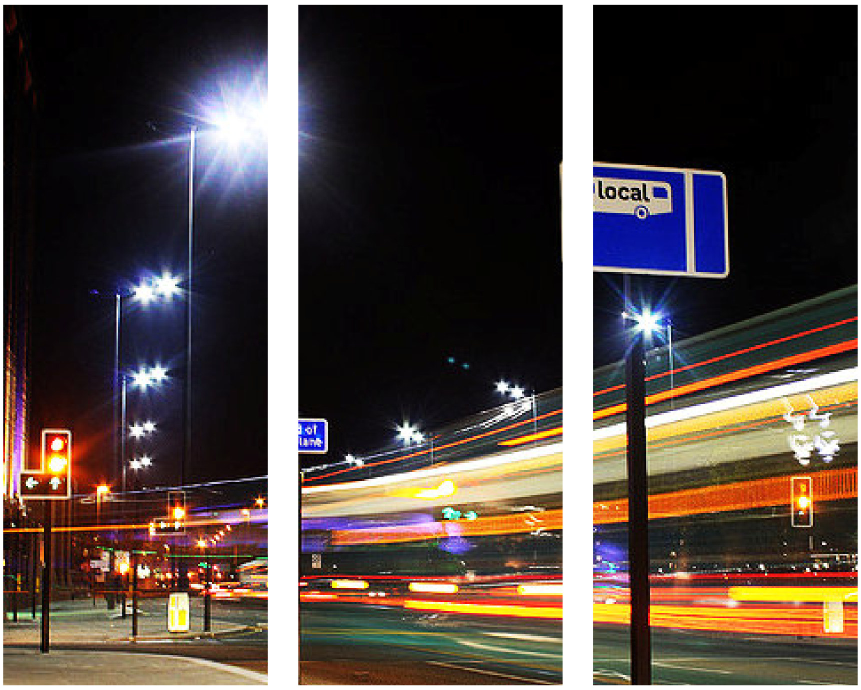

LTP3 Modelling and Forecasting

Final Strategy Forecasting Report

May 2011

LTP Support Unit

LOCAL TRANSPORT PLAN
MERSEYSIDE

Mott MacDonald

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1. Introduction

1.1 Background

The Merseyside Local Transport Plan Support Unit (LTPSU) in conjunction with the Merseyside local authorities have developed through a comprehensive process the Final Strategy for the Local Transport Plan (LTP3). The Final Strategy adopted by the authorities for the LTP3 has been developed against national goals and local priorities which include:

National Goals

- Support economic growth
- Reduce carbon emissions
- Promote equality of opportunity
- Contribute to better safety, security and health
- Improve quality of life and a healthy natural environment

Regional and Local Priorities

- Ensure the transport system supports the priorities of the Liverpool City Region (LCR), the proposed Local Enterprise Partnership and the Local Strategic Partnerships.
- Provide and promote a clean and low carbon transport system.
- Ensure the transport system promotes and enables improved health and wellbeing.
- Ensure the transport system supports equality of travel opportunity by ensuring people can connect easily with employment, services and social activities.
- Ensure the transport network supports the economic success of the LCR by the efficient movement of people and goods.
- Maintain assets to a high standard

To assess the transport policy measures for LTP3, the LTPSU commissioned Mott MacDonald to lead on development of a multi-modal transport model in conjunction with SDG Consultants.

It is understood that this model, named the Liverpool City Region Transport Model (LCRTM), could be the primary assessment tool for testing various transport intervention measures developed by the Merseyside local authorities over the next few years.

This report provides information on the LCRTM structure and also results of the work undertaken in modelling the LTP3 Final Strategy measures for a local and an alternative growth scenarios.

Appendix A provides further details (supplied by the LTPSU) of how outputs from LCRTM have been used to inform emissions forecasts in the Merseyside Atmospheric Emissions Inventory.

1.2 Structure of the Report

This report consists of the following sections:

- Section 2 describes the structure of the LCRTM modelling system
- Section 3 provides details of work undertaken to develop the forecast Final Strategy models
- Section 4 contains the results of the Final Strategy forecast models
- Section 5 includes the summary and conclusions of the report
- Appendix A contains forecasts of atmospheric emissions from the Merseyside Atmospheric Emissions Inventory (MAEI) using results from the LCRTM as an input.

2. Transport Model Structure

The Liverpool City Region Transport Model (LCRTM) is a multi-modal transport model comprising the following three modules:

- a link based highway model
- a public transport model
- a demand model.

The highway and public transport models are concerned with the routing of vehicles and passengers throughout the transport system, whilst the demand model deals with the traveller choices of trip generation, mode choice, macro-time period choice and distribution.

The model system operates within the CUBE environment, using VOYAGER applications and scripting. It has capability of testing both directly and indirectly a wide-range of policy interventions in the Liverpool City Region model area and is responsive both to network and land use changes. The LCRTM follows the Department for Transport (DfT) guidance WebTAG in respect of its components and structure.

In this section the key features of the LCRTM modelling system are outlined. More detailed information about the model structure can be found in the *"Liverpool City Regional Transport Model: Development of the Transport Model, April 2011".*

2.1 Highway Model

The highway model was developed through a process which is summarised under the following sub headings.

2.1.1 Data Sources

Highway Networks

The model area highway networks were initially developed in terms of connectivity and link lengths using a Geographical Information System (GIS) software package (MapInfo) which is particularly suitable for strategic models due to the large size of such networks.

The Mersey Gateway Model developed by Mott MacDonald which covers Halton and some parts of Merseyside was then used to provide information on number of lanes, speed limits and road names for the common area. Street view mapping was used to expand this network.

Trip Matrices

Over five hundred counts from various sources including local authorities, Highways Agency and Merseyside Information Service were reviewed for the development of the highway model. In addition, Road Side Interview (RSI) data from 9 other studies including Merseytram, South Liverpool Study and Mersey Gateway which had been undertaken between the years 2000 and 2008 were also obtained with reference to the model area.

Following a review of existing data, new traffic surveys were commissioned between May and November 2008 to infill identified missing locations for the formation of cordons and screen lines. The survey commission consisted of:

- 11 Road Side Interview (RSI) surveys
- 11 Automatic Traffic Count (ATC) surveys
- 60 Manual Classified Count (MCC) surveys

Journey Time Data

For the validation of modelled journey times in LCRTM, several routes were selected. The observed journey times were obtained from the CJAMS (Congestion and Journey-time Acquisition and Monitoring System) database, which is based on ITIS data. This is a collection of data transmitted at frequent intervals (every few seconds) by vehicles which have devices fitted (usually commercial vehicles).

2.1.2 Highway Network Development

The LCRTM highway network is link based and the representation of delay to highway vehicles is undertaken by the use of speed flow curves. There is no explicit junction modelling in the current version of LCRTM.

Link and Junction Characteristics

Link characteristics were coded according to road type, area characteristics and certain parameters that vary by road and area type (e.g. number of lanes, amount of development on route, number of intersections).

Speed Flow Curves

Speed flow curves for light and heavy vehicles were developed separately based on those used in the DfT's COBA (Cost Benefit Analysis) programme and defined in DMRB Volume 13. A total of 23 different speed flow curves were derived to account for the different road types.

Zone Connectors

Each zone within the model was given a zone centroid, which corresponds to the centre of gravity in the zone. Zone centroids were connected to an appropriate loading point on the network, chosen to ensure a realistic routing onto the major roads in the network.

2.1.3 Demand Matrix Build

The demand matrix build was a technically complicated process merging observed and synthetic trip matrices to form the study area matrices. The various processes involved for building the demand matrices are outlined below.

Zoning System

There are 459 zones in the LCRTM, of which 401 are within the defined study area whilst the rest represent the external areas. The zoning system has been developed based on Census Output Areas (COAs). Care was taken to limit the number of zones so that computer run times were kept within manageable limits.

Cordons and Sectors

For the matrix building process a system of 34 sectors was adopted. Within the study area these sectors were defined by the Roadside Interview Cordons. For each of these RSI cordons it was possible to build observed matrices for trips into and out of the cordon.

The observed matrices constructed from the RSI data set made use of the observed RSI data, transposed RSI data and synthetic RSI data. In total, 235 RSI sites were used in the matrix build. Of these 122 were fully observed RSI sites. The others consisted of inputs taken from synthetic matrices. Transposing of RSI sites was carried out to estimate the non-interview direction data.

ERICA Database (RSI Data)

Observed matrices were assembled using the DfT recommended ERICA software. It allows for the building of large matrices with multiple observed RSI cordons and contains a technique for the identification and removal of 'wiggly' trips, i.e. those that make several crossings of the same cordon boundary. Gaps in the RSI cordons were filled by substituting missing RSI data using the synthetic matrices. In order to combine the two matrices output by ERICA, and to effectively merge the RSI matrices with the synthetic matrices for non-observed trips, the approach set out in DMRB using variances was adopted.

The next step was the merging of the two matrices to produce the 'complete' RSI observed matrix. The LCRTM matrices were built by vehicle types, time period and overall purpose. The 12 overall model purposes built by ERICA incorporated Home-based and Non-home based trips and direction.

Synthetic Matrix

Synthetic matrices were required for the full extent of the study area and buffer area, and the full demand segmentation. The synthetic matrix build was focused on Home Based (HB) trip production / attraction and then trip distribution, all of which was undertaken separately by mode. The HB production analysis was based on the product of households and trip rates.

The trip attractions were controlled by the totals implied by the trip productions and use a variety of data sources to indicate the attraction of zones for different journey purposes. For HB attractions the Journey to Work (J2W) data was used directly for Commute and Employer's Business distributions whilst performance tables and university places for education, retail employment Annual Business Inquiry (ABI) data for Shopping, and Other was based on total populations.

The productions and attractions, along with inter-zonal and intra-zonal travel costs, were then fed into a distribution process, the output of which was a twenty four hour Production-Attraction (PA) matrix. This was then converted to an Origin / Destination (OD) time period format. The time periods used at this stage represent 3 hour morning and evening periods, a 6 hour interpeak period and a 12 hour overnight period.

The process then produced estimates of Non Home Based (NHB) movements from the product of the destination totals of HB trips and NHB trip rates, derived from travel diary analysis.

Trip Distribution

The car trip distribution was applied at the twenty four hour PA level. A separate distribution was calibrated for HB Education, Shopping and Other, and the NHB purposes of Employer's Business (EB) and Other.

The distribution model calibration process used all trips defined in the Household Information Survey (HIS) by origin, destination and purpose for Home Based Education, Shopping, Other, and Non Home Based Other, but used all RSI data for Non Home Based Employer's Business as there was insufficient records in the HIS. Home Based Commute and Employer's Business were distributed directly from J2W data, for Car, Scheduled Bus and rail separately.

Matrix Format Conversion

The twenty four hour PA format matrices were then converted to the one hour modelled time periods. This was achieved by using the Land Use Segmentation time period and direction based trip rates derived from the HIS. These modelled time periods included 07:00 - 09:59 for AM peak, 09:59 - 15:59 for Inter peak, 16:00 - 18:59 for PM peak and off-peak between 19:00 - 23:59 and 00:00 - 06:59 hours. The output From Home and To Home matrices by time period was then combined to represent all OD movements.

Merge of ERICA and Synthetic Matrix

The matrix merge combined observed matrices with the synthetic matrices. The merge process used sector systems, which represented aggregates of zones, to combine the observed demand. The sector to zone correspondence had a one to one match within the Buffer Area and Externals. The aggregated sector observed Origin / Destinations (ODs) demand was then disaggregated back to the full zoning system ODs using the synthetic demand. Trips that were wholly missing from the sector ODs were added separately. The RSI observed and synthetic sites were combined within the ERICA program.

Goods Vehicle Matrices

Light Goods vehicles (LGV) and Other Goods vehicles (OGV) origin-destination matrices were required for each of the model time periods in the highway assignment model. The process required the production of synthetic LGV and OGV matrices that could be combined with observed data, using the same principles developed for the car matrix. This involved creating full synthetic matrices and then building 'synthetic RSI' sites to create complete cordons. As with the car matrix, the ERICA programme was used to combine the observed and synthetic RSI level using an appropriate weighting.

2.1.4 Calibration and Validation

The merge and smoothing of the observed and synthetic trip data provided prior matrices for assignment in the link-based highway model. The LCRTM highway assignment consists of five user classes comprising of Car commute, Car other, Car employer's business, LGV and OGV.

Network Calibration

A series of checks were undertaken on the coded highway network including banned turns, one-way links, bus only links, freight routes, link classifications and location of zone centroid connectors.

Model Fit

The approach to the calibration was two-fold namely fit against observed counts and fit against observed journey times. Fit against observed counts was undertaken using matrix estimation (ME). Several count sets were used, representing sector cordons, screenlines, urban cordons, motorways and buffer area.

Whilst desirable to retain a set of independent counts for validation, it was found that the quality of the model was significantly impaired if counts were withheld. WebTAG recognises that in some instances validation data is required to improve the quality of the model.

