generation associated with the airport passengers. Further explanation is provided in the sections following the table.

Table 6.1 – Airport Passenger vehicle generation

Mode	Arrivals	Departures
Taxi	72	72
Cars – parking on site	144	144
Cars – kiss and fly	288	288
Total	**504**	**504**

6.1.1.1 Taxis

The taxi mode share accounts for 16% of passenger movements to and from the airport, or 72 passenger arrivals and 72 passenger departures. The occupancy of each taxi is assumed to be two passengers; therefore 36 taxis will be required to accommodate the predicted passenger movements. However, unless a taxi rank is provided on site, or taxis entering the airport to drop off passengers then collect passengers arriving at the airport, a taxi arriving at the airport to drop off passengers will depart empty and vice versa. This means that actual taxi flows could be double, at 72 arrivals and 72 departures.

6.1.1.2 Cars parking at the airport

This mode share accounts for a predicted 32% of passenger movements, or 288 passenger arrivals and 288 passenger departures. The occupancy of each vehicle is assumed to be two passengers, therefore 144 vehicles will arrive at the airport, and 144 will depart. Since these vehicles are either staying on site, or are already on site, there is no opposing movement.

6.1.1.3 Kiss and Fly

As with car parking, this mode share accounts for a predicted 32% of passenger movements, or 288 passenger arrivals and 288 passenger departures. The occupancy of each vehicle is assumed to be 2 passengers, therefore 144 vehicles will arrive at the airport, and 144 will depart. However, as with the taxis these are pick-up and drop-off trips so vehicles will either depart empty or arrive empty, essentially doubling the number of vehicle movements. A total of 288 arrivals and departures will enter and exit the airport.

The method used to derive these vehicle movements is simplistic, but is considered to provide a reasonable worst case scenario in the absence of more robust data on how the airport would

operate. In reality, there are a number of factors which will reduce the vehicle movements associated with airport passengers during the peak hours. These are:

- Passengers will arrive for a flight at least 30 minutes before departure;
- Passengers will not depart the terminal immediately after landing;
- It is unlikely three commercial flights will depart in any hour;
- Taxis may pick up arriving passengers after dropping off departing passengers.

6.2 Airport Staff

Expansion of the airport will create additional jobs at the airport. These will be in roles such as cabin crew, security, customs officials, hospitality, retail and airport operations staff. The Issues and Options report predicts a rise in airport staff of 1,180 from a current level of approximately 1,000 staff. Following expansion it is predicted there will be a total of 910 air-based staff and 1,200 staff engaged in the maintenance, repair and overhaul activities.

6.2.1 Airport Staff

With the proposed expansion of the airport, the number of air-based staff is predicted to rise to 910. The strategic nature of this assessment means that at present the existing operation of the airport is not known. To provide a robust assessment, the vehicle generation has been predicted based on the 910 staff, without existing staff being accounted for.

The 2008 Halcrow report provides an indication of how the shift patterns for staff are likely to work, based on experience from other airports. Only 70% of staff will be present on an average weekday, with only 25% reporting during the peak periods. Flights are proposed to operate between 06:30 and 23:30, therefore staff will be arriving and departing over a range of time periods.

Using the assumptions from the Halcrow report, of the 910 staff employed by the passenger airport activity, 70%, or 637 staff, will report for work on an average weekday. Of these 637 staff, 25%, or 159 staff, will arrive in the peak hours. It has been assumed, without more detailed information on operation, that the number of staff arrivals will equal departures as a total change of shift occurs. It is considered that this represents an over-estimation of staff movements.

The same 2001 Census 'Journey to Work' data, as used for the assessment of business park vehicle generation (Figure 6.1), has been used as an appropriate mode share for staff arriving at the airport for work. The resulting staff trips, per transport mode, are provided in Table 6.2.

Table 6.2 - Airport Staff arrivals and departures by Transport Mode

Transport Mode	Mode Share	Staff Movements
Train	11%	18
Bus	4%	6
Motorcycle	1%	2
Driving a car or van	64%	102
Passenger in a car or van	6%	10
Taxi	1%	2
Bicycle	3%	5
Walking	9%	14

It has been assumed that the number of arrivals and departures are equal, and that the AM and PM peak hours are also equal. This is considered robust and providing an over-estimation of staff movements within the peak hours. A more detailed assessment to support a planning application would be required.

