

MSTS Stage 3 Interim Summary Report **Mid Sussex Transport Study**



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1 Introduction

1.1 Overview

This is an interim summary of the outcomes and findings from the Mid Sussex Transport Study, Stage 3, (MSTS S3), which investigates the likely impacts of the Mid Sussex Pre-Submission District Plan (2014-2031), published by Mid-Sussex District Council (MSDC) for consultation in June 2015. This District Plan scenario is termed the 'Development Case', for modelling and appraisal purposes.

The summary report also considers the transport implications of an 'Additional Development Case' scenario, which represents a higher level of development than that proposed in the Pre-Submission District Plan and is based on a theoretical maximum development ceiling, to align with the Strategic Housing Land Availability Assessment (SHLAA), published by MSDC in May 2015. It also takes account of accompanying MSDC proposals for employment land.

The interim status of this report reflects the MSDC intention to revise the MSTS S-3 Development Case, in due course, to account for a proposed increase to the housing provision made in the Mid Sussex District Plan (2014-2031).

1.2 Objectives

It is the purpose of MSTS S-3 to examine the impact on the transport network of land uses proposed in the District Plan. It uses a variant of the West Sussex County Transport Model (WSCTM) to predict the highway and passenger travel patterns associated with committed, strategic and neighbourhood development in the District Plan. It then tests the ability of the transport network to handle the trip demands arising from the development scenarios and assesses the ability of appropriate transport interventions to mitigate any adverse impacts.

Stage 3 is the most recent refinement of the MSTS, which is required by MSDC to:

- Inform the allocation of strategic development through the further revised Mid Sussex District Plan;

- Inform consideration of the sustainable transport options and assumptions to be incorporated into the District Plan evidence; and the Mid Sussex Infrastructure Delivery Plan;
- Address the requirements of both West Sussex County Council as the Highway Authority and Highways England, both of whom aim for a sustainable approach to transport with the common objective of managing travel demand to minimise congestion, delays and adverse environmental / safety impact;
- Be in general conformity with current Government planning practice guidance on evidence bases in plan making;
- Identify forecast changes in traffic flow on roads entering the Ashdown Forest, as a result of housing and commercial development in Mid Sussex, to inform analysis under the Habitats Regulations; and
- Examine the impacts of a proposed science and technology park to the west of Burgess Hill (a proposed broad location within the District Plan).

Future scenarios have been tested in Stage 3, based upon the Mid Sussex SHLAA (May 2015) and employment land proposals, for the weekday AM and synthesised PM peak at 2031. These future scenarios comprise:

- A 'Reference Development Case', containing: committed developments; windfalls; and committed transport schemes;
- A core District Plan 'Development Case', containing: committed and strategic developments; Neighbourhood Plan development, (spread across the District in line with defined and emerging plans and estimated rates of delivery); and committed and remedial transport schemes; and
- An 'Alternative Development Case', consistent with the 'Development Case', but also containing: a potential science and technology park to the west of Burgess Hill.

A further, 'Additional Development Case' scenario has also been tested, based on a theoretical maximum development ceiling, to align with the Strategic Housing Land Availability Assessment (SHLAA), published by MSDC in May 2015. This was undertaken, primarily, to examine the likely impact of additional housing upon the Ashdown Forest,

but it also provides an indication of the impacts upon the wider transport network. This Additional Development Case scenario tested the provision of 1,106 more homes, compared with the Development Case.

Given that the WSCTM is an AM peak-only model, the traffic assessment for the Study has focused, mainly, on this critical peak period. However, the District Plan proposals are also likely to have significant impacts during a typical evening peak. Therefore, AM peak demand matrices were transposed and factored to realistic journey purpose levels based on the TEMPRO West Sussex data set. These matrices were assigned to the transport model and the outputs used to derive an indication of the likely impacts during the PM peak.