DMRB requires all or nearly all of screen lines (cordons) to have total modelled flows with GEH statistic (comparing observed counts and modelled flows) below 4 and 85% of all individual flows to be within GEH of 5. Overall, the model whilst not fully meeting the level set out in DMRB shows quite a reasonable fit. Given the model structure (in particular the age of much of the observed trip data) and the fact that DMRB is more applicable to the assessment of inter-urban road schemes where the degree of alternative routes is far fewer, the calibration level are considered to be satisfactory for LCRTM Version 1.

Modelled and observed journey times were compared for twenty-three strategic routes across the study area, by direction. Modelled journey times were validated in accordance to DMRB criteria. This comparison showed that the AM and IP time periods satisfy the DMRB range criteria, of 85% of routes validating within 15% (or 1 minute if higher) of observed journey times. The PM peak hour validated slightly below this threshold at 80%.

2.2 Public Transport Model

The public transport assignment model was developed using CUBE VOYAGE software and consists of three parts, the supply side, the demand side and model parameters. The supply side source of data was the bus and rail service database that was managed by Merseytravel. The demand data employed in the model was bus and rail count data. The public transport data is substantially reliant on synthetic data that was estimated from, primarily, the Household Information Surveys (HIS).

2.2.1 Public Transport Database

The bus and rail networks were developed from the client's GIS registration database. A set of Merseyside regional bus data, consisting of more than 2,000 files was supplied by Merseytravel as the source data from which the bus network was constructed. The dataset comprised detailed bus service information for services covered within the study area including bus route, route number, route operator, days of operation and bus stops in its stopping order and time of departure and arrival at each stop.

Bus Count Data

The bus count data was drawn from Liverpool inner and outer screenline count data collated Spring 2008; and Autumn 2008 and Regional centre mode share count data collated 2007/08.

Rail Data

Two forms of rail demand data were used firstly LENNON data which provides rail station to rail station Origin-Destination data and secondly comprehensive count data was supplied by Merseyrail Electrics covering the service lines in Ormskirk, New Brighton, Kirkby, Southport – Hunt's Cross, West Kirby and Hooton.

2.3 Network Development

Bus Network Development

The bus network development process included two main stages of bus service data processing and network development. These two parts were inter-dependent and they involved iterations between them. Initially, a selection process was followed to narrow down the bus routes from the large regional dataset employing selection criteria with the objective of retaining services representative of a typical weekday within the study area.

After the selection of relevant bus routes was finalised, variants of each route were identified by examining the time of day in which it operates. Having reduced the bus service data from an enormous dataset to those services relevant to the study area and time of day the bus network was built to consist of bi-directional links that were simpler to manage. The bus network was finally validated against the bus service information on the Merseytravel website which is an independent data source.

Rail Network Development

The rail network was built using a different approach from that adopted for the bus network. .It was developed from two TeleAtlas tables in the GIS software, MapInfo. These were Gbrir.tab (Railways) and Gbrist.tab (Rail stations). Having built the rail network, rail services were extracted from the service database. These were processed and filtered to only include weekday services which were then separated into their respective time periods.

2.3.1 Fares and Parameters

Bus Fares

The bus fares tables were developed from data supplied by Merseytravel on commercial operators' fare scales, supported services fares scales, and information on non-cash tickets.

Rail Fares

For this model, a distance-based fare structure and levels was used. The travel demand fare information was extracted and estimated from the LENNON database which had been extracted from period 2 of 2008.

Assignment Parameters

The public transport model parameters were imported from the existing Merseytram model that was locally available. The parameters were adjusted during the calibration process where it was deemed necessary. The assignment main parameters included weightings for bus and rail boarding times, a transfer penalty, waiting times for bus and rail as well as value of time.

2.3.2 Matrix Development

The public transport model was developed without access to bus or rail final origin-destination data. This meant the matrices were substantially built from synthetic matrices produced by the base year trip generation model that was applied to extensive household survey data. The process of matrix construction was tied in with the calibration process as matrix estimation was used.

Bus Demand Matrices

The PT base year bus model was dependent on the synthetic matrices due to the absence of origin-destination surveys. The only available observed bus data available, other than that existing within the household information survey that underpinned the synthetic matrix, was bus count data that is described above.

Rail Demand Matrices

The rail matrices were built from the synthetic matrices that were merged with LENNON matrices that provides a much better proportion of observed data in the rail matrices than was the case with the bus matrices. For gaps in the LENNON data due to journeys related to particular ticket types that are excluded from LENNON such as PTE-sponsored tickets, the total rail patronage and revenue associated with such ticket types were used as the control totals for the infilling within the Merseytravel area.

2.3.3 Calibration

The calibration of the public transport models was done in two stages at individual mode and combined. The results of calibration for the bus model against the synthetic matrices did not validate, as expected. Using ME resulted in a much improved calibration and the R-squared statistic of 0.9811 (1 being full match between observe and modelled flows) demonstrated a close relationship between the observed and modelled flows. The results of the pre-matrix estimation calibration for rail showed a more reasonable relationship between the observed and modelled flows, but having applied ME, the results of post matrix estimation assignment showed R-squared values close to 1.

Post Matrix Estimation Combined Assignment Bus and Rail produced R-squared values in the range 0.89 to 0.98. The impacts of the stage 2 (combined) matrix estimation process on the trip length distributions of the bus and rail matrices by journey purpose and time period did not show any unreasonable distortion of the trip lengths.

2.4 Demand Model

The full LCRTM system includes components representing six travel responses comprising, trip generation, mode choice, time period choice, trip distribution, departure time choice and highways assignment and public transport assignment. The demand model estimation focused on four of these responses which are mode choice, time period choice, trip distribution and departure time choice.

The main features of the demand model include the assumed hierarchy of travel responses; the different dimensions of demand segmentation; the input data, geographical coverage; matrix format; the generalised cost functions used in the model; the use of the logit formulation and adjustment process post model estimation.

2.4.1 The Hierarchy of Responses

The different components of a demand model form a hierarchy, so that each level of the hierarchy represents a specific type of choice individuals make. The hierarchy of responses represent the level of flexibility travellers demonstrate when making travel choices. At the bottom of the hierarchy is the choice that travellers are most sensitive to. In this case this is route choice (assignment).

The hierarchy of the LCRTM model which accords with the DfT WebTAG recommended structure is shown below:

- Trip Generation
- Mode Choice
- Time Period Choice
- Trip Distribution
- Departure Time Choice
- Assignment

2.4.2 Demand Segmentation

Several dimensions were used in the model for segmenting demand, but some of them were only used for specific parts of the model. These different dimensions are described in the following paragraphs.

- Journey Purpose: The demand model uses three purposes, complying with the requirement defined in WebTAG
- Car Availability: This dimension of segmentation appreciates that although travel behaviour is modelled by individual traveller, the availability of a car is often a key feature of the household that the person belongs to
- Income: This is used at the trip generation stage, but the remaining parts of the model are not segmented by income. This was due to insufficient data available and also to ensure that the number of model segments is manageable
- Period of Travel: The different categories are the morning peak, inter-peak, afternoon peak or off-peak
- Hour of Travel: This allows the impacts of morning peak spreading be examined
- Mode: The trip rates used at the generation stage do not distinguish between trips made by different modes. From the mode choice stage the split by mode is retained throughout the model.

2.4.3 Geographical Coverage

Due to level of validity and detail of the network and the base year data, it was not feasible to estimate the demand model parameters for the whole of the area that is covered by the model. Rather model estimation is done only within a defined area, consistent with the Liverpool City Region.

2.4.4 Matrix Formats

Information in travel demand models can be stored either in a Production/Attraction (PA) format or in an origin-destination (OD) format. PA formats are more consistent with methodologies for trip generation, as they store any home-based trip at the home end (i.e. the production end), whatever the direction of the trip. OD formats are more straightforwardly associated with the assignment model and with the format of traffic count data, as they store trips based on their direction.

For this study, the amount of inputs at a PA format was not sufficient for the estimation of credible mode choice and time choice models; it has been critical to also exhaust the traffic count data during the estimation of these models. Since this can only be done at an OD format, the process is based on conversion from PA to OD format after the trip generation stage, and work with an OD format from that point.

2.4.5 The Input Data

The inputs for the estimation of the demand included detailed information about all components of the generalised costs for travel. These all came in the form of origin-destination matrices. For car trips, typical components of the generalised cost are the travel time and the distance travelled.

For public transport trips, typical components of the generalised cost are the fare, travel time, access time to the boarding stop, egress time from the alighting stop, waiting time and the time associated with transfer.

2.4.6 Generalised Cost Functions

The mode choice, time period choice, distribution and departure time choice models are all logit models. The use of logit models, in general, is the standard practice in travel demand modelling. In each one of these models there is a given number of alternatives, and a generalised cost is associated with each one of them. When the model is applied, the logit model converts the set of generalised costs into an estimate of the proportion of travellers choosing each alternative.

2.4.7 Compliance with WebTAG

All major features of the demand model are designed to comply with the Department for Transport guidance for travel demand modelling, as specified in WebTAG.

2.4.8 The Model Estimation Approach

For this model a simultaneous estimation approach has been adopted. Simultaneous estimation means that all the parameters for each level of the model are estimated at the same time. When the model is applied, the logit model converts the set of generalised costs into an estimate of the proportion of traveller choosing each alternative. At the model estimation stage, the opposite process is undertaken. The objective of the model estimation process is to determine the most appropriate values for the parameters of the generalised cost functions.

Typical variables in generalised cost functions are journey times, journey distances, public transport waiting times and others as mentioned above. Conventionally, a parameter is estimated for each one of these variables in the model situated one level above the assignment, to capture the relative weights with respect to each other.

2.4.9 Developing the Preferred Model

To develop the preferred model several tests were carried out each varying the estimation process and each leading to incremental improvements in model performance. WebTAG suggests realism tests should be run to check whether the model behaves realistically by looking at the overall response of demand to changes in travel costs. These realism tests are done by changing the public transport and highway cost components by certain degrees and calculating the elasticity of demand to the implemented change.

Assessment of the model is done by comparing the realism test results with the WebTAG recommended elasticity values. Furthermore, WebTAG suggests that adjustment to the parameters controlling the response of demand should be made if realism test does not show realistic behaviour.

Adjustment Process

Initial realism tests were run using parameters obtained from the estimation process. The result were encouraging with elasticities generally falling within WebTAG ranges and also showing the correct relationship between values for different journey purposes. It was found, however, that employers business elasticities fell below the minimum range while the other journey purposes showed acceptable elasticities.

Therefore scaling parameters for the employers business were adjusted to improve performance. The adjustments were made in respect to PT time period choice, PT distribution, Home Work distribution and HW departure time choice model scaling parameters. The adjustments helped producing an employer business elasticity in line with expectation. It was thus considered that the results were acceptable and that no further adjustment to the scaling parameters were required.

2.4.10 Model Summary

The demand model developed for LCRTM has in summary the following characteristics:

- A hierarchy in line with WebTAG expectations
- Makes best use of existing data sources in model development and estimation
- Has elasticities to fuel price and public transport fares that are in line with WebTAG expectations
- Generalised cost coefficients are in line with expectations
- Average modelled trip lengths match observed values sufficiently well

3. Final Strategy Forecasts Model Development

Using the LCRTM modelling system forecast models have been develop to test the Final Strategy for the Merseyside LTP3. In this section the work undertaken to develop the forecast models is discussed.

3.1 Growth Scenarios

The Final Strategy measures have been assessed under two main growth scenarios namely local and alternative (or "national" - TEMPRO 6.1) which are reported in the next section of this report.

3.1.1 Local Growth

Several growth scenarios have been considered in the course of developing LCRTM. The growth forecast adopted for this assessment uses local forecasts for both housing and employment in the Liverpool City Region.

Forecast of future housing has been derived by consideration at district level of data provided in the Regional Spatial Strategy (RSS), LDF and SHLAA, which provide agreed targets for volumes of households and timescale for development and in the case of SHLAA data, locations where this housing is likely to be built.

For employment the forecasts are based on the work undertaken in 2009 by PION and Cambridge Econometrics on behalf of various City Region stakeholders, including the Support Unit, to update the previous LCR Economic Assessment report prepared in 2007 by Cambridge Econometrics and SQW.

This work produced four possible growth scenarios which are outlined below:

- ***Scenario 1 'Extended Recession'*** : It allows for realignment in the motor vehicles and finance sectors, reductions in baseline public sector spend profiles in line with Institute for Fiscal Studies (IFS) expectations to 2020; and severely limited key sector growth over the recession period to 2015
- ***Scenario 2 ' Moderate Recovery'***: It involves partial realignment in the motor vehicles and finance sectors, more moderate reductions in public sector spend profiles and limited key sector growth
- ***Scenario 3 'Aspirational' :*** This involves partial realignment in the finance sector only; even more moderate reductions in public expenditure and no imposed constraints on key sector trend growth
- ***Scenario 4 'Development Pipeline' :***. This is specifically intended to allow the very best case situation and effectively sets out a development path that is devoid of any recession impact other than that contained in the original baseline alongside stronger key sector growth.

Whilst the local growth scenario adopted from PION/Cambridge Econometrics for the Final Strategy model developments is *"Scenario 3: Aspirational"*, the planning data for additional large developments including Liverpool Waters, Wirral Waters (East Float), Parkside Depot and Daresbury Park has been included into the model to provide more accurate forecast demand. The planning data for the background scenario in Merseyside and also the major developments are shown in Tables 3.1 to 3.4 below.