6.2.2 Maintenance Repair and Overhaul Staff

With the proposed expansion of the MRO activities surrounding the airport, the number of staff will rise to 1,200. The strategic nature of this assessment means that at present it is not known how this will vary from the existing operation of the airport. To provide a robust assessment, the vehicle generation has been predicted based on the 1,200 staff, without existing staff being excluded.

The TRICS 2009 database has been interrogated to determine a vehicle trip rate for the MRO staff. The Preferred Options document does not provide a figure for an increase in floor area, only a final target of 1,200 employees. As a consequence the database has been used to determine a trip rate per employee, rather than per 100sq.m as was done for the business parks. It is considered that the TRICS classification 02/C Industrial Unit (GDO use class B1 or B2) is most appropriate for the MRO sites. The definition of use 02/C is as follows:

> *'02/C – Industrial Unit (GDO use class B1 or B2)*
> *Single industrial building, used by one organisation. May be light or general industry. If predominantly warehousing include as 02/E or 02/F. If predominantly office then include as 02/A. Trip rates are calculated by Gross Floor Area, Employees, or Parking Spaces.'*

This is considered most appropriate because all units will undertake the same operation. The database contains a total of 34 industrial unit sites. The same filters were applied to this assessment as for the business park assessment:

- Only sites surveyed after 2000 have been included; and
- Only sites in locations at the edge of town and free standing (out of town) have been used.

Three sites were excluded from the assessment due to having no public transport provision. A fourth site was excluded because it was located in Ireland. The four sites were as follows:

- EB-02-C-01: Brewery, Edinburgh;
- ER-02-C-02: Dyeworks, Newton Means;
- WY-02-C-01: Animal feeds, near Sherburn-in-Elemet; and
- WA-02-C-01: Foods company, Waterford.

For the remaining 14 sites, the average trip rates **per employee** for the peak hours are provided in Table 6.3.

Table 6.3 – Industrial Unit Trip Rates (per employee)

Use	Number of Sites	AM (08:00-09:00)		PM(17:00-18:00)		Daily Total	
		Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
B1/B2	14	0.163	0.035	0.027	0.172	0.835	0.955

Assuming 1,200 employees on the MRO sites, the trip rates in Table 7.3 will yield vehicle movements as detailed in Table 6.4.

Table 6.4 – Vehicle generation associated with MRO activity

Employees	AM (08:00-09:00)		PM(17:00-18:00)		Daily Total	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
1,200	196	42	32	206	1002	1146

The vehicle generation calculated by TRICS includes cars, motorcycles and taxis, therefore based on the 2001 Census 'Journey to Work' data (Figure 6.1), the vehicle generation calculated in Table 6.4 represents 66% of the total trips to and from the site. Extrapolating from the vehicle trip generation and the Census data it is possible to determine generation for other modes of transport, as shown in Table 6.5.

Table 6.5 – Multi-modal assessment for MRO staff

Transport Mode	AM (08:00-09:00)		PM (17:00-18:00)	
	Arrivals	Departures	Arrivals	Departures
Train	34	7	5	35
Bus	12	2	2	12
Vehicles (car, motorcycle, taxi)	196	42	32	206
Passenger	19	4	3	20
Bicycle	8	2	1	9
Walking	27	6	4	29
Other	1	0	0	1
Total	**297**	**64**	**48**	**312**

As with the air-based staff this assessment uses the projected staff figures, without accounting for the staff which are already employed on the site.

7. Impact Assessment

7.1 Local Highway Network

The proposed employment and airport expansion will generate a significant number of additional vehicles on the local road network.

7.1.1 Business Park Trip Distribution

Southend-on-Sea and Rochford are located on a peninsula between the Thames Estuary and the River Crouch. To the north and east of the study area the land use is predominantly rural with small isolated settlements. Ashingdon, Hockley and Rochford are the only settlements of significant size. Given that there is limited settlement it is anticipated that few trips to/from the proposed development will originate from the north.