1.3 Scope of Interim Summary Report

In scope, the remainder of this report consists of the following sections:

- Chapter 2 outlines the content and fitness for purpose of the multi-modal model and describes the future development scenarios that have been represented;
- Chapter 3 summarises the modelling results, output analyses and conclusions drawn from the MSTS S-3 findings;
- Chapter 4 discusses the broad outcomes from the impact assessment of an additional development case scenario upon Ashdown Forest and the wider transport network; and
- Chapter 5 draws conclusions from the interim Study.

2 MSTS Stage-3 Transport Model Content

2.1 Overview

This section reviews the fitness for purpose of the MSTS S-3 multi-modal transport model and the content of the future year scenarios that have been used to appraise the MSDC District Plan.

2.2 Base Year Model 2008

The West Sussex County Transport Model from 2008 was re-based and refined in key areas of interest, mainly Burgess Hill and the Strategic Road Network (i.e. M23 / A23 between Crawley and Brighton), to become the 2008 AM peak base model for MSTS S-3. This MSTS model represented multi-modal transport conditions, using a package of SATURN highway, CUBE Public Transport (PT) and CUBE variable demand software. It incorporated some additional detail from the Burgess Hill Transport Model. The revised MSTS S3 highway model was checked for its accuracy against recorded AM peak flow conditions, in 2008, for the parts of the road network shown below.

- Burgess Hill – total directional movements across the following 2-way links:
 - Cordon – 8 sites;
 - North/South screen-line – 5 sites;
 - East/West screen-line (West of B2036 London Road) – 5 sites;
 - East/West screen-line (East of B2036 London Road) – 3 sites;
- Burgess Hill – individual directional movements on the following links:
 - All cordons and screen-lines – 42 sites;
- Strategic Road Network – total directional movements on the following 2-way links:
 - M23 – 28 sites;
 - A23 – 24 sites;

- West Sussex County – total directional movements across the following 2-way links:
 - East/West screen-line (A) – 6 sites;
 - East/West screen-line (B) – 5 sites;
 - East/West screen-line (C) – 7 sites;
 - East/West screen-line (E) – 7 sites;
 - East/West screen-line (F) – 11 sites;
 - North/South screen-line (D) – 8 sites;
 - North/South screen-line (G) – 9 sites;
 - North/South screen-line (H) – 10 sites;
 - North/South screen-line (I) – 6 sites;

The MSTS stage-3 highway model was also checked for its reliability against vehicle journey times, through and around Burgess Hill, on 8 directional routes.

Base model flow and travel time validity were mainly judged in terms of percentage change from observed values to modelled values. Flows were also tested by means of the 'GEH' accuracy statistic. The validation criteria and thresholds of acceptability were set according to DfT WebTAG specifications (Unit M3.1).

2.2.1 Assigned Traffic Flow Validation Summary

Flow validation in the base traffic model has been judged against three criteria. Criteria 1 and 2 are each required to be met in at least 85% of cases. These two criteria are:

- Criterion 1 – Individual Flow Comparison (in at least 85% of cases):
 - Individual flows within 100 veh/h of counts for flows less than 700 veh/h;
 - Individual flows within 15% of counts for flows from 700 to 2,700 veh/h; and
 - Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h.
- Criterion 2 - GEH Statistic (in at least 85% of cases):
 - Links should have a GEH value of 5 or less.

Criterion 3 assesses the validity of aggregated model flows on links that are combined, to form directional cordons and screen-lines.

- Criterion 3 – Total Screen-line or cordon flow modelled change from observed:
 - Modelled flow within +/- 5% of observed at 'nearly all' locations.

Burgess Hill Flow Validation

In the base 2008 AM peak traffic model, there was demonstrated to be a reasonably good fit between observed and modelled traffic flows on combined links in Burgess Hill, with the majority of cordon and screen-line flows (5 out of 8) meeting required thresholds (i.e. modelled flow within +/- 5% of observed at 'nearly all' locations). In the non-compliant cases, the observed total screen-line flows were relatively low, meaning that a small change in modelled flow volumes created a large percentage change, resulting in differences being greater than the WebTAG typical measure of 5%.