Table 3.1: Number of Additional Dwellings

Model Sector	No. of Additional Dwellings	
	2008-2014	2014-2024
Liverpool	10740	26716
Wirral	2046	5954
Sefton	2400	5280
Knowsley	2700	4500
St Helens	3852	4733
Merseyside	21738	47183

Table 3.2: Employment Data (no of Jobs)

Model Sector	2008	2014	2024
Liverpool	234,100	238,612	256,739
Wirral	100,979	104,485	111,683
Sefton	98,139	99,187	106,956
Knowsley	59,659	62,751	66,928
St Helens	63,208	63,630	67,289
Merseyside	556,085	568,665	609,595

The planning data associated with the additional major developments that are included in the model are shown below.

Table 3.3: Major Development Number of Dwellings

Development	No. of Dwellings	
	2014	2024
Liverpool Waters	0	2710
Wirral Waters	1300	5900
Parkside	0	0
Daresbury Park	250	1150

Table 3.4: Major Development Employment Data (no. of Jobs)

Development	No. of Jobs	
	2014	2024
Liverpool Waters	0	4889
Wirral Waters	798	5,707
Parkside	0	7,750
Daresbury Park	674	1348

3.1.2 National Growth (Alternative) Scenario

The national growth (alternative) scenario is based on the forecasts contained in the Department for Transport National Trip End Model (NTEM) which uses TEMPRO software for output of data. The TEMPRO used for extracting growth trends for this assessment is version 6.1 which is in Draft status at present however it is understood that its forecast are close to the definitive version which is expected to be published post April 2011.

3.2 Assessment Years

The assessment years for the Final Strategy forecasts when model runs have been undertaken are 2014 and 2024.

3.3 Modelled Periods

The results reported in this document are for the modelled hour from the following modelled periods:

- AM Peak Hour : 8:00-9:00 from 7:00-10:00 period;
- Inter Peak Hour : Average hour from the 10:00 to 16:00 period
- PM Peak Hour: 17:00-18:00 from 16:00 to 19:00 period

3.4 Forecast Networks

Networks have been developed for two scenarios namely Do-Minimum (without Final Strategy) and Do-Something (with Final Strategy) for the 2014 and 2024 assessment years. For the Do-Minimum, committed schemes have been added to the base year networks. The measures associated with the Final Strategy are then added wherever appropriate to the Do-Minimum to form the Do-Something scenario.

The following committed schemes with respect to their opening years have been added to the base networks to form the 2014 and 2024 networks:

- Hall Lane Strategic Gateway
- Tarbock Island (Junction 6 of M62)
- A5117 Deeside Park Junctions Improvement
- A5300/A562 Speke Road Improvement
- Mersey Gateway: 2^{nd} Mersey crossing in Halton
- Switch Island: Thornton Link Road
- North West Triangle rail electrification (Liverpool-Manchester and Liverpool-Wigan)

3.5 Forecast Demand

The forecast Reference Case trip matrices (i.e. before they are input to the demand model) for 2014 and 2024 have been developed separately based on the local and national growth (TEMPRO) assumptions using the External Forecast Model (EFM) module developed for this purpose.

The EFM derives future year household changes using household category analysis to model changes in household composition and car ownership, which predicts future year car availability and income splits.

Future year household developments are combined with the household structure changes and these are used to derive Home Based (HB) productions using the product of households and HB trip rates. Trip attraction forecasts can be defined by central growth forecasts, commercial economic forecasts and development control information.

A number of control mechanisms were applied to the future year production and attraction trip ends. Base year trip ends were used with the future year trip ends to derive a trip end growth. This was then applied to calibrated and fully segmented base year matrix trip ends to provide future year trip ends. These were used to growth the calibrated segmented base year matrix.

The resulting HB matrices were used to derive future year growth in NHB trips, which were assumed to be dependent on HB trips. Port trips were controlled to local growth estimates. Freight trip end growth was derived through changes in employment data and the resulting future year freight matrix was controlled to global freight growth.

It is worth noting that for this assessment the RC matrices produced by EFM have been used for the Do-Minimum model runs. The RC Do-Something matrices were produced by implementation of the Final Strategy measures wherever appropriate to the Do-Minimum Reference Case matrices (prior to being input to the demand model).

As noted above (section 3.1.1) the demand associated with the Liverpool Waters, Wirral Waters (East Float), Parkside Depot and Daresbury Park was included in the future RC matrices for the assessment.

3.6 Values of Time and Vehicle Operating Costs

The forecast Values of Time (VoT) and Vehicle Operating Costs (VOC) which are part of the function that calculates the travel cost in the model have been derived from the base year (2008) values in line with GDP growth predicted in the WebTAG Unit 3.5.6 March 2010 (In Draft Guidance). Table 3.5 below shows VoT and VOC in 2008 and the predicted growth to 2014 and 2024.

Table 3.5: Values of Time and Vehicle Operating Costs

Vehicle category	Value of Time			Vehicle Operating Cost		
	2008 Pence per minute	2014 % change	2024 % Change	2008 Pence per kilometre	2014 % change	2024 % Change
Car (Commute)	11.53	4%	20%	6.99	-2%	-23%
Car (Other)	10.17	4%	20%	6.99	-2%	-23%
Car (Employers Business)	49.07	5%	25%	13.65	-1%	-10%
Light Goods Vehicles (LGV)	16.91	5%	25%	15.25	0%	2%
Heavy Goods Vehicles (HGV)	19.86	5%	25%	45.71	0%	2%

3.7 Public Transport Fares and Toll Charges

The forecast increases in the public transport fares and toll charges have been derived in line with GDP growth predicted between the model base year (2008) and forecast years (2014 and 2024) as contained in the WebTAG Unit 3.5.6 March 2010 (In Draft Guidance).

The toll charges have been applied to Mersey Tunnel and the proposed Mersey Gateway as well as Silver Jubilee Bridge (assumed to be tolled when Mersey Gateway is constructed) in the relevant assessment year. Tables 3.6 to 3.8 show the public transport fares and toll charges for the base and future years (2014 and 2024).

Table 3.6: Bus Fares

Distance (km)	Fare (£)				Percentage Difference	
	2008	2014	2024		2008-2014	2008-2024
1.6	1.04	1.08	1.25		4%	20%
3.2	1.06	1.11	1.27		4%	20%
4.8	1.10	1.15	1.32		4%	20%
6.4	1.14	1.19	1.37		4%	20%
8	1.17	1.22	1.40		4%	20%
9.6	1.17	1.22	1.40		4%	20%
11.2	1.21	1.26	1.45		4%	20%
12.8	1.26	1.31	1.51		4%	20%
14.4	1.26	1.31	1.51		4%	20%
16	1.29	1.35	1.55		4%	20%
17.6	1.36	1.42	1.63		4%	20%
19.2	1.52	1.59	1.82		4%	20%

Table 3.7: Rail Fares

Distance (km)	Fare (£)				Percentage Difference	
	2008	2014	2024		2008-2014	2008-2024
1	0.64	0.67	0.77		4%	20%
5	1.93	2.01	2.31		4%	20%
10	2.43	2.53	2.91		4%	20%
15	3.11	3.24	3.73		4%	20%
20	3.41	3.56	4.09		4%	20%
60	14.15	14.76	16.97		4%	20%
100	22.79	23.77	27.33		4%	20%
300	51.68	53.90	61.98		4%	20%
500	80.29	83.74	96.30		4%	20%

Table 3.8: Toll Charges

Vehicle Type	Fare (£)				Percentage Difference	
	2008	2014	2024		2008-2014	2008-2024
Car	1.40	1.46	1.68		4%	20%
Light Goods Vehicles (LGV)	2.80	2.95	3.49		5%	25%
Heavy Goods Vehicles (HGV)	4.20	4.42	5.26		5%	25%

3.8 Final Strategy Measures

The Final Strategy which includes a wide range of measures aimed to improve the transport system together with details of their implementations in the LCRTM are described in Table 3.9 below.

Table 3.9: Final Strategy Measures

Ref.	Component	Description and Implementation in the Model
A	Cycle Enhancements	Network priority measures on key radial routes ▪ Reduction of slow modes generalised time cost in zones 5 miles to south of city, Everton Park E-W connect2 link and Southport
B	Pedestrian Route Enhancements	Improvements to pedestrian routes in key centres with effect of improving pedestrian journey times ▪ Reduction of slow modes generalised time cost in Abercromby, Everton, Huyton, Southport, St Helens, Birkenhead, Bootle (All district centres)
C	Bus Enhancements	Network priority measures on key radial routes ▪ i) Reduction in generalised time cost on bus routes 14, 10, A41 ▪ ii) From 2015 reduce generalised time cost on bus routes 53, 86, 82, 20/21 ▪ iii) Highway capacity on these routes reduced accordingly ▪ iv) Further improvements to journeys to town centres
D	Behaviour Change	Schemes including PTP, cycle training, child pedestrian training, work and school travel plans ▪ Reduction in reference car mode share for all car trip purposes ▪ Transfer of trips to Public Transport and Walk/Cycle matrices
K	Smart Park and Ride	Appropriate Station Access strategy - here with a focus on cycle park and ride ▪ Reduction applied to the time cost of slow mode access to rail stations implemented by 2014
E	PT fares and Structures	Smartcard system introduced by 2018 ▪ Reduction in bus board times by 2014 ▪ Reduction to rail board time after 2014 ▪ Increased time benefit per passenger on bus journey due to decreased bus journey times
F	Network Management/ITS Optimisation	Increased patrols and enforcement of speed limits and highway regulations ▪ Increase in highway capacity on key approaches to docks and centres
M	Parking Charges	Increase in parking charges in centres ▪ Increases in parking charges from 2011
H	Developer Contribution	Capture of additional funding, and schemes for development sites ▪ Annual Reduction in slow modes generalised time cost and modified bus services to top half of employment zones to 2014
L	Maintenance	A limited programme to ensure present condition maintained on core routes ▪ A slight reduction applied in the format of reduced capacity in the Do-Minimum networks (without Final strategy) with them restored to the same level to maintain present conditions/capacity on Strategic Freight and Public Transport networks
G	Rail Enhancements	Chester service frequency doubling. Liverpool Central capacity constraints from 2018. ▪ i) Chester Service frequency improvements from 2011 ▪ ii) Additional time cost to station users from 2018

4. Forecast Model Results

4.1 Model Results Structure

The results of the model runs undertaken are discussed in this section of the report for Do-Minimum and Final Strategy runs under both the local and national (alternative) growth scenarios.

The assessment of results are reported with the following structure:

- Travel Mode Share
- Highway Trips
- Public Transport Trips
- Car Trips by Purpose
- Public Transport Trips by Purpose

Results in this section relate to the time periods as described under paragraph 3.3.

4.2 Do-Minimum (Local Growth)

4.2.1 Do-Minimum : Travel Mode Share (Local Growth)

The mode share (Table 4.1) trends under the Do-Minimum (DM) scenario for Merseyside show that car is forecast to continue as being the main mode of transport over the assessment period. The average mode share of car trips over the two modelled peak hours is 68% in 2014 and about 69% in 2024. The average share of freight transport over the two modelled peak hours is set to rise from 10% in 2008 to 13% in 2024 whilst public transport trips are forecast to decline over time from an average of about 20% in 2008 to 18% in 2014 and 16% in 2024.

Table 4.1: Base and Do-Minimum Mode Shares (Local Growth)

	2008			2014 Do-Minimum			2024 Do-Minimum		
AM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	63%	10%	28%	62%	13%	25%	64%	14%	22%
Wirral	73%	8%	18%	72%	12%	17%	72%	13%	14%
Knowsley	71%	11%	19%	70%	14%	16%	71%	15%	14%
Sefton	65%	15%	21%	64%	18%	18%	63%	21%	16%
St Helens	73%	9%	17%	71%	14%	15%	73%	15%	13%
Merseyside	68%	10%	22%	66%	14%	20%	68%	15%	17%
PM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	67%	8%	25%	67%	11%	22%	68%	12%	20%
Wirral	75%	8%	17%	74%	11%	15%	75%	12%	14%
Knowsley	75%	9%	16%	74%	12%	14%	75%	13%	12%
Sefton	67%	16%	16%	66%	19%	15%	65%	22%	13%
St Helens	77%	9%	14%	75%	12%	12%	76%	14%	11%
Merseyside	71%	10%	19%	70%	13%	17%	71%	14%	15%

4.2.2 Do-Minimum : Highway and Public Transport Trips (Local Growth)

The forecast number of highway and public transport trips in comparison to 2008 (Tables 4.2 and 4.3) show opposite trends. Whilst the highway trips are predicted to increase by an average (over the three modelled time periods) of over 8% by 2014 and 24% by 2024, the public transport trips over the same modelled periods, show average decreases relative to the base in Merseyside of about 3% to 2014 and 5% to 2024.