To the south of the site is an urban area which comprises Southend-on-Sea and Shoeburyness, with Leigh-on-Sea to the south west. The major routes from Southend towards the north are the A127 and the A1158, with a more minor route via Priory Crescent. From both routes vehicles would eventually approach the site northbound on B1013 Nestuda Way/Cherry Orchard Way.

The majority of settlements are to the west of Southend, with the A127 being the only major route into the study area from the west. People travelling to the business parks from other towns, such as Basildon, Brentwood or Chelmsford or via the M25 would arrive from this direction.

Based on this pattern of settlement and the main road network it is anticipated that the majority of vehicles will approach the site via the westbound A127, and then travel north on B1013 Nestuda Way and Cherry Orchard Way.

7.1.2 Airport Trip Distribution

A reasonable proportion of the airport's staff and passengers will travel to the airport from Southend-on-Sea. It is likely that these vehicles would approach via Rochford Road or Manners Way. A small proportion may travel south from Rochford, Ashingdon or Hockley.

It is likely that passengers in particular may travel from further afield to access the airport. These are likely to arrive in Southend-on-Sea via the westbound A127 and follow signs for the airport, which at present would lead them up A1159 Manners Way. With the diversion of Eastwoodbury Lane this may become a more appropriate route.

7.1.3 Impact Assessment

Based on the trip generation exercise in Section 5 and 6 the total vehicle generation would be as shown in Table 7.1. It should be noted that vehicle generations for airport passengers and staff are based on general assumptions.

Table 7.1 – Total Vehicle generation

Development	AM		PM	
	Arrivals	Departures	Arrivals	Departures
Business Parks	1,313	245	175	1,124
Airport Passengers	504	504	504	504
Airport Staff	114	114	114	114
MRO Staff	196	42	32	206

Development	AM		PM	
	Arrivals	Departures	Arrivals	Departures
Total	**2,127**	**905**	**825**	**1,948**

Based on the pattern of local settlement and the local road network it is anticipated that the majority of vehicles accessing the business parks will approach from the westbound A127 then travel north on B1013 Nestuda Way and Cherry Orchard Way. Based on Table 7.1 this could equate to additional flows in the region of 1,000 vehicles in the AM and PM peak hours. During the site visit it was noted that there were already capacity issues at the B1013 Nestuda Way/Eastwoodbury Lane/B1013 Cherry Orchard Way double roundabouts, as shown by Figure 7.1.

Figure 7.1 – Congestion in the evening peak at Nestuda Way/Eastwoodbury Lane junction

Any congestion points along the A127, B1013 Nestuda Way and B1013 Cherry Orchard Way will be exacerbated by the proposed development as it is significant in size and will generate a significant number of vehicles.

For the airport and MRO based traffic, vehicle movements on A127 Prince Avenue, A1159 Manners Way and Rochford Road are expected to increase, with the majority of vehicles approaching on A1159 Manners Way. During the site visit congestion was observed on the A127 on the approaches to both the Rochford Road junction and the A127 Prince Avenue/Manners Way/Victoria Avenue/Priory Crescent roundabout. Additional vehicle movements are anticipated to be in the region of 500 vehicles in both the AM and PM peak hours, which will have an impact on these junctions.

7.1.4 Junction Capacity Assessments

The 2008 Transport Assessment prepared by Halcrow contained capacity assessments for the following junctions:

- Proposed access junctions;
- B1013 Nestuda Way/Eastwoodbury Lane roundabout;
- A127 Prince Avenue/B1013 Nestuda Way/Thanet Grange roundabout;

- A127 Prince Avenue/Rochford Road/Hobleythick Lane signalised junction;
- A127 Prince Avenue/A1159 Manners Way/A1159 Priory Crescent/A157 Victoria Avenue; and
- A1159 Manners Way/Rochford Road/Eastwoodbury Crescent roundabout.

The junction assessment considers the impact of the four development scenarios as were put forward by the Issues and Options paper. Assessments were undertaken for the AM peak period only, for the year 2021 with base flows taken from a SATURN model.