At all cordons and screen-lines the respective GEH values were less than 5, meaning that overall there remained a good fit between modelled and observed, once the scale of flow was allowed for.

The model accuracy was also generally good, when compared with WebTAG criteria at individual link locations in Burgess Hill, as follows:

- The percentage of individual flows within 100 veh/h of counts for flows less than 700 veh/h is 86%;
- The percentage of individual flows within 15% of counts for flows from 700 to 2,700 veh/h is 86%; and
- The total percentages of assigned flows in each model that have a 'GEH' value of 5.0 or less, when compared to observed counts is 86%.

These results show that the accuracy of the modelled flows exceeded all of the WebTAG criteria.

There were two link locations with modelled flow GEH greater than 10 (i.e. West Street eastbound and westbound). These flow inaccuracies reflected the necessary absence in the strategic model of some finer network and zoning detail in Burgess Hill, because this

detail would be incompatible with the scope of available data and capabilities of the model's mechanisms. Although the base model could not truly replicate all route choices and traffic movements here, this is not a concern, as overall, the model did accurately represent base flows on the main corridors through the urban area.

Strategic Road Network Flow Validation

The accuracy of the AM peak 2008 base highway model was also shown to be generally very good, when compared with WebTAG flow criteria at individual locations on the M23/A23 Strategic Road Network. The main findings from the flow validation are summarised below:

- The percentage of individual flows within 100 veh/h of counts for flows less than 700 veh/h is 92%;
- The percentage of individual flows within 15% of counts for flows from 700 to 2,700 veh/h is 90%;
- The percentage of individual flows within 400 veh/h of counts for flows more than 2,700 veh/h is 94%; and
- The overall proportion of assigned flows that have a 'GEH' value of 5.0 or less, when compared to observed counts is 89%.

These results show that the modelled traffic flows on the SRN validated well and exceeded all of the WebTAG criteria.

M23 J9 (Gatwick) was less accurately modelled, because it lay outside the area of detailed validation in the original WSCTM and had no traffic counts with which to shape the model precision here. Overall, the modelling of the SRN was sufficiently accurate to give a robust assessment of the District Plan impact on the SRN.

West Sussex County Network Flow Validation

It was shown that the wider West Sussex model area validated reasonably well, in terms of modelled and observed flow comparisons at 18 directional screen-lines across the county network, when assessed against WebTAG criteria (i.e. total modelled flow within +/- 5% of observed at 'nearly all' screen-lines). The majority, or 'nearly all' (14 out of

18, or 78%) of the directional screen-lines satisfactorily achieved the flow difference criteria of +/- 5%.

Considering screen-lines D, E and F separately, as they are the closest strategic screen-lines to the core Mid Sussex District, the majority, or 'nearly all' (4 out of 6, or 67%) of the directional data sets successfully met the flow difference criteria of +/- 5%.

The original, wider-area, WSCTM model validation accuracy was reduced by the necessary inclusion of additional road network detail in the MSTS model for links to the east of Mid Sussex, in Lewes and Wealden districts of East Sussex. These additional links at Ashdown Forest were needed to enable fuller appraisal of the District Plan impacts on the Special Area of Conservation and Special Protection Area, within the area bounded by A264 and B2110 to the north, A26 to the east and A22 to the west. The road links added to the MSTS model comprised B2188, B2026, Coleman's Hatch Road and Kidd's Hill.

The accuracy of the wider West Sussex County network validation could have been improved in the MSTS, by adding observed flows from the WSCC strategic screen-lines into the SATURN trip matrix estimation process. However, this was not done, because it would distort the previously-validated and approved trip matrix origin to destination (O-D) movements from the 2008 strategic model.

2.2.2 *Highway Journey Time Validation Summary*

Journey time validation in the 2008 MSTS S3 highway model was checked, on routes through and around Burgess Hill, against two criteria:

- Criterion 1 – Modelled, directional route journey times within +/-15% of observed times;
- Criterion 2 – Modelled, directional route journey times within +/-1 minute of observed, if modelled journey time exceeds observed by more than +15%.