Table 4.2: Do Minimum Highway Trips (Local Growth)

	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Liverpool	72956	53944	68265	10%	10%	11%	29%	30%	27%
Wirral	49879	33458	45010	5%	7%	6%	16%	21%	17%
Knowsley	24041	15473	21901	10%	11%	10%	25%	30%	24%
Sefton	43913	30930	42345	7%	9%	8%	18%	25%	19%
St Helens	27917	17996	25810	9%	10%	9%	24%	27%	24%
Merseyside	218705	151801	203331	8%	9%	9%	23%	27%	22%

Table 4.3: Do Minimum Public Transport Trips (Local Growth)

	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Liverpool	27847	18410	22550	-3%	-2%	-3%	-3%	-1%	-3%
Wirral	11108	8281	9147	-3%	-4%	-2%	-10%	-5%	-6%
Knowsley	5605	4257	4227	-5%	-3%	-3%	-11%	-5%	-8%
Sefton	11390	8317	8358	-5%	-5%	-3%	-13%	-7%	-8%
St Helens	5808	4366	4184	-4%	-3%	-3%	-9%	-5%	-7%
Merseyside	61758	43631	48466	-4%	-3%	-3%	-7%	-3%	-5%

With Liverpool City Centre being a key urban centre in the Merseyside conurbation, a comparison of the base year and Do-Minimum two way trips related to Liverpool City centre by cars and public transport are shown in Table 4.4 below. The car trips increases on average about 2% per annum over the three modelled hours to 2014 and about 2.5% per year thereafter to 2024. The public transport trips show a slight decrease of about 0.4% per year to 2014 and a net average yearly increase of 0.5% thereafter to 2024 over the three modelled hours.

Table 4.4: Do Minimum Liverpool City Centre Trips (Local Growth)

	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Car	9,102	7,744	9,429	11%	12%	11%	27%	23%	20%
	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Public Transport	9,769	6,361	10,672	0.1%	-3%	-4%	6%	2%	-3%

4.2.3 Do-Minimum : Trips By Purpose (Local Growth)

A comparison of the car and public transport trips by purpose (Tables 4.5 and 4.6) displays similar trends to the total trips discussed above i.e. whilst the highway trips are predicted to increase over the assessment period, public transport use is reported to decrease.

The trip purposes reported are:

- 'Commute' (travel to/from work) shown as 'Com'. in the following tables
- 'Employers' Business' : Trips undertaken for the business purpose shown as 'EB'
- 'Other' which includes the remaining types of trip purposes and is shown as 'Other'

The average rate of increase of car commuter trips in Merseyside over the three modelled periods between 2008 and 2014 and also 2024 is about 1.4% per year. The 'other' car trip purpose for Merseyside which forms the largest number of highway trips among the three modelled trip purposes, shows an average increase of just over 1% per year between 2008 and 2014 and 1.3% to 2024.

The average rate of decrease in public transport trips relative to 2008 for commuter trips is forecast to be just under 1% to 2014 and 0.5% to 2024 for commuting trips with a corresponding decrease of less than 0.5% for the 'other' trip purpose.

Table 4.5: Do Minimum Car Trips by Purpose (Local Growth)

	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	28851	29457	5059	12%	6%	10%	31%	22%	28%
Wirral	19132	21940	3633	6%	3%	4%	17%	10%	8%
Knowsley	9547	9865	1508	12%	7%	6%	26%	20%	16%
Sefton	16357	16652	2804	7%	3%	4%	15%	9%	11%
St Helens	11396	11489	1891	9%	8%	6%	26%	19%	14%
Merseyside	85284	89404	14895	9%	5%	7%	24%	16%	17%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	5235	34029	5425	11%	9%	8%	32%	28%	24%
Wirral	3525	22171	3115	5%	6%	4%	19%	19%	7%
Knowsley	1725	9756	1353	12%	10%	10%	26%	29%	23%
Sefton	3310	17849	2624	6%	7%	5%	14%	20%	14%
St Helens	2201	11353	1735	9%	10%	7%	30%	27%	16%
Merseyside	15997	95158	14253	9%	8%	7%	24%	24%	17%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	24659	28885	7104	11%	9%	11%	24%	26%	27%
Wirral	16915	19267	4642	5%	5%	4%	15%	15%	7%
Knowsley	8625	9046	1875	11%	8%	10%	20%	23%	24%
Sefton	14939	15457	3800	6%	6%	6%	10%	15%	17%
St Helens	11255	9895	1943	9%	9%	9%	22%	20%	20%
Merseyside	76393	82550	19364	8%	7%	8%	19%	20%	19%

Table 4.6: Do Minimum Public Transport Trips by Purpose (Local Growth)

	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	11520	15969	357	-1%	-3%	-7%	2%	-6%	-12%
Wirral	3852	7150	105	-3%	-4%	-6%	-8%	-11%	-11%
Knowsley	1558	3987	59	-3%	-5%	-5%	-11%	-12%	-8%
Sefton	4257	7024	109	-5%	-5%	-7%	-13%	-13%	-13%
St Helens	1582	4164	62	-5%	-3%	-7%	-9%	-9%	-12%
Merseyside	22770	38295	693	-3%	-4%	-6%	-4%	-9%	-12%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	1655	16491	265	-5%	-2%	-9%	-2%	0%	-15%
Wirral	676	7513	92	-8%	-3%	-9%	-14%	-4%	-15%
Knowsley	300	3903	54	-5%	-2%	-7%	-12%	-5%	-12%
Sefton	612	7614	92	-11%	-4%	-9%	-19%	-6%	-18%
St Helens	315	3986	65	-7%	-3%	-10%	-14%	-4%	-16%
Merseyside	3557	39506	568	-7%	-3%	-9%	-9%	-3%	-15%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	13413	8351	786	-4%	0%	-7%	-6%	3%	-15%
Wirral	4597	4240	310	-5%	1%	-7%	-12%	1%	-16%
Knowsley	2152	1914	161	-4%	-2%	-7%	-13%	-3%	-19%
Sefton	4110	4005	243	-6%	0%	-8%	-15%	-1%	-16%
St Helens	2183	1837	164	-6%	0%	-8%	-12%	1%	-15%
Merseyside	26455	20346	1665	-5%	0%	-7%	-9%	1%	-16%

4.3 *Final Strategy (Local Growth)*

Under this section the impact of Final Strategy measures on the Do-Minimum are shown and discussed for both of the two assessment years (2014 and 2024).

4.3.1 *Final Strategy Travel Mode Share (Local Growth)*

The impacts of the Final Strategy on the Do-Minimum are shown in Tables 4.7 and 4.8 for 2014 and 2024 respectively. The implementation of the Final Strategy is forecast to lead to reductions in car mode share over both modelled peak hours in 2014 and 2024 whilst the mode share of public transport is shown to rise in both assessment years. The average size of reduction in the Do-Minimum car mode share over the two modelled peak hours is forecast to be from about 68% to about 66% in 2014 and from over 69% to over 67% in 2024. The public transport mode share is forecast to rise from an average of over 18% in 2014 to 20% and from over 16% to 18% in 2024.

Table 4.7: Do Minimum & Do Something 2014 Mode Share (Local Growth)

	2014 Do-Minimum			2014 Do-Something		
AM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	62%	13%	25%	60%	13%	27%
Wirral	72%	12%	17%	70%	12%	18%
Knowsley	70%	14%	16%	68%	14%	18%
Sefton	64%	18%	18%	62%	18%	20%
St Helens	71%	14%	15%	70%	14%	16%
Merseyside	66%	14%	20%	65%	14%	21%
PM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	67%	11%	22%	65%	11%	24%
Wirral	74%	11%	15%	73%	11%	17%
Knowsley	74%	12%	14%	73%	12%	16%
Sefton	66%	19%	15%	64%	19%	16%
St Helens	75%	12%	12%	74%	13%	13%
Merseyside	70%	13%	17%	68%	13%	19%

Table 4.8: Do Minimum & Do Something 2024 Mode Share (Local Growth)

	2024 Do-Minimum			2024 Do-Something		
AM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	64%	14%	22%	62%	14%	24%
Wirral	72%	13%	14%	71%	13%	16%
Knowsley	71%	15%	14%	69%	15%	16%
Sefton	63%	21%	16%	62%	21%	17%
St Helens	73%	15%	13%	72%	15%	14%
Merseyside	68%	15%	17%	66%	15%	19%
PM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	68%	12%	20%	66%	12%	22%
Wirral	75%	12%	14%	73%	12%	15%
Knowsley	75%	13%	12%	74%	13%	13%
Sefton	65%	22%	13%	64%	22%	14%
St Helens	76%	14%	11%	75%	14%	11%
Merseyside	71%	14%	15%	69%	14%	17%

4.3.2 *Final Strategy : Highway and Public Transport Trips (Local Growth)*

The impact of implementing the Final Strategy measures on the Do-Minimum trips across are shown in Tables 4.9 to 4.12. The results as expected display that in general the Final Strategy measures lead to reductions in the number of highway trips and increases in the use of public transport. The size of reduction in highway trips is reported to be about 2% in 2014 and 2024 with corresponding increases in public transport trips of about 8% in 2014 and over 8.5% in 2024.

Table 4.9: Do Minimum & Do Something 2014 Highway Trips (Local Growth)

	2014 Do Minimum			2014 Do Minimum – Do Something		
	AM	IP	PM	AM	IP	PM
Liverpool	79891	59439	75591	-3%	-3%	-3%
Wirral	52467	35767	47623	-2%	-2%	-2%
Knowsley	26438	17209	24135	-1%	-1%	-1%
Sefton	47034	33605	45703	-1%	-2%	-2%
St Helens	30454	19819	28225	-1%	-1%	-1%
Merseyside	236285	165840	221278	-2%	-2%	-2%

Table 4.10:Do Minimum & Do Something 2024 Highway Trips (Local Growth)

	2024 Do Minimum			2024 Do Minimum – Do Something		
	AM	IP	PM	AM	IP	PM
Liverpool	93760	70196	86883	-3%	-3%	-3%
Wirral	57798	40372	52444	-1%	-1%	-1%
Knowsley	29978	20114	27089	-1%	-1%	-1%
Sefton	51895	38542	50457	-1%	-1%	-1%
St Helens	34532	22815	31887	-1%	-1%	-1%
Merseyside	267963	192040	248761	-2%	-2%	-2%

Table 4.11 : Do Minimum & Do Something 2014 Public Transport Trips (Local Growth)

	2014 Do Minimum			2014 Do Minimum – Do Something		
	AM	IP	PM	AM	IP	PM
Liverpool	27108	17964	21972	10%	8%	9%
Wirral	10739	7989	8955	10%	7%	9%
Knowsley	5346	4144	4102	14%	6%	9%
Sefton	10780	7921	8073	10%	4%	11%
St Helens	5602	4228	4039	6%	5%	7%
Merseyside	59575	42245	47141	10%	7%	9%

Table 4.12: Do Minimum & Do Something 2024 Public Transport Trips (Local Growth)

	2024 Do Minimum			2024 Do Minimum – Do Something		
	AM	IP	PM	AM	IP	PM
Liverpool	27085	18284	21932	9%	7%	9%
Wirral	10011	7887	8598	8%	7%	8%
Knowsley	4964	4035	3868	14%	5%	9%
Sefton	9897	7755	7676	9%	6%	8%
St Helens	5307	4144	3902	7%	5%	6%
Merseyside	57263	42105	45976	9%	7%	8%

The effects of the Final Strategy on the forecast Do-Minimum trips related to Liverpool City centre are shown in Tables 4.13 to 4.14 below. The two way car journeys are shown to decrease with a range of -5% to -10% in 2014 and -5% to -9% in 2024 across the three modelled periods (Table 4.13). On the other hand, the public transport trips show average forecast increases of about 7% in 2014 and 6% in 2024 across the three modelled periods.

Table 4.13: Do Minimum & Do Something 2014 and 2024 Liverpool City Centre Car Trips (Local Growth)

2014 Do Minimum			2014 Do Minimum – Do Something Percentage Difference		
AM	IP	PM	AM	IP	PM
10,053	8,655	10,520	-5%	-10%	-9%
2024 Do Minimum			2024 Do Minimum – Do Something Percentage Difference		
AM	IP	PM	AM	IP	PM
12,777	10,690	12,574	-5%	-9%	-8%

Table 4.14: Do Minimum & Do Something 2014 and 2024 Liverpool City Centre Public Transport Trips (Local Growth)

2014 Do Minimum			2014 Do Minimum – Do Something Percentage Difference		
AM	IP	PM	AM	IP	PM
9,784	6,153	10,274	9%	5%	6%
2024 Do Minimum			2024 Do Minimum – Do Something Percentage Difference		
AM	IP	PM	AM	IP	PM
10,339	6,504	10,405	7%	5%	7%

4.3.3 Final Strategy : Trips By Purpose (Local Growth)

The impact of the Final Strategy on the patterns of car and public transport journeys are shown by purpose in Tables 4.15 to 4.18.

The results of the comparison between Do-Minimum (DM) and Final Strategy (Do-Something) show a consistent reduction along all car trip purposes (Tables 4.15 to 4.16) for both modelled years and across all three time periods. The size of reduction in highway is largest for commuting trips of about 3% in 2014 and 2024 followed by other trip purpose at about 2% for Merseyside.

The corresponding impact on public transport is one of increase relative to the DM across all purposes for the three modelled periods over the two assessment years (2014 and 2024). The average increase in the commuting and other trip purpose are about 9% and over 8% in 2014 and 9% and over 7% in 2024.