Since preparation of the 2008 assessment, and with publication of the preferred option the proposed development has changed, with an increase in floor area for the business parks. Additionally refinement of the trip rates has been done, with greater consideration of the location of the sites relative to Southend, plus a newer version of the software. Both these factors mean that the vehicle generation identified in the previous assessment have been superseded.

7.2 Pedestrian network

2001 Census data indicates that approximately 9% of people will commute to work on foot. It is not anticipated that passengers will travel to the airport on foot, unless they live very close to the airport. Pedestrian generation figures are provided in Table 7.2. It should be noted that vehicle generations for airport staff are based on general assumptions.

Table 7.2 – Total Pedestrian generation

Development	AM		PM	
	Arrivals	Departures	Arrivals	Departures
Business Parks	183	34	24	157
Airport Passengers	-	-	-	-
Airport Staff	14	14	14	14
MRO Staff	27	6	4	29
Total	**224**	**54**	**42**	**200**

There is a reasonable pedestrian network around the site, with good footways. Crossing points in some locations are poorer than other locations. Given the number of additional pedestrians it is not anticipated that there will be any detrimental impact. There are residential areas in all directions from the site therefore pedestrians are likely to be reasonably dispersed.

7.3 Cycle Network

Cycle use is expected to be limited, with just a 2% mode share. It is not anticipated that airport passengers will use cycles to access the airport. Cycle generation figures are provided in Table 7.3. It should be noted that vehicle generations for airport passengers and staff are based on general assumptions.

Table 7.3 – Total Cycle generation

Development	AM		PM	
	Arrivals	Departures	Arrivals	Departures
Business Parks	56	10	7	48
Airport Passengers	-	-	-	-

Development	AM		PM	
	Arrivals	Departures	Arrivals	Departures
Airport Staff	5	5	5	5
MRO Staff	8	2	1	9
Total	**69**	**17**	**13**	**62**

The provision of dedicated cycle facilities around the study area is reasonably limited, especially crossings points on busy roads. The figures in Table 8.3 are likely to be a considerable increase over existing levels of cycling in the area, but are not expected to have a detrimental effect. As with pedestrians there are residential areas on all sides of the study area, therefore cyclists are likely to be reasonably dispersed onto the network.

7.4 Public Transport Network

Rail and bus passengers are expected to account for 11% and 4% of the total person generation. Bus and train generation figures are provided in Tables 7.4 and 7.5. It should be noted that vehicle generations for airport passengers and staff are based on general assumptions. In addition it has been assumed that for airport passengers, train travel is the most realistic public transport mode, especially with the provision of a railway station on the site.

Table 7.4 – Total Train generation

Development	AM		PM	
	Arrivals	Departures	Arrivals	Departures
Business Parks	224	42	30	192
Airport Passengers	180	180	180	180
Airport Staff	18	18	18	18
MRO Staff	34	7	5	35
Total	**456**	**247**	**233**	**425**

Table 7.5 – Total bus generation

Development	AM		PM	
	Arrivals	Departures	Arrivals	Departures
Business Parks	78	14	10	66
Airport Passengers	-	-	-	-
Airport Staff	6	6	6	6
MRO Staff	12	2	2	12
Total	**96**	**22**	**18**	**84**

After vehicles, the train mode share is the greatest and therefore train patronage is expected to be high. For access to the business parks by train people would alight at Rochford then either walk or use a shuttle bus to access the site. At the airport there will be a dedicated station. Based on the

generation figures in Table 7.4 it is considered that there could be potential issues with crowding on services during the peak hours, if capacity isn't increased.

A single deck bus can accommodate 72 people, including those standing. To accommodate peak period bus demand would require two buses. It is considered likely that bus services which operate past the airport would be able to accommodate the additional demand without a detrimental impact. However, for passengers travelling to/from the business parks there is only a limited service and demand figures indicate that without additional capacity there may be a detrimental impact on quality of service.

8. Mitigation Strategy

The previous chapter has identified the potential for adverse impacts arising from additional vehicles, train passengers and bus passengers accessing the business parks and airport. National, regional and local planning policy seeks to encourage a shift away from vehicles to sustainable modes. This chapter sets out a series of measures to offset the impact of the development, as well as some which can be implemented to encourage sustainable travel.