Taken together, one or other of the above criteria are required to be met in at least 85% of cases.

Burgess Hill Journey Time Validation

Accuracy of the modelled network travel times, in Burgess Hill, was found to be reasonably acceptable, with 75% of routes (six out of eight) showing modelled journey times within +/- 15% of observed (target 85%). There were no routes with modelled time exceeding observed by more than 15%.

The slight shortfall in journey time accuracy arose from the necessary omission from the transport model of some network and zoning detail in Burgess Hill, because this detail would be incompatible with the scope of available data and capabilities of the model's mechanisms. It means that the strategic model could not truly replicate all local junction congestion and delay. This was not a concern, as other validation checks have shown that the modelled flow patterns and chosen O-D routes were reliable.

2.2.3 Overall Validation Summary

Overall, in terms of the measured base model accuracy of assigned traffic flows and route travel times, the MSTS S3 model was considered to be robust and fit-for-purpose, within the limitations of its purpose, scope, content and mechanisms.

2.3 Future Year Model 2031

The validated base MSTS S3 2008 AM peak model was projected to forecast year 2031. An additional PM peak highway-only model was also synthesised at forecast year 2031, derived from the AM model.

The PM assignments were undertaken using the SATURN highway model only. It did not use the full multi-modal model mechanisms in the AM model, (e.g. destination choice and mode choice). Hence, the PM outcomes were not reliable as definitive results for the local Mid Sussex network. They were only intended as indicative of impacts on the Strategic Road Network (SRN), i.e. A23 / M23.

2.3.1 Model Mechanisms

The future year model included several mechanisms, to represent traveller responses to: changes in trip demand volumes; changes in available transport facilities and capacity; and changes in congestion and travel costs. These mechanisms were:

- Trip generation and attraction at O-D zones;
- Trip distribution and destination choice;
- Travel mode choice;
- SATURN highway route choice assignments; and
- CUBE PT route choice assignments.

Checks were made to ensure that the future year model achieved satisfactory convergence and stability, in all scenarios.

2.3.2 Future Model Travel Demand and Transport Supply Scenarios

In MSTS S3, various 2031 scenarios were forecast from the 2008 base and tested to cover a range of travel demand and transport supply combinations, as follows:

- 'Reference Development Case', representing: Background trip growth from the National Trip End Model (NTEM) and Road Traffic Forecasts (RTF15); Committed land-use site trip movements; ad hoc 'windfall' land-use trips; Committed transport schemes; and appropriate land-use site access schemes.
- 'Development Case', representing: Background trip growth; Committed land-use trips; Windfall land-use trips; District Plan land-use site trips; Neighbourhood Plan land-use trips; Committed transport schemes; 'Primary' and 'Secondary' remedial transport interventions; and appropriate land-use site access schemes.
- 'Alternative Development Case', representing: Background trip growth; Committed land-use trips; Windfall land-use trips; District Plan land-use site trips; Neighbourhood Plan land-use trips; 'Alternative' land-use site Science and Technology Park trips; Committed transport schemes; 'Primary' and 'Secondary' remedial transport interventions; and appropriate land-use site access schemes.
- 'Remedial Development Case' and 'Remedial Alternative Development Case', representing: Respective Development Case and Alternative Development Case scenarios (above), but with further 'Remedial' highway initiatives to mitigate unacceptable transport impacts of development.

2.3.3 Future Transport Network Configurations

Various transport network configurations were included in the MSTS S3 future year model, to suit the respective forecast scenarios. The network elements represent the supply side of the model.

Five network configurations were modelled, for AM and PM peaks at 2031, as follows:

- Reference Development Case, with committed schemes only;
- Development Case, with previous Primary and Secondary Interventions;
- Alternative Development Case, with previous Primary and Secondary Interventions;
- Remedial Development Case, with previous Primary and Secondary Interventions and new remedial initiatives from the current study; and
- Remedial Alternative Development Case, with previous Primary and Secondary Interventions and new remedial interventions from the current study.