Table 4.15: Do Minimum & Do Something 2014 Car Trips by Purpose (Local Growth)

	2014 Do Minimum Car Trips			2014 Do Minimum – Do Something Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	32244	31102	5568	-4%	-2%	-3%
Wirral	20201	22540	3778	-2%	-1%	-1%
Knowsley	10715	10535	1603	-2%	-1%	-1%
Sefton	17504	17192	2913	-2%	-1%	-1%
St Helens	12454	12425	2011	-2%	-1%	-1%
Merseyside	93118	93795	15872	-3%	-1%	-2%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	5835	37118	5880	-5%	-3%	-4%
Wirral	3708	23496	3233	-3%	-2%	-2%
Knowsley	1931	10777	1487	-2%	-1%	-2%
Sefton	3499	19056	2746	-2%	-2%	-2%
St Helens	2403	12495	1857	-2%	-1%	-1%
Merseyside	17376	102942	15203	-3%	-2%	-3%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	27367	31615	7850	-4%	-2%	-3%
Wirral	17799	20178	4831	-2%	-1%	-2%
Knowsley	9576	9790	2055	-2%	-1%	-2%
Sefton	15839	16315	4043	-2%	-2%	-2%
St Helens	12217	10781	2119	-2%	-1%	-1%
Merseyside	82799	88679	20898	-3%	-2%	-2%

Table 4.16: Do Minimum & Do Something 2024 Car Trips by Purpose (Local Growth)

	2024 Do Minimum Car Trips			2024 Do Minimum – Do Something Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	37826	36053	6486	-5%	-2%	-4%
Wirral	22465	24103	3926	-2%	-1%	-1%
Knowsley	12018	11821	1747	-2%	-1%	-1%
Sefton	18841	18191	3124	-2%	-1%	-1%
St Helens	14382	13656	2158	-1%	-1%	-1%
Merseyside	105532	103825	17440	-3%	-1%	-2%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	6902	43630	6710	-5%	-3%	-4%
Wirral	4186	26327	3343	-3%	-1%	-2%
Knowsley	2180	12617	1664	-2%	-1%	-1%
Sefton	3763	21463	2989	-2%	-2%	-2%
St Helens	2869	14366	2016	-1%	-1%	-1%
Merseyside	19900	118402	16721	-3%	-2%	-3%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	30584	36519	9031	-4%	-2%	-3%
Wirral	19514	22065	4969	-2%	-1%	-2%
Knowsley	10316	11099	2318	-2%	-1%	-1%
Sefton	16436	17703	4439	-2%	-2%	-2%
St Helens	13763	11920	2334	-1%	-1%	-1%
Merseyside	90614	99306	23091	-3%	-2%	-2%

Table 4.17: Do Minimum & Do Something 2014 Public Transport Trips by Purpose (Local Growth)

	2014 Do Minimum PT Trips			2014 Do Minimum – Do Something Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	11348	15427	333	10%	9%	33%
Wirral	3750	6890	99	11%	9%	38%
Knowsley	1506	3784	57	14%	14%	42%
Sefton	4034	6644	102	10%	10%	24%
St Helens	1510	4034	58	12%	4%	24%
Merseyside	22147	36779	649	11%	9%	32%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	1578	16143	242	10%	7%	56%
Wirral	623	7282	84	8%	6%	45%
Knowsley	285	3808	50	9%	5%	38%
Sefton	543	7294	84	7%	4%	23%
St Helens	292	3877	59	9%	4%	22%
Merseyside	3321	38404	519	9%	6%	43%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	12896	8345	730	7%	10%	32%
Wirral	4379	4287	289	7%	9%	30%
Knowsley	2071	1882	149	8%	9%	34%
Sefton	3861	3989	223	8%	13%	24%
St Helens	2052	1837	150	7%	7%	16%
Merseyside	25259	20340	1541	7%	10%	29%

Table 4.18:Do Minimum & Do Something 2024 Public Transport Trips by Purpose (Local Growth)

	2024 Do Minimum PT Trips			2024 Do Minimum – Do Something Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	11714	15058	313	10%	8%	35%
Wirral	3559	6359	93	11%	6%	40%
Knowsley	1388	3521	55	13%	14%	29%
Sefton	3721	6082	95	8%	8%	23%
St Helens	1443	3809	54	10%	6%	23%
Merseyside	21825	34828	610	10%	8%	32%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	1623	16436	226	11%	6%	63%
Wirral	581	7228	79	8%	6%	50%
Knowsley	264	3723	47	9%	4%	35%
Sefton	496	7184	75	8%	6%	28%
St Helens	270	3819	55	10%	5%	26%
Merseyside	3234	38390	482	10%	6%	49%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	12672	8594	666	7%	9%	32%
Wirral	4060	4277	261	8%	7%	28%
Knowsley	1877	1861	130	8%	8%	36%
Sefton	3505	3967	204	8%	8%	34%
St Helens	1915	1847	139	5%	5%	14%
Merseyside	24029	20547	1401	7%	8%	30%

4.4 Do-Minimum (National (alternative) Growth)

The national forecasts for the future travel trends and growth are produced by Department for Transport using the National Trip End Model (NTEM). The output data from the NTEM is made available through TEMPRO software. The TEMPRO used for extracting growth trends for this assessment is version 6.1

The national growth forecasts provide an alternative set of growth assumptions for assessing the Final Strategy measures which are reported on a similar basis as the main local growth forecast reported above.

4.4.1 Do-Minimum : Travel Model Share (National Growth)

Table 4.19 shows the mode share for the Do-Minimum. The trends between the two growth scenarios (local and national) are quite similar for Merseyside. The car remains the main mode of travel under the national forecast scenario with an average mode share over the two modelled peak hours of about 67% in 2014 and 2024. The average share of public transport trips over the two modelled peak hours is reduced from 20% in 2008 to about 19% in 2014 and about 17% in 2024. These are slightly higher than public transport mode shares under the local growth forecast of 18% in 2014 and 16% in 2024.

Table 4.19: Do Minimum Mode Share (National Growth)

	2008			2014 Do-Minimum			2024 Do-Minimum		
AM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	63%	10%	28%	61%	13%	26%	63%	14%	23%
Wirral	73%	8%	18%	71%	12%	17%	71%	13%	16%
Knowsley	71%	11%	19%	68%	14%	17%	69%	16%	15%
Sefton	65%	15%	21%	63%	18%	19%	62%	21%	17%
St Helens	73%	9%	17%	70%	14%	16%	71%	15%	14%
Merseyside	68%	10%	22%	65%	14%	21%	66%	15%	18%
PM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	67%	8%	25%	65%	11%	23%	67%	12%	21%
Wirral	75%	8%	17%	73%	11%	16%	74%	12%	15%
Knowsley	75%	9%	16%	73%	12%	15%	74%	13%	13%
Sefton	67%	16%	16%	65%	19%	15%	64%	22%	14%
St Helens	77%	9%	14%	74%	13%	13%	75%	14%	12%
Merseyside	71%	10%	19%	69%	13%	18%	69%	14%	17%

4.4.2 Do-Minimum : Highway and Public Transport Trips (National Growth)

Tables 4.20 and 4.21 show the patterns of change in highway and public transport trips in 2014 and 2024 relative to 2008. The general trend in highway trips is an expected increase over time compared to the base year (2008) which is an average of 7% to 2014 and 22% to 2024 over the three modelled time periods. However, the level of forecast increase for highway trips under this scenario is lower than the local growth forecasts. The public transport trips over the same modelled periods under national growth scenario, show a slight net increase relative to the base in Merseyside of about 1% to 2014 and 2% to 2024.

Table 4.20: Do Minimum Highway Trips (National Growth)

	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Liverpool	72956	53944	68265	7%	9%	8%	26%	29%	26%
Wirral	49879	33458	45010	3%	6%	4%	14%	19%	15%
Knowsley	24041	15473	21901	7%	9%	7%	21%	27%	20%
Sefton	43913	30930	42345	5%	8%	6%	17%	24%	18%
St Helens	27917	17996	25810	6%	8%	7%	21%	25%	22%
Merseyside	218705	151801	203331	6%	8%	6%	20%	25%	21%

Table 4.21: Do Minimum Public Transport Trips (National Growth)

	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Liverpool	27847	18410	22550	2%	2%	2%	6%	8%	6%
Wirral	11108	8281	9147	0%	1%	2%	-3%	2%	1%
Knowsley	5605	4257	4227	0%	2%	2%	-4%	2%	-1%
Sefton	11390	8317	8358	-2%	-1%	0%	-7%	-1%	-2%
St Helens	5808	4366	4184	2%	4%	4%	0%	6%	4%
Merseyside	61758	43631	48466	1%	1%	2%	0%	4%	3%

The comparison of the base year and Do-Minimum two way trips related to Liverpool City centre by cars and public transport under the national growth scenario are shown in Table 4.22 below. The car trips are shown to increase to 2014 with an annual average of about 1.5% per annum over the three modelled hours and about 2.5% per year afterward to 2024. The public transport trips show a slight annual increase of about 0.3% to 2014 and increase of about 0.8% per year thereafter to 2024 over the three modelled hours.

Table 4.22: Do Minimum Liverpool City Centre Trips (National Growth)

	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Car	9,102	7,744	9,429	9%	10%	9%	27%	24%	21%
	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Public Transport	9,769	6,361	10,672	4%	0.9%	1%	9%	9%	5%

4.4.3 Do-Minimum : Trips By Purpose (National Growth)

The car and public transport trips by purposes (Tables 4.23 and 4.24) show consistent trends under this scenario when compared to the local growth forecasts.

Whilst all car journeys show increases over time, the level of growth forecast under the national growth scenario for all time periods and purposes are lower than those forecast under the local growth assumptions. The largest difference between the two sets of growth assumptions (local and national) for car trips is 4 percentage points which is reported for a number of trip purposes in both 2014 and 2024. The average annual growth for the commuting and 'other' trip purposes between 2008 and both the forecast years over the three modelled periods is about 1%.

The trend in public transport under this scenario, unlike the local growth forecast which showed a universal reduction in the use of public transport, displays an increase in the use of public transport with a small increase of 0.3% in commuting trips and about 4% for 'other' trips purpose between 2008 and 2024 across the three modelled periods.

Table 4.23: Do Minimum Car Trips by Purpose (National Growth)

	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	28851	29457	5059	8%	3%	8%	27%	21%	26%
Wirral	19132	21940	3633	3%	2%	2%	13%	9%	6%
Knowsley	9547	9865	1508	7%	5%	4%	19%	18%	13%
Sefton	16357	16652	2804	4%	2%	2%	12%	9%	10%
St Helens	11396	11489	1891	6%	5%	4%	23%	17%	12%
Merseyside	85284	89404	14895	6%	3%	5%	20%	15%	15%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	5235	34029	5425	7%	8%	5%	28%	28%	22%
Wirral	3525	22171	3115	2%	5%	-1%	14%	18%	4%
Knowsley	1725	9756	1353	7%	8%	6%	19%	27%	17%
Sefton	3310	17849	2624	2%	6%	2%	11%	20%	11%
St Helens	2201	11353	1735	6%	8%	5%	27%	26%	14%
Merseyside	15997	95158	14253	5%	7%	3%	20%	24%	15%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	24659	28885	7104	7%	8%	7%	21%	26%	25%
Wirral	16915	19267	4642	2%	4%	-1%	12%	14%	4%
Knowsley	8625	9046	1875	6%	6%	5%	14%	21%	19%
Sefton	14939	15457	3800	3%	4%	3%	8%	14%	14%
St Helens	11255	9895	1943	5%	6%	6%	20%	19%	18%
Merseyside	76393	82550	19364	5%	6%	4%	16%	20%	16%

Table 4.24: Do Minimum Public Transport Trips by Purpose (National Growth)

	2008			2008-2014 Percentage Difference			2008-2024 Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	11520	15969	357	3%	1%	-1%	10%	3%	-3%
Wirral	3852	7150	105	1%	0%	-1%	-2%	-4%	-3%
Knowsley	1558	3987	59	2%	-1%	3%	-4%	-4%	1%
Sefton	4257	7024	109	-2%	-2%	-2%	-7%	-7%	-6%
St Helens	1582	4164	62	2%	2%	3%	2%	0%	1%
Merseyside	22770	38295	693	2%	0%	0%	3%	-2%	-3%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	1655	16491	265	0%	3%	-3%	6%	8%	-5%
Wirral	676	7513	92	-4%	1%	-4%	-8%	3%	-7%
Knowsley	300	3903	54	0%	2%	-2%	-5%	3%	-4%
Sefton	612	7614	92	-7%	0%	-4%	-13%	0%	-11%
St Helens	315	3986	65	1%	5%	0%	-2%	7%	-3%
Merseyside	3557	39506	568	-2%	2%	-3%	-1%	5%	-6%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	13413	8351	786	2%	4%	-1%	4%	11%	-4%
Wirral	4597	4240	310	-1%	4%	-2%	-5%	7%	-8%
Knowsley	2152	1914	161	2%	2%	-1%	-4%	4%	-10%
Sefton	4110	4005	243	-2%	3%	-3%	-8%	5%	-8%
St Helens	2183	1837	164	2%	6%	1%	-1%	10%	-1%
Merseyside	26455	20346	1665	1%	4%	-1%	-1%	8%	-6%

4.5 Final Strategy (National Growth)

The impact of Final Strategy measures on the Do-Minimum for the national growth scenario are shown in this section.