8.1 Trains

8.1.1 Employment Expansion

The proposed employment areas are predicted to generate 224 person arrivals and 42 person departures in the AM peak hour, with 30 person arrivals and 192 person departures in the PM peak hour.

The closest railway station to the proposed employment area is Rochford, which is located between Hall Road and West Street to the north east of the site. Public transport access from Rochford station to the employment area is currently poor. The nearest bus stop to the station is on West Street, but there is no direct bus from here to the employment area. The distance between the station and the proposed employment site is approximately 1.5km.

8.1.2 Expansion of Airport

The expansion of the airport and the associated MRO facilities is expected to generate 232 person arrivals and 205 person departures in the AM peak hour, with 203 person arrivals and 233 person departures in the PM peak hour.

London Southend Airport is situated between Rochford station to the north and Prittlewell station to the south. A new railway station will open at the airport in the future, which will serve the airport passengers and staff.

8.1.3 Proposed measures

The proposed airport railway station will encourage people to use trains to access the airport and is a mitigation measure in itself. Travelling to the business parks by train is likely to be less attractive due to the distance between the site and the railway station. The lack of existing connection between the station and the business park site must be addressed to maximise train use.

It is anticipated that without increases in train capacity there could potentially be an issue with overcrowding on peak hour services. In addition, if measures are not put in place to encourage train travel and make it a viable alternative, then car trips will increase as a result.

The following measures are proposed to mitigate the impact of additional passengers and to encourage train use:

- Shuttle bus between the railway stations and the proposed employment areas, potentially a free service or subsidised by the businesses on site;
- Increased secure, sheltered cycle parking to encourage cycling from the railway station to the proposed employment area (see section 8.4.3 for measures to improve cycling facilities);
- Improved facilities at Rochford Station to include parking space for shuttle bus to/from the proposed employment areas; and

- Businesses and the airport operators to offer season ticket loans for staff so they can take advantage of travel savings, as part of a wider travel planning initiative.

8.2 Buses

8.2.1 Employment Expansion

The proposed employment areas are predicted to generate 78 person arrivals and 14 person departures by bus in the AM peak hour. In the PM peak hour the person generation would be 10 arrivals and 66 departures.

There is only one bus service (number 18) which operates along Cherry Orchard Way, with the closest bus stops being temporary stops at the car retail park. This service is very poor with only four services on a Friday. Bus services within the vicinity of the site are infrequent, with only bus service number 9 having a frequency of more than one bus per 30 minutes. However, with the diversion of Eastwoodbury Lane to accommodate the increased runway length, this service will no longer operate close to the business park site.

8.2.2 Expansion of Airport

The expansion of the airport and the MRO facilities is predicted to generate 18 person arrivals and 8 person departures in the AM peak hour, with 8 person arrivals and 18 person departures in the PM peak hour.

Bus service number 9 stops outside the airport entrance on Eastwoodbury Crescent and runs every 12 minutes. The route covers some of the main residential areas in Southend, including Shoeburyness, Thorpe Bay, Southend-on-sea, Eastwood and Rayleigh. Services 7 and 8 run close to the site as well along Rochford Road and Southend Road. Facilities close to the site are generally poor quality, especially those on Southend Road where most of the bus stops are indicated with just a post and not all of the bus stops have timetables. The additional passengers generated by the airport and MRO activity is unlikely to impact significantly on the existing bus services and mitigation is not considered necessary. Improvements to the service however, could encourage greater bus use.

8.2.3 Proposed measures

Measures should be implemented to improve bus services to the proposed business park site, as existing provision is poor. Without intervention buses are unlikely to be a realistic way to travel to the site. The airport is already well served by bus routes; however improvement to the services and facilities could encourage greater use.