Reference Development Case

The 'Reference Development Case' represented the supply situation if only committed transport schemes were introduced on to the current highway and PT network. This is the network configuration against which the performance of other networks was judged, to determine if they could satisfactorily relieve operational 'stress' (i.e. congestion and delay).

Development Case and Alternative Development Case

The 'Development Case' and 'Alternative Development Case' were both a hybrid refinement of previously identified Reference Development Case, 'Primary' and 'Secondary' interventions, proposed to allow access at development sites and ease future network stress. These schemes were agreed with MSDC and WSCC at MSTS S1, further refined at MSTS S2 and finalised for MSTS S3.

The Alternative Development Case network included access arrangements for the Science and Technology Park that were excluded from the Development Case.

Remedial Development Case and Remedial Alternative Development Case

The 'Remedial Development Case' and 'Remedial Alternative Development Case' were enhanced network supply scenarios, incorporating all of the Reference Development Case and primary and secondary intervention schemes, itemised earlier. However, they also included newly identified remedial mitigation, to resolve further network stress associated with the latest MSDC District Plan and Reference Development Case content.

2.3.4 Future Transport Network Scheme Details

Descriptions of the highway and PT interventions included in the respective model network configurations, at AM and PM 2031, are outlined below. The objective has been to represent a balanced range of highway, PT and policy initiatives, within the limitations of a broad-scale strategic model.

Reference Development Case Interventions

The Reference Development Case interventions entailed completed transport initiatives, which have been implemented since 2008, together with committed future schemes. These Reference Development Case schemes were as follows:

- Haywards Heath Relief Road Stages 5 & 6 (Stages 1 – 4 previously implemented);
- A23 Handcross - Warninglid (HE scheme) improvements;
- B2113 Station Road / Keymer Road / Silverdale Road (Hoadleys Corner) – traffic signals;
- Leylands Road / Valebridge Road / Janes Lane / Junction Road – linked traffic signals;
- B2113 Folders Lane / Kingsway – traffic signals;
- B2113 Station Road / Church Road – traffic signals;
- B2113 Keymer Road / Folders Lane – traffic signals;
- Junction Road / Cants Lane – traffic signals;
- B2112 Ditchling Road Traffic calming between B2113 Folders La and St Georges Park / Janes Lane;

- Kingsway – carriageway widening; and
- East of Kingsway Development – committed Interventions.

Primary and Secondary Interventions

The primary and secondary interventions were schemes identified by WSCC and were intended to enable delivery of the MSDC District Plan. They were refined at MSTS S3 from the configurations assumed at S1 and S2 and were included in the Development Case and Alternative Development Case, as additional to the Reference Development Case interventions (listed above). The Primary and Secondary Interventions are summarised below:

- Northern Arc Link Road between A273(S), A2300 & A273 (N) in 3 sections;
- Parking Strategy scheme – CPZ for the centre of Burgess Hill with extensions (e.g. Wivelsfield Station);
- Bus service frequency and route connectivity enhancements, district-wide, combined with sustainable transport links, improved passenger / parking facilities at bus / rail interchanges and links to development sites;
- Victoria Road – York Road highway link, Burgess Hill;
- Traffic management strategy on the B2036, between Burgess Hill and Ansty, to mitigate the impact of future developments in Burgess Hill and Haywards Heath;
- Safety-led improvements to A273 Isaac's Lane, between Burgess Hill and Bolnore;
- Traffic restraint on A273 Jane Murray Way / Sussex Way, between A2300 and A273 Fairplace Bridge;
- Junction capacity improvements – A23 / A2300 Hickstead, including traffic signals at western roundabout, uncontrolled eastern roundabout and single carriageway bridge over A23 (Highways England scheme);
- Junction improvement - A273 Fairplace Bridge double mini- roundabout junction;
- B2036 London Road / Leylands Road and London Road / West Street junctions – linked traffic signal control;