4.5.1 Final Strategy Travel Mode Share (National Growth)

Tables 4.25 and 4.26 show the forecast impact of the Final Strategy on the Do-Minimum mode. The implementation of the Final Strategy is forecast to result in reduction of the average car mode share from about 67% to about 65% in 2014 and from 67% to 66% in 2024 over the two modelled peak hours. The public transport mode share however is forecast to rise from an average of about 19% in 2014 to 21% and from over 17% to 19% in 2024. The trends under this scenario are the same as the local growth forecast with slightly lower car mode share and higher public transport trips mode share.

Table 4.25: Do Minimum & Do Something 2014 Mode Share (National Growth)

	2014 Do-Minimum			2014 Do-Something		
AM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	61%	13%	26%	59%	13%	28%
Wirral	71%	12%	17%	69%	12%	19%
Knowsley	68%	14%	17%	66%	14%	19%
Sefton	63%	18%	19%	61%	18%	21%
St Helens	70%	14%	16%	69%	14%	17%
Merseyside	65%	14%	21%	64%	14%	22%
PM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	65%	11%	23%	63%	11%	25%
Wirral	73%	11%	16%	72%	11%	18%
Knowsley	73%	12%	15%	72%	12%	17%
Sefton	65%	19%	15%	64%	19%	17%
St Helens	74%	13%	13%	73%	13%	14%
Merseyside	69%	13%	18%	67%	13%	20%

Table 4.26: Do Minimum & Do Something 2024 Mode Share (National Growth)

	2024 Do-Minimum			2024 Do-Something		
AM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	63%	14%	23%	61%	14%	25%
Wirral	71%	13%	16%	70%	13%	17%
Knowsley	69%	16%	15%	68%	15%	17%
Sefton	62%	21%	17%	61%	21%	18%
St Helens	71%	15%	14%	70%	15%	15%
Merseyside	66%	15%	18%	65%	15%	20%
PM Peak Hour	**Car**	**Freight**	**PT**	**Car**	**Freight**	**PT**
Liverpool	67%	12%	21%	65%	12%	23%
Wirral	74%	12%	15%	72%	12%	16%
Knowsley	74%	13%	13%	73%	13%	15%
Sefton	64%	22%	14%	63%	22%	15%
St Helens	75%	14%	12%	74%	14%	12%
Merseyside	69%	14%	17%	68%	14%	18%

4.5.2 Final Strategy : Highway and Public Transport Trips (National Growth)

The impact of Final Strategy measures on the Do-Minimum trips under the national growth scenario are shown in Tables 4.27 to 4.30. The results show that the Final Strategy measures relative to the Do-Minimum would lead to the same level of reductions (between 1% to 3%) in highway trips in 2014 and slightly larger reduction in 2024 as the local growth forecasts. The public transport trips as a result of implementing the Final Strategy are forecast to increase by an average of over 8% in 2014 and over 7.5% in 2024 across the modelled periods.

Table 4.27: Do Minimum & Do Something 2014 Highway Trips (National Growth)

	2014 Do Minimum			2014 Do Minimum – Do Something		
	AM	IP	PM	AM	IP	PM
Liverpool	78024	58633	73783	-3%	-3%	-3%
Wirral	51537	35358	46591	-2%	-2%	-2%
Knowsley	25715	16854	23414	-1%	-1%	-1%
Sefton	46292	33307	44892	-1%	-2%	-2%
St Helens	29694	19518	27553	-1%	-1%	-1%
Merseyside	231262	163670	216233	-2%	-2%	-2%

Table 4.28: Do Minimum & Do Something 2024 Highway Trips (National Growth)

	2024 Do Minimum			2024 Do Minimum – Do Something		
	AM	IP	PM	AM	IP	PM
Liverpool	91956	69687	85742	-3%	-3%	-3%
Wirral	56673	39981	51609	-1%	-1%	-2%
Knowsley	28997	19621	26273	-1%	-1%	-1%
Sefton	51252	38333	49970	-1%	-1%	-2%
St Helens	33885	22584	31447	-1%	-1%	-1%
Merseyside	262763	190206	245042	-2%	-2%	-2%

Table 4.29: Do Minimum & Do Something 2014 Public Transport Trips (National Growth)

	2014 Do Minimum			2014 Do Minimum – Do Something		
	AM	IP	PM	AM	IP	PM
Liverpool	28357	18828	23097	10%	8%	9%
Wirral	11120	8323	9305	10%	7%	8%
Knowsley	5606	4331	4310	14%	5%	9%
Sefton	11184	8241	8386	10%	4%	11%
St Helens	5937	4555	4332	6%	5%	7%
Merseyside	62205	44279	49429	10%	6%	9%

Table 4.30: Do Minimum & Do Something 2024 Public Transport Trips (National Growth)

	2024 Do Minimum			2024 Do Minimum – Do Something		
	AM	IP	PM	AM	IP	PM
Liverpool	29407	19819	23923	8%	7%	8%
Wirral	10728	8423	9195	8%	7%	8%
Knowsley	5376	4345	4192	14%	4%	8%
Sefton	10558	8253	8180	8%	6%	8%
St Helens	5830	4627	4336	7%	5%	5%
Merseyside	61900	45466	49825	9%	6%	8%

The impact of the Final Strategy on the forecast Do-Minimum car and public transport trips related to Liverpool City Centre under National Growth is shown in Tables 4.31 to 4.32. The reduction in the two way car trips under this scenario is of similar magnitude to the local growth forecast with a range of -5% to -11% in 2014 and -5% to -9% in 2024 over the three modelled periods. The public transport trips relative to the forecast Do-Minimum under this scenario show average increases of about 7% in 2014 and 6% in 2024 across the three modelled periods.

Table 4.31: Do Minimum & Do Something 2014 and 2024 Liverpool City Centre Car Trips (National Growth)

2014 Do Minimum			2014 Do Minimum – Do Something Percentage Difference		
AM	IP	PM	AM	IP	PM
9,896	8,535	10,321	-5%	-11%	-9%
2024 Do Minimum			**2024 Do Minimum – Do Something Percentage Difference**		
AM	**IP**	**PM**	**AM**	**IP**	**PM**
12,563	10,611	12,474	-5%	-9%	-8%

Table 4.32: Do Minimum & Do Something 2014 and 2024 Liverpool City Centre Public Transport Trips (National Growth)

2014 Do Minimum			2014 Do Minimum – Do Something Percentage Difference		
AM	IP	PM	AM	IP	PM
10,178	6,418	10,780	8%	5%	7%
2024 Do Minimum			**2024 Do Minimum – Do Something Percentage Difference**		
AM	**IP**	**PM**	**AM**	**IP**	**PM**
11,099	7,022	11,290	7%	5%	6%

4.5.3 Final Strategy : Trips by Purpose (National Growth)

Tables 4.33 to 4.36 show the results of the Final Strategy on the Do-Minimum trips by car and public transport shown by purpose.

The impact of Final Strategy (Do-Something) in this scenario is consistent with the local growth forecast which leads to reduction of all car journeys in both 2014 and 2024 with an average reduction of about 2% in both modelled years and across all three time periods. The impact of the Final Strategy on public transport is similar to that reported under local growth forecast with slightly higher increases of about 8% in the two main commute and 'other' trip purposes in both 2014 and 2024.

Table 4.33: Do Minimum & Do Something 2014 Car Trips by Purpose (National Growth)

	2014 Do Minimum Car Trips			2014 Do Minimum – Do Something Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	31088	30488	5468	-4%	-2%	-3%
Wirral	19614	22282	3695	-2%	-1%	-1%
Knowsley	10249	10312	1570	-2%	-1%	-1%
Sefton	17001	16996	2873	-2%	-1%	-1%
St Helens	12068	12090	1970	-2%	-1%	-1%
Merseyside	90021	92168	15576	-3%	-1%	-2%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	5616	36711	5704	-5%	-3%	-4%
Wirral	3594	23357	3078	-3%	-2%	-2%
Knowsley	1844	10564	1431	-2%	-1%	-2%
Sefton	3393	18930	2675	-2%	-2%	-2%
St Helens	2327	12307	1819	-2%	-1%	-1%
Merseyside	16774	101870	14707	-3%	-2%	-3%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	26332	31097	7592	-4%	-2%	-3%
Wirral	17234	19950	4589	-2%	-1%	-2%
Knowsley	9148	9573	1976	-2%	-1%	-2%
Sefton	15344	16119	3923	-2%	-2%	-2%
St Helens	11848	10534	2066	-2%	-1%	-1%
Merseyside	79906	87274	20147	-3%	-2%	-2%

Table 4.34: Do Minimum & Do Something 2024 Car Trips by Purpose (National Growth)

	2024 Do Minimum Car Trips			2024 Do Minimum – Do Something Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	36678	35579	6391	-4%	-2%	-4%
Wirral	21621	23910	3857	-2%	-1%	-1%
Knowsley	11342	11594	1698	-2%	-1%	-1%
Sefton	18346	18113	3080	-2%	-1%	-1%
St Helens	14023	13427	2119	-1%	-1%	-1%
Merseyside	102011	102622	17145	-3%	-1%	-2%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	6711	43539	6602	-5%	-3%	-4%
Wirral	4031	26216	3242	-3%	-1%	-2%
Knowsley	2054	12359	1588	-2%	-1%	-1%
Sefton	3671	21431	2922	-2%	-2%	-2%
St Helens	2798	14275	1983	-1%	-1%	-1%
Merseyside	19265	117819	16336	-3%	-2%	-3%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	29894	36328	8865	-4%	-2%	-3%
Wirral	18932	21973	4823	-2%	-1%	-2%
Knowsley	9803	10919	2226	-2%	-1%	-1%
Sefton	16109	17656	4346	-2%	-2%	-2%
St Helens	13538	11785	2297	-1%	-1%	-1%
Merseyside	88276	98661	22557	-3%	-2%	-2%

Table 4.35: Do Minimum & Do Something 2014 Public Transport Trips by Purpose (National Growth)

	2014 Do Minimum PT Trips			2014 Do Minimum – Do Something Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	11871	16132	354	10%	9%	32%
Wirral	3875	7141	104	11%	9%	36%
Knowsley	1585	3960	61	13%	13%	39%
Sefton	4165	6911	108	10%	9%	23%
St Helens	1620	4254	64	11%	4%	23%
Merseyside	23117	38397	691	10%	9%	31%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	1656	16916	256	9%	7%	53%
Wirral	651	7584	89	8%	7%	44%
Knowsley	300	3978	53	8%	5%	37%
Sefton	566	7587	88	6%	4%	21%
St Helens	318	4172	65	8%	4%	21%
Merseyside	3490	40238	551	8%	6%	41%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	13625	8690	782	7%	10%	30%
Wirral	4572	4430	303	7%	9%	28%
Knowsley	2194	1956	159	7%	9%	33%
Sefton	4032	4118	236	8%	13%	22%
St Helens	2221	1945	166	6%	7%	15%
Merseyside	26643	21139	1647	7%	10%	27%

Table 4.36: Do Minimum & Do Something 2024 Public Transport Trips by Purpose (National Growth)

	2024 Do Minimum PT Trips			2024 Do Minimum – Do Something Percentage Difference		
AM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	12676	16384	348	9%	8%	33%
Wirral	3780	6846	102	10%	6%	37%
Knowsley	1503	3813	60	12%	14%	27%
Sefton	3945	6511	103	8%	8%	22%
St Helens	1608	4159	63	9%	6%	21%
Merseyside	23511	37713	675	9%	8%	30%
IP	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	1760	17807	253	10%	6%	57%
Wirral	623	7714	86	7%	6%	47%
Knowsley	284	4009	52	8%	4%	32%
Sefton	530	7641	81	7%	6%	25%
St Helens	308	4256	63	9%	4%	24%
Merseyside	3505	41426	535	9%	6%	44%
PM	**Com**	**Other**	**EB**	**Com**	**Other**	**EB**
Liverpool	13926	9245	753	6%	9%	29%
Wirral	4378	4532	286	7%	7%	26%
Knowsley	2056	1990	145	7%	8%	33%
Sefton	3767	4188	224	7%	8%	31%
St Helens	2161	2013	162	5%	5%	14%
Merseyside	26288	21968	1569	7%	8%	27%

5. Summary and Conclusions

This section of the report under the *Model Development Summary* heading provides an outline of the transport model structure and the models developed for the Do-Minimum and the Final Strategy as detailed in chapters two and three above. The main findings detailed in chapter four above and conclusions are set out in the *Summary of Results and Conclusions* section in this chapter.

5.1 Model Development Summary

The Merseyside Local Transport Plan Support Unit (LTPSU) in conjunction with the Merseyside local authorities have developed through a comprehensive process and in line with both national and local objectives, the Final Strategy for the Local Transport Plan (LTP3) which have been assessed and the results reported in this document.

LTPSU commissioned Mott MacDonald to lead on development of a multi-modal transport model in conjunction with SDG Consultants. The model known as Liverpool City Region Transport Model (LCRTM) is a multi-modal transport model comprising a link based highway model, a public transport model and demand model.