The following measures are proposed to mitigate the impact of additional passengers and to encourage bus use:

- The South Essex Rapid Transit (SERT) has already been proposed within the Joint Area Action Plan. The route of SERT services could be amended to serve and integrate with the airport and business park;
- A public transport hub within the employment area providing a focal point for bus services and timetable information;
- Introduction of new bus routes from major catchment areas ideally into the employment area;
- Increased frequency of buses and expansion of services into evenings and weekends;
- Improved facilities at bus stops;
- Ticket discounts for major employers within the business park and airport operators;

- Real time bus information within the main employment buildings and the airport terminal; and
- Park and Ride facility on the west side of Nestuda Way.

It is suggested that a transport hub on the site of the proposed employment site that will provide a central turn-around area for buses should be provided. This will allow public buses to be diverted onto site and to accommodate the shuttle bus. It is suggested that real time information for buses and trains should be displayed here as well as notice boards showing walking and cycle routes to the site.

Bus priority measures could be implemented on Cherry Orchard Way and Nestuda Way to improve bus journey times and encourage use. This should be investigated at a design and application stage.

8.3 Walking

8.3.1 Employment Expansion

The proposed employment area is predicted to generate 183 person arrivals and 34 person departures on foot in the AM peak hour. In the PM peak hour the number of person trips on foot is predicted to be 24 arrivals and 157 departures.

Walking is not expected to be a significant trip generator to the employment area given the regional nature of the employment area, but it is important to facilitate walking for the workforce who live within a reasonable walk distance (approx 2 kms). The main walking routes to the employment area will be from Rochford train station along Hall Road and B1013 Cherry Orchard Way and also from the nearby residential areas to the south and west. The quality of footpaths and bridleways leading to the site are varied and crossing points on Hall Road and Cherry Orchard Way are indicated by just dropped kerbs. There is a pedestrian subway linking to footpaths from residential areas to the west.

8.3.2 Expansion of Airport

It is considered likely that walking trips to and from the airport will be related to airport staff and MRO staff rather than passengers. It is predicted that there will be 41 person arrivals and 20 person departures on foot in the AM peak hour, with 18 person arrivals and 43 person departures in the PM peak hour.

Passengers travelling to the airport are unlikely to walk, but for staff who work at the airport and live close by walking may be more feasible. The main walking routes to the airport will be from the train station or nearby residential areas. Most people will chose to walk from Rochford train station as it is a shorter distance. The footways on Eastwoodbury Lane and Southend Road are poor. Eastwoodbury Lane would be diverted to accommodate the increased runway, therefore increasing walking routes from some areas, but allowing scope to improve footway provision.

8.3.3 Mitigation measures

General improvements should be made to footways in the area, in accordance with the Essex Walking Strategy. This would include:

- Making sure routes are maintained to a high standard;
- Develop a network of routes that are in line with the 5 C's (Convenient, Convivial, Comfortable, Conspicuous and Connected);
- Providing as far as possible a safe and pleasant environment for those on foot, including adequate street lighting and sense of security;
- Signing of key pedestrian routes and maps at information points,

- A minimum footway width of 1.8m in the vicinity of the site;
- Controls on footway parking; and
- To provide for people with sensory and mobility impairment.

The following sections detail more specific improvements that could be to be made to encourage walking to the two sites.

8.3.3.1 Employment Areas

- Upgrade Bridleways 47 and 48 along Cherry Orchard Way and Cherry Orchard Lane so that they become attractive routes to the employment site with suitable crossing facilities provided across Cherry Orchard Way;
- Improve the pedestrian subway underneath Cherry Orchard Way to make it more attractive to use;
- Improve all key corridors to the site identified by Figure 8.1
- Upgrade of current crossing points:
  - On Hall Road opposite Rochford train station;
  - On Hall Road where Roach Valley Way crossed from one side of the road to the other;
  - On Cherry Orchard Way at the roundabouts with Nestuda Way and Eastwoodbury Lane to follow desire lines to the employment entrance;
  - On Nestuda Way at the Tesco roundabout.

Figure 8.1 illustrates these potential improvements. The Proposals Map for the JAAP shows a pedestrian/cycle route across the open fields from Hall Road into the business park from the north. To encourage use of this link it should be street lit, be well maintained and monitored to ensure it is safe to use, especially in the winter.

8.3.3.2 Expansion of Airport

- Improve all key corridors to the site identified by Figure 8.2;
- Provide a pedestrian route from Southend Road, via the new station to the terminal building;
- Improve pedestrian crossing facilities at the A127 Prince Avenue/A157 Victoria Avenue/Priory Crescent roundabout;
- Improve pedestrian crossing facilities at the Manners Way/Eastwoodbury Crescent/Rochford Road roundabout.

Figure 8.2 illustrates these potential improvements.

8.4 Cycling

Southend has recently become a cycling demonstration town, receiving funding from Cycle for England. The programme has three main aims:

- Promoting cycling to schools and work places
- Improving the cycling infrastructure of the town
- Getting the wider community involved in cycling through training and education

From 2008 to 2011 the programme aims to double the levels of cycling to work, which currently stands at 3%. *(Cycling City and Towns Programme Overview, May 2009, Cycling England).*

8.4.1 Employment Expansion

Cycling is predicted to account for just 2% of journeys from the business park, based on 2001 Census data. This equates to 56 cycle arrivals and 10 cycle departures in the AM peak hour, with 7 cycle arrivals and 48 cycle departures in the PM peak hour.

There are no on road cycle routes leading to the site, but there are shared use cycle routes on B1013/Nestuda Way, B1013/Eastwoodbury Lane, Hall Road and part of Cherry Orchard Way. Crossings for cyclists are limited and the only formal cycle crossings within the vicinity of the site are on Prince Avenue adjacent to Tesco, and on Hall Road opposite Rochford Station.

8.4.2 Expansion of Airport

It is considered unlikely that airport passengers would travel to the airport by cycle, therefore cycle journeys to the airport will relate to staff. In the AM peak hour this equates to 13 cycle arrivals and 7 cycle departures, whilst in the PM peak hour 6 cycle arrivals and 14 cycle departures.

South of the airport, from the centre of Southend-on-Sea there is an off road cycle lane on Victoria Avenue, however this does not continue north along Manners Way or Southend Road. Cycle facilities adjacent to the airport are limited.

8.4.3 Mitigation measures

The additional cycles generated by the proposed development are unlikely to have a detrimental impact and require mitigation. However, improvements to the local cycle network, as detailed below, could encourage more employees to cycle rather than use a car.

- Develop a network of routes that are in line with the 5 C's (Convenient, Convivial, Comfortable, Conspicuous and Connected);
- Improve all key corridors to the site for cyclists identified by Figures 8.1 and 8.2, potentially introducing on street cycle lanes or more shared use paths;
- New/improved cycling crossing at access points and at junctions;
- Clear cycle route signage and marking; and
- Secure/safe cycle parking on site.

8.5 Highway Network

Vehicles will account for the majority of total person trips to and from the proposed business parks and the airport. Given the size of the proposed development the vehicle numbers are substantial.

8.5.1 Employment Expansion

The proposed business parks are predicted to generate 1,313 vehicle arrivals and 245 vehicle departures in the AM peak hour, with 175 vehicle arrivals and 1,124 vehicle departures in the PM peak period.

The majority of these vehicles will approach the site from the south. It was noted during the site visit that there are already congestion issues at some of the junctions on the A127 and the B1013. Additional vehicles on these routes will increase congestion if appropriate mitigation is not implemented.

8.5.2 Expansion of Airport

The airport and expanded MRO operations are expected to generate 814 vehicle arrivals and 660 vehicle departures in the AM peak period. In the PM peak period it is expected to be 650 vehicle arrivals and 824 vehicle departures.

Access to the airport will be from the Manners Way/Eastwoodbury Crescent/Rochford Road roundabout. The majority of vehicles will approach from the south via Manners Way, Eastwoodbury Crescent and Rochford Road. Airport staff and taxi drivers will be aware of local routes whereas people travelling from further afield may follow the sign posted routes.

8.5.3 Mitigation measures

Measures to mitigate the impact of the additional vehicles will be a mixture of engineering measures to increase capacity, as well as the measures listed in previous sections to encourage sustainable modes. Appropriate land use planning within the business park could help to reduce car journeys, for example providing places where staff can buy lunch so they do not have to travel off site at lunchtime.