The highway and public transport models are concerned with the routing of vehicles and passengers throughout the transport system, whilst the demand model deals with the traveller choices of trip generation, mode choice, macro-time period choice and distribution. The model system operates within the CUBE environment, using VOYAGER applications and scripting. The LCRTM follows the Department for Transport (DfT) guidance WebTAG in respect of its components and structure.

Using the LCRTM modelling system, forecast models were develop to test the Final Strategy for the Merseyside LTP3 under both local and national growth scenarios for the forecast years of 2014 and 2024.

For the local growth forecast, a growth profile developed by PION and Cambridge Econometrics consultants known as Scenario 3 'Aspirational' was used. Under this profile a partial realignment in the finance sector is assumed with a moderate reductions in public expenditure and no imposed constraints on key sector trend growth. In addition, the planning data for large developments including Liverpool Waters, Wirral Waters (East Float), Parkside Depot and Daresbury Park was included into the model to provide further updated local assumptions.

The national (alternative) growth scenario was based on the forecasts contained in the Department for Transport National Trip End Model (NTEM) which uses TEMPRO software for output of data. The TEMPRO used for this assessment was version 6.1.

The modelled hours for this assessment were AM Peak hour 8:00-9:00, Inter Peak hour average hour between 10:00 to 16:00 and PM Peak hour 17:00-18:00.

Forecast networks were developed for two scenarios namely Do-Minimum (without Final Strategy) and Do-Something (with Final Strategy) for the 2014 and 2024 assessment years. For the Do-Minimum, committed schemes were added to the base year networks. The measures associated with the Final Strategy were then added wherever appropriate to the Do-Minimum to form the Do-Something (Final Strategy) scenario.

The forecast Reference Case trip matrices (i.e. before they are input to the demand model) for 2014 and 2024 were developed separately based on the local and national growth (TEMPRO) planning data and assumptions using the External Forecast Model (EFM) module developed for this purpose. The EFM derives future year household changes using household category analysis to model changes in household composition and car ownership, which predicts future year car availability and income splits.

The Final Strategy incorporated in the Do-Something models included a wide range of components including enhancement measures for slow modes (cycling and pedestrians) and public transport including rail, encouraging behavioural change to use public transport, introduction of a smart card system, maintaining capacity on key routes to docks and centres and increases in parking charges.

5.2 Summary of Results and Conclusions

The summary of results and conclusions drawn from the assessment undertaken and reported earlier in this document are set out below:

Mode Share

- The car was shown to remain the main travel mode of transport in the 2014 and 2024 under both the local scenario and national growth scenario. In the Do-Minimum, the average car mode share over the two modelled morning and evening peak hours was forecast at 68% in 2014 and about 69% in 2024 under the local growth assumptions. The corresponding figures for the national growth scenario was reported at about 67% in both assessment years.
- The public transport average mode share under Do-Minimum over the modelled peak hours was reported at over 18% in 2014 and over 16% in 2024 for local growth forecast. The public transport average mode shares under national growth were reported as over 19% in 2014 and over 17% in 2024.
- Introduction of the Final Strategy is forecast to lead to reductions in Do-Minimum car mode share under both growth scenarios. The average size of this reduction was reported at about 2 percentage points in both 2014 and 2024 under local growth. For the national growth scenario the corresponding reduction is 2 percentage points in 2014 and 1 percentage point in 2024.
- The implementation of the Final Strategy is reported to increase public transport mode share under both growth assumptions. The average size of this increase in public transport mode share relative to the Do-Minimum was forecast to be about 2 percentage points in both 2014 and 2024. The corresponding reduction under the national growth assumptions is also 2 percentage points in both 2014 and 2024.

Highway and Public Transport Trips

- The highway trips in the Do-Minimum (without intervention measures) are forecast to increase between 2008 and 2014 by an average of 8% to 2014 and 24% by 2024 over the three modelled periods under the local growth forecast.
- The implementation of the Final Strategy measures (under the local growth assumptions) would lead to reduction in the growth associated with the highway trips over the same period (2008-2024). The size of this reduction relative to the Do-Minimum is 2% in both forecast years (2014 and 2024).
- Under the national growth scenario, the increase in highway trips for the Do-Minimum relative to the base year (2008) was reported to be about 7% by 2014 and about 22% by 2024 which are lower than the local growth forecasts. The impact of the Final Strategy on the Do-Minimum however under this scenario was of the same size as the local growth forecast at a 2% reduction in highway trips for both assessment years.

- The public transport trips were shown to decrease over time relative to the base year (2008) by about 3% in 2014 and 5% by 2024 under the Do-Minimum local growth assumptions. The implementation of the Final Strategy was found to increase the public transport trips relative to the Do-Minimum by an average of about 8% in 2014 and 8.5% in 2024 over the three modelled periods.
- The do minimum trend under national growth scenario for public transport trips across Merseyside was different to that of local growth assumptions with some small increases in PT trips forecast. Implementation of the final strategy produced similar increases in PT trips of over 8% in 2014 and over 7.5% in 2024 over the three modelled periods.
- The trips related to Liverpool City Centre which is a key urban centre show increases in the Do-Minimum two way car trips relative to the base year (2008) of 2% per annum to 2014 and about 2.5% per year thereafter to 2024 under the local growth scenario. The public transport trips under this growth scenario show a slight annual decrease of about 0.4% to 2014 and a net average increase of 0.5% per annum to 2024. Under the national growth scenario, there is by and large a similar pattern with annual increases in car trips of about 1.5% to 2014 and 2.5% to 2024. The public transport trips under national growth scenario however, show a slight annual increase of about 0.3% to 2014 followed by yearly increase of about 0.8% to 2024.
- The impact of the Final Strategy on the forecast Do-Minimum trips related to Liverpool City Centre are similar under both local and national growth scenarios in terms of trend and magnitude. Under the local growth scenario, the car trips show reduction as a result of implementing the Final Strategy at both assessment years (2014 and 2024). The range of this reduction over the two forecast years is reported at between 5% to 11% across the three modelled periods . The public transport trips however, are shown to increase relative to the forecast Do-Minimum with a range of 5% to 9% over the two assessment years.

Trips by Purpose

- The car journeys across Merseyside under the local growth scenario showed increases across all modelled purposes (Commute, Other and Employer's Business) between 2008 and the Do-Minimum forecast years. The average rate of increase was reported at about 1.4% to 2024 over the three modelled periods for the commuting trips. For the 'Other' trip purpose this was about 1% to 2014 and 1.3% to 2024. Under the national growth scenario, a similar trend of growth was reported in the do-Minimum relative to the base for all car trip purposes. The average rate of growth under this scenario at 1% was lower in comparison to the local growth forecasts.
- The public transport trips by purpose under the local growth forecast showed decreases in the Do-Minimum across all trip purposes relative to the base year of 2008 across Merseyside. The range of the decreases in public transport trips were between about 0.5% to 1% for commuting and 'other' trip purposes over the three modelled periods. Under the national growth scenario, as well as reductions in the use of public transport trips there are increases in commuting and 'other' trip purposes between 2008 and 2024.

The overall pattern of results based on the model outputs show that in absence of intervening measures the highway trips in Merseyside are set to rise by about 8% from 2008 to 2014 and 24% to 2024 from the same base year under the local growth forecast. Public transport trips for the same period show a decline of about 3% to 2014 and 5% by 2024. The implementation of the Final Strategy however is forecast to result in a reduction of 2% in the Do-Minimum highway trips in 2014 and 2024 whilst leading to notable increases in the Do-Minimum public transport trips of 8% in 2014 and 8.5% in 2024.

Results using the national (alternative) forecasts show slightly lower highway trip forecasts and higher PT trip forecasts in the Do-minimum, with the final strategy having similar impacts as the local scenario in reducing highway growth and increasing PT trip levels.

Appendices

Appendix A. Linking to MAEI

A.1. Introduction

Results from the LCRTM have been used as an input to provide future year forecasts of atmospheric emissions in the Merseyside Atmospheric Emissions Inventory (MAEI).

The purpose of this section is to describe the process used to test the atmospheric emissions impacts of the final strategy and summarise the findings.

A.2. Merseyside Atmospheric Emissions Inventory (MAEI)

MAEI is a database of geographically referenced datasets of emissions sources within the Merseyside region holding estimates of the amount and type of pollutants emitted to the air from these sources. It provides a structured framework within which emissions information is stored and analysed, allowing comparisons between different emission source types and across the Merseyside local authorities.

Information on the following air pollutants is held;
- Benzene
- 1,3-butadiene
- Carbon monoxide
- Lead
- Mercury
- Non-methane volatile organic compounds
- Oxides of nitrogen (NOx)
- Particulate matter less than 10 micrometers aerodynamic diameter (PM10)
- Sulphur dioxide

And the following greenhouse gases;
- Carbon dioxide (CO2)
- Hydro-fluoro carbons
- Methane
- Nitrous oxide
- Per-fluoro carbons
- Sulphur hexafluoride

Emission sources are grouped into four major categories;
- Point emission source category; includes stationary emission sources identified individually due to the quantity or nature of their atmospheric emissions.
- Line emission source category; includes emission sources along a defined line e.g. major road and rail transport.
- Area emission source category; includes emission sources that may be treated in an aggregated fashion, since it is not necessary or may not be feasible to locate the emissions any more specifically. These include tunnel vents, rail and bus stations and petrol stations.
- Grid emission source category; includes emission sources whose individual emissions do not qualify them as a point or line source (individually they emit smaller quantities of pollutants), however significant emissions can arise from a cumulative impact e.g. minor roads.

A.3. Linking MAEI to LCRTM

A.3.1. Emissions modelled

Emissions studied for the purposes of LTP forecasting are;

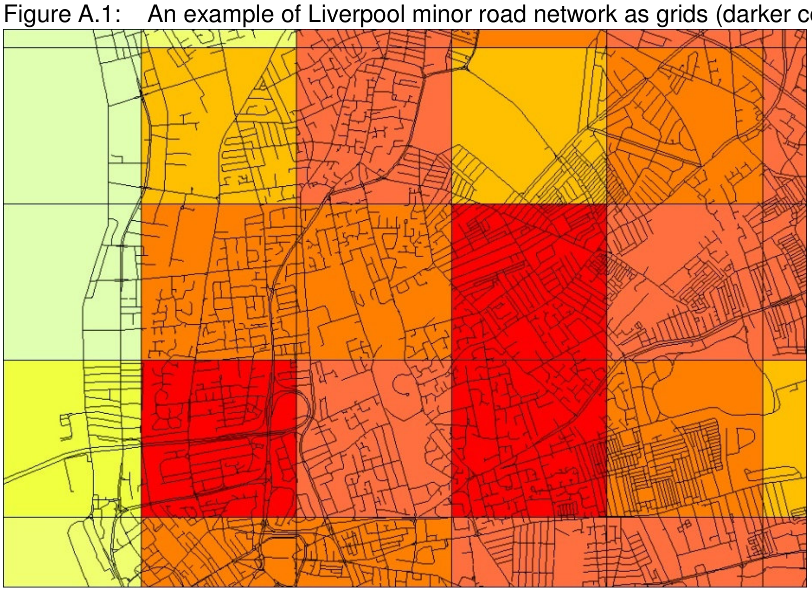
- Carbon dioxide
- PM10 (exhaust emissions) from combustion
- PM10 (non-exhaust emissions) from brake and tyre wear
- NOx

A.3.2. Road traffic

Road traffic in MAEI is modelled in two ways. Major roads are modelled as line emission source categories. The major road network is mapped as links and annual average flow data in conjunction with vehicle related emission factors used to calculate total emissions. Flow data from the LCR TM was overlaid on the network to forecast future trends in emission sources. Flow data includes the following categories; cars & taxis, buses & coaches, LGVs, HGVs rigid, and HGVs articulated.

The minor road network can not be mapped as a line emission source; instead it is mapped as a grid emission source category. Flow data is not available for most minor roads, they are modelled using DfT statistics on vehicle km travelled, vehicle proportions, and average speeds and represented across 1km2 grids based on the length of minor roads in each grid (see figure below).

Figure A.1: An example of Liverpool minor road network as grids (darker colour represents greater road km)



The LCR TM does not model traffic flows on the minor road network, therefore direct translation of data in to MAEI is not possible. With this in mind we take two approaches to reporting emissions from the road network;

The LCR TM does not model traffic flows on the minor road network, therefore direct translation of data in to MAEI is not possible. With this in mind we take two approaches to reporting emissions from the road network;

- Excluding minor roads; for the purpose of drawing comparisons between the do minimum and final strategy scenarios minor roads were excluded. It was considered that the inclusion of minor roads at a baseline level would distort the impact of the LTP strategy.
- Including minor roads; for the purpose of air quality modelling and comparisons with the 2008 base year it was necessary to include a proxy for emissions from the minor road network. Inclusion of minor roads

at a baseline level was again considered inappropriate as forecast increases in traffic levels would not be represented. In the absence of flow data from LCR TM an average traffic growths were included across all minor roads which were reflective of LCRTM outputs. These figures are currently unavailable and will be reported at a later date.

A.4. Additional modelling

A.4.1. Improved efficiency of vehicles

Forecast emission values for vehicles (except buses) are based on Defra's Emission Factor Toolkit (EFT). Improvements in emission factors would be expected over the modelled period due to technology improvements and legislative requirements. This is represented in MAEI by altering the proportion of different Euro standard vehicles in the fleet as recommended by the EFT.

Current EFT guidance recognises vehicle standards up to Euro VI – the highest standard currently available. It is to be anticipated that continued improvements to vehicle standards will result in further Euro grades which are not represented within the EFT or MAEI. Whilst the approach adopted is correct and the most accurate measure available to us, we believe this will result in an underestimate of future emission reductions. This may be particularly true of CO2 which is subject to EU reduction targets in new vehicles.

Forecast emission factors for buses for 2014 and 2024 were produced separately. Merseyside bus fleet composition, collected by Merseytravel, for the current year (2010) was used in the 2014 scenario as relatively small turnover in stock was expected during the intervening time. For 2024 scenario the fleet composition was modelled as 75% Euro VI and 25% Euro V[1]. Previous data shows that after 5 years of a new Euro standard being available it typically represents around 20% of the Merseyside fleet. Extrapolation of this trend would suggest that we would achieve the suggested ratio by 2024. In addition to this pressure from potential air quality fines and initiatives such as the Green Bus Fund could accelerate uptake. In balance, there are concerns that rising vehicle standards to date could have been driven by in-vehicle improvements (e.g. cosmetic improvements, CCTV, air conditioning) rather than engine standards, and that this may decline as vehicles reach the highest standards.

A.4.2. Electric vehicles

Electric vehicles produce no atmospheric emissions at point of use. They are modelled through MAEI by assigning emission factors of zero for all relevant vehicles. To 2014 there were assumed to be no significant numbers of electric vehicles. 2024 do nothing and final strategy scenarios include assume that 15.84% of the fleet are electric (based on Adroit Economics report [2]).

A.4.3. Liverpool – Manchester Electrification

Electric trains produce no atmospheric emissions at point of use. They are modelled through MAEI by registering emission factors of zero for relevant services. The electrification was not included in 2014 scenario but is included in 2024 scenarios.

A.5. Notes about NOx

Over recent months there has been growing evidence that Euro IV and V engines have not resulted in expected reductions of NOx. Due to this there is likely to have been an overestimation of reductions

1 Euro IV vehicles with particulate traps fitted are modelled as Euro V.

2 NW electric vehicle manufacturing, take-up and impact modelling (2010) Dr Steve Sheppard

achieved in this pollutant. To date there has been no change to government guidance on NOx engine emission factors.

We have taken a cautionary stance and have modelled NOx using both existing guidance on emission factors and corrected figures which take account of the underperformance. The latest view is that Euro IV and V engines have shown little improvement from Euro III in terms of NOx reduction. Therefore, in the corrected version, 2014 forecasts for all Euro IV and V vehicles are reapportioned and assigned against Euro III emission factors. Euro VI engines are believed to significantly improve NOx emissions and will be treated as normal.

Corrected and uncorrected results are reported below.

A.6. Results

Changes in emissions are summarised in the table below;

Table A.1: Summary changes in emissions to 2014 and 2024

Scenario	Year/Change	CO2	NOx	PM10
Do Minimum	2008	1,500Ktonnes	5,500tonnes	460tonnes
	Change to 2014	5%	10%	-3%
	Change to 2024	1%	-76%	-5%
Final Strategy	Change to 2014	3%	9%	-4%
	Change to 2024	0%	-77%	-6%
Difference DM/FS	2014	-1.4%	-1.2%	-1.1%
	2024	-1.2%	-1.0%	-0.9%

Emissions of CO2 and NOx increase initially in both the Do Minimum and Final Strategy outputs due to significant forecast increases in traffic growth from the LCRTM. Through to 2024 this increase is tempered by advances in cleaner vehicle technology. While CO2 falls back to 2008 rates in 2024, NOx and PM10 are showing major improvements with decreases of 76% and 5% respectively under the Do Minimum scenario. It should be noted that the results modelled, particularly in relation to CO2, are considered to be a conservative estimation of environmental improvements to vehicle technology (see above). We may expect to see greater reductions in CO2 emissions by 2024 as vehicle manufacturers are required to comply with EU regulations on environmental performance of new vehicles.

Full forecasts are shown in the figures below:

Table A.2: Full emission forecasts to 2014 (tonnes per annum)

	2008	Do Minimum	Final Strategy	Difference (DM/FS)	Savings (£M per year)
NOx (Uncorrected)	4,715	3,705	3,661	-1.2%	£0.05
NOx (Corrected)	5,503	6,056	5,983	-1.2%	£0.08
PM10 (Exhaust)	135	95	94	-1.1%	£0.10
PM10 (Non-exhaust)	323	351	347	-1.1%	£0.39
PM10 (Total)	458	446	441	-1.1%	£0.49
CO2	1,499,614	1,568,581	1,547,373	-1.4%	£0.62

Table A.3: Full emission forecasts to 2024 (tonnes per annum)

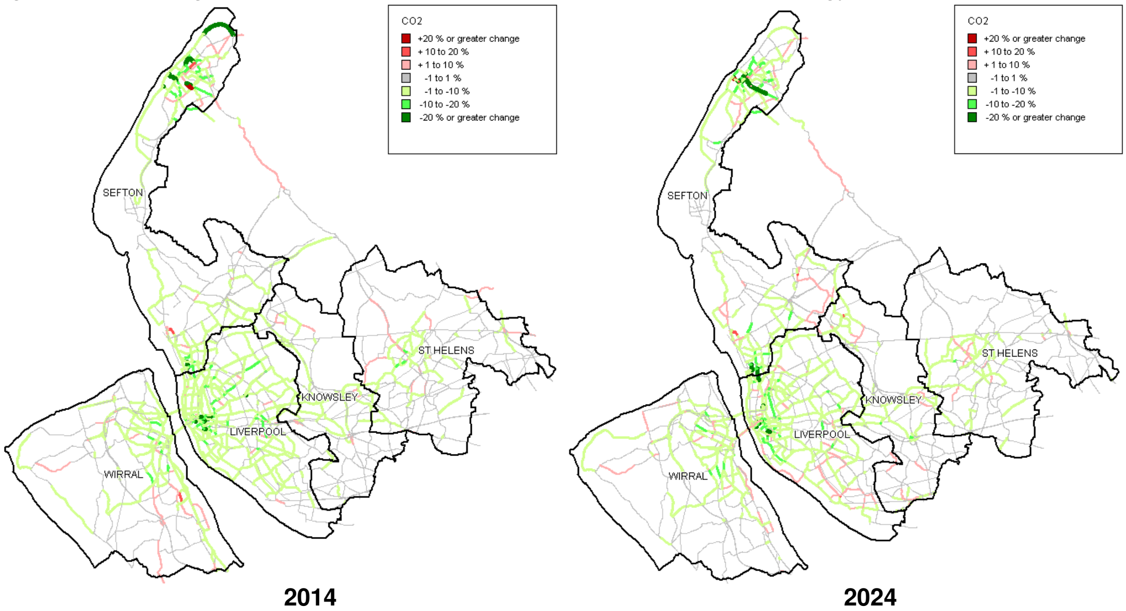
	2008	Do Minimum	Final Strategy	Difference (DM/FS)	Savings (£M per year)
NOx (Uncorrected)	4,715	1,298	1,285	-1.0%	£0.02

	2008	Do Minimum	Final Strategy	Difference (DM/FS)	Savings (£M per year)
NOx (Corrected)	5,503	1,298	1,285	-1.0%	£0.02
PM10 (Exhaust)	135	23	23	0.0%	£0.00
PM10 (Non-exhaust)	323	412	408	-1.0%	£0.47
PM10 (Total)	458	435	431	-0.9%	£0.47
CO2	1,499,614	1,518,434	1,500,255	-1.2%	£0.64

The figures include an estimation of the financial value of reducing emissions. These figures are taken from the Intergovernmental Group on Costs and Benefits (IGCB) Damage Cost Calculator. Emissions of pollutants cause damage to health, buildings and crops and result in financial penalties or costs; costs can be avoided by reducing emission outputs. In total financial savings to Merseyside of just over £1 million per year are forecast to be achieved throughout LTP3 by implementing the final strategy.

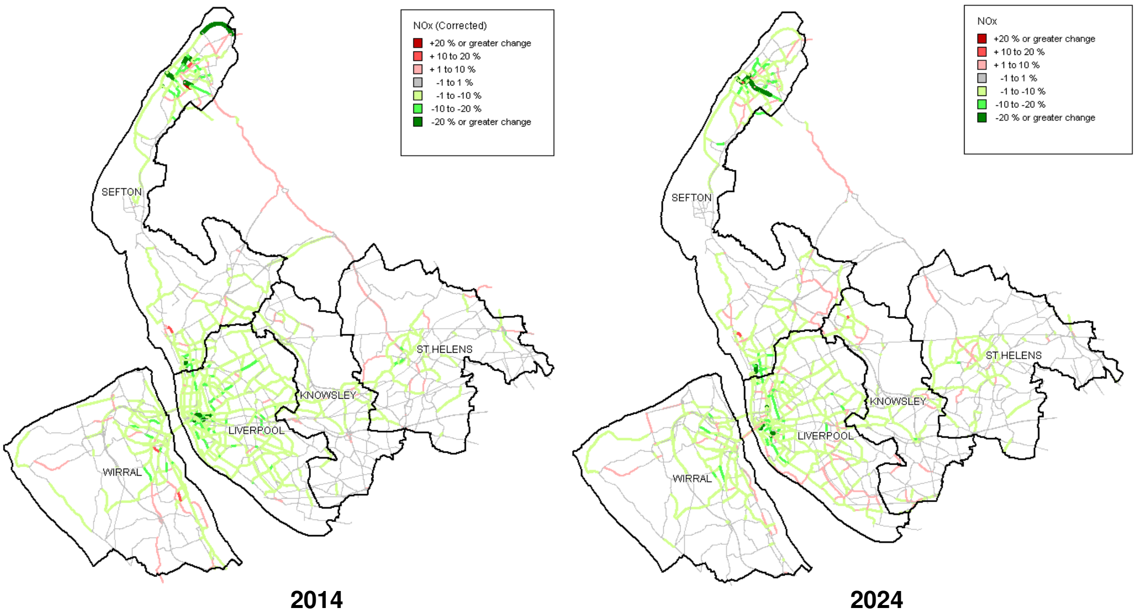
The geographical distribution of emission sources have been mapped and are illustrated below:

Figure A.2: Changes in CO2 emissions between do minimum and final strategy.



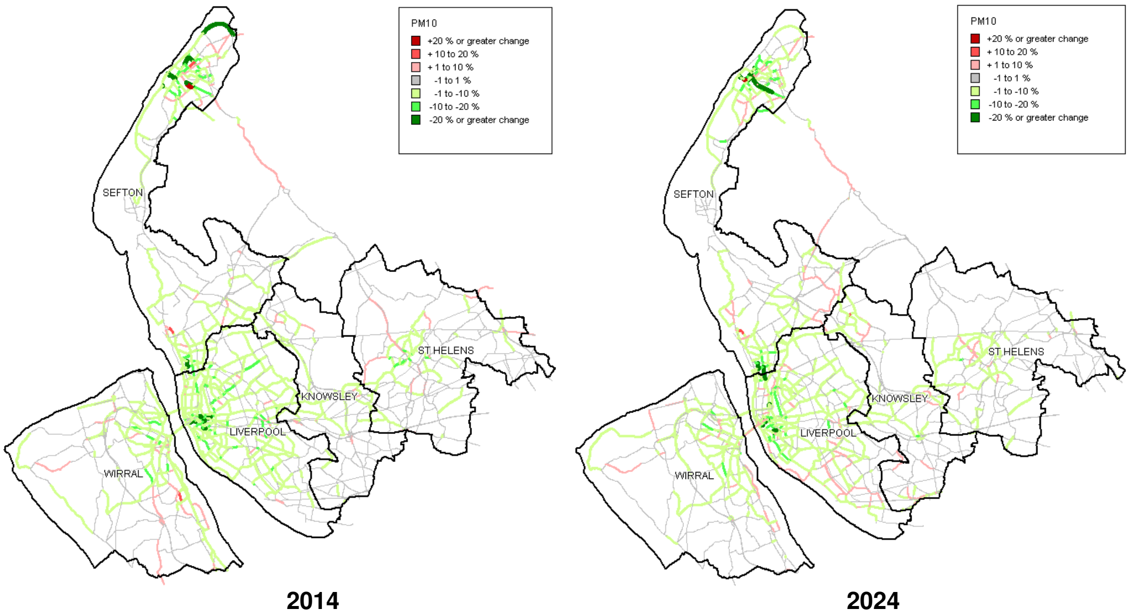
Source: MAEI

Figure A.3: Changes in NOx emissions between do minimum and final strategy.



Source: MAEI

Figure A.4: Changes in PM10 emissions between do minimum and final strategy.



Source: MAEI

The maps show road links which have increased emissions of air pollutants in red and orange, reduced emissions in green and those which have remained stable in grey. The model forecast increased emissions on approximately 6.1% of links, decreased emissions on 29.2% and negligible change on 64.7%.