The JAAP documents list a number of highway improvement schemes which would need to be implemented to accommodate the proposed developments:

- Dualling the remainder of Cherry Orchard Way from the car retailers roundabout to Hall Road;
- Two new access points via roundabouts to Aviation Way direct from Cherry Orchard Way linking to internal road network through new business park;
- Junction improvements at the roundabout of Nestuda Way/Cherry Orchard Way/White House Road;
- Upgrading of the existing mini-roundabout at the junction of Aviation Way and Eastwoodbury Road;
- The extension of the runway would require the diversion of Eastwoodbury Lane to the south of the safety zone, linking to Nestuda Way to the north of the RBS office development;
- Park and Ride facility to the west of Nestuda Way following construction of diverted Eastwoodbury Lane; and
- Improvements to Southend Road to reduce northbound congestion in the PM peak hour.

As well as providing infrastructure improvements, influencing the travel habits of staff and passengers to and from the airport, and staff at the employment area will be an important to support the improvements listed above. A Framework Travel Plan should be produced to minimise less sustainable travel habits and car use to the sites. It is suggested that this will be supported by an Information Strategy which should detail the travel choices available to the sites and a marketing strategy to support the delivery of the Framework Travel Plan.

8.6 Framework Travel Plan

A Framework Travel Plan is likely be required at the planning application stage for the business park and airport development. This will need to include measures to reduce car travel with specific targets to be achieved. The Framework Travel Plan should cover the business park as a whole. Subsequent to any planning permission and development, individual companies will need to develop their own detailed travel plans for their employees.

Figure 8.1 - Potential Walking and Cycling Measures for the Proposed Business Parks

Figure 8.2 – Potential Walking and Cycling Measures for the proposed Airport Expansion

9. Summary and Conclusions

This document has been prepared to support the Joint Area Action Plan (JAAP) for London Southend Airport and Environs. It follows on from, and builds on, a previous report prepared in 2008 by Halcrow. The preferred option, set out in the *London Southend Airport and Environs Joint Area Action Plan Preferred Options Report* is as follows:

- 124,000 sq.m of business park development (B1 and B2 land uses);
- Expansion of London Southend Airport to accommodate 2 million passengers per annum; and
- Expansion of the airports maintenance, operation and repair facilities.

National, regional and local planning policy supports the expansion of the airport, and the provision of additional employment would be beneficial to the area. Given the size of the development, it is expected to be of regional significance attracting staff and passengers from a wide area.

A trip generation exercise has been undertaken for the proposed developments, with the resulting vehicle generation summarised in Table 9.1 below.

Table 9.1 – Total vehicle generation.

Development	AM		PM	
	Arrivals	Departures	Arrivals	Departures
Business Parks	1,313	245	175	1,124
Airport Passengers	504	504	504	504
Airport Staff	114	114	114	114
MRO Staff	196	42	32	206
Total	**2,127**	**905**	**825**	**1,948**

Based on 2001 Census data, it was determined that vehicle generation would account for 66% of the total person trips to and from the site. 11% of trips would be made by train, 4% by bus, 9% by bicycle and 3% on foot. A review of the surrounding area shows that most settlements are to the west of the study area, accessed via the A127. Based on this it has been concluded that the vast majority of vehicles will approach via the A127, using the B1013 Nestuda Way to access the business parks. Access to the airport would be via Eastwoodbury Lane, Rochford Road or A1159 Manners Way, which is the existing signposted route.

Traffic modelling has not been undertaken for this study, however given the vehicle generation figures in Table 9.1, and the likely distribution of vehicles, it can be considered likely that without mitigation, there will be adverse impacts on the road network. A site visit observed congestion in some locations during the AM and PM peak hours. In addition, there would be a substantial increase in train passengers which may require mitigation.

Chapter 8 sets out measures which could be employed to reduce the impact of the proposed development. These include improvements to bus services, including SERT, highway improvement works and cycle and pedestrian improvements. Encouraging the use of sustainable modes, and ensuring these are realistic alternatives to car travel, will be vital in reducing the impact of the proposed developments. More detailed assessment of these measures will be required at a later stage. A full Transport Assessment will be required to support any planning application for the business park.

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