- B2036 London Road / Royal George Road / Lower Church Road – linked traffic signal upgrade;
- Burgess Hill Smarter Choices car share / car club schemes;
- East Grinstead Smarter Choices - Area-wide Travel Plans (multi-stakeholder approach - not site specific) and establishment Transport Management Associations (TMAs) to implement their delivery;
- Controlled Parking Zone (CPZ) review for East Grinstead - potential extensions;
- Haywards Heath Smarter Choices car share / car club schemes;
- Parking Strategy Aim - Provision of a CPZ (dependent on regeneration scheme) to address issue of lack of off-street parking in Haywards Heath (long-term aspirational) - follow up review to be undertaken;
- Burgess Hill, additional bus service frequency and route connectivity enhancements, combined with sustainable transport links, improved passenger / parking facilities at bus / rail interchange;
- A2300 widening to dual 2-lane carriageway A23 Hickstead – Northern Arc Link, with junction capacity improvements;
- A273 Jane Murray Way other junction enhancements (x4 junctions);
- East Grinstead housing development mitigation schemes (Atkins stage-3 study); and
- A2300 / Science and Technology Park new roundabout access (Alternative Development Case only).

Further Remedial Interventions

As part of the MSTS S3 modelling and appraisal, the need for further remedial network interventions has been investigated, which would enable the revised District Plan to be implemented without excessive adverse transport impacts in terms of network stress, congestion and user delays. These remedial network interventions comprised the following:

Development Case and Alternative Development Case

- A272 Cowfold Road / A23 London Road northbound access / egress junction, Bolney;
 - (PM requirement only in Development Case and Alternative Development Case);
- A2300 / Northern Arc Spine junction, Burgess Hill;
 - (AM requirement only in Development Case; AM and PM requirement in Alternative Development Case);

Development Case Only

- B2115 / B2110 Leechpond Hill junction, Lower Beeding;
 - (AM requirement only in Development Case);

Alternative Development Case Only

- A23 northbound upstream mainline at exit diverge for A2300, Hickstead;
 - (PM requirement only in Alternative Development Case);
- A23 northbound upstream and downstream mainline at entry merge from B2118, Sayers Common;
 - (AM requirement only in Alternative Development Case);
- A23 northbound downstream mainline at entry merge from B2118, Sayers Common;
 - (PM requirement only in Alternative Development Case);
- A23 southbound upstream and downstream mainline at exit diverge for B2118, Sayers Common;
 - (PM requirement only in Alternative Development Case);
- A23 southbound upstream and downstream mainline at entry merge from B2117, Hurstpierpoint;
 - (PM requirement only in Alternative Development Case);
- A23 northbound upstream mainline at exit diverge for A281, Red House;
 - (PM requirement only in Alternative Development Case);

- A23 northbound downstream mainline at entry merge from B273, Pyecombe;
- (PM requirement only in Alternative Development Case).

2.3.5 Future Travel Demand Scenarios

Various trip movement components were included in the MSTS S3 forecast year model, to define the respective future travel scenarios. The trip origin to destination, (O-D), elements represent the demand side of the model.

Three travel demand scenarios were prepared in the AM and PM peak models at 2031, namely:

- Reference Development Case;
- Development Case; and
- Alternative Development Case.

There were common strands and differences between the above future demand scenarios, in terms of trip growth from base year 2008 and trips associated with planned land-use sites. The principal features of the demand scenarios were as follows:

- 'Reference Development Case', representing: Background trip growth from the National Trip End Model (NTEM) and Road Traffic Forecasts (RTF15); Committed land-use site trip movements; and 'windfall' land-use trips;
- 'Development Case', representing: Reference Development Case trip components (as above); District Plan land-use site trips; Neighbourhood Plan land-use trips; and
- 'Alternative Development Case', representing: Development Case trip components (as above); 'Alternative' land-use site Science and Technology Park trips.

Procedures Used to Assemble the Travel Demand Scenarios

Several important assumptions and techniques were applied in order to prepare the respective travel demand scenarios. The key procedures were as follows:

Procedures Common to All Scenarios

- Background growth in car and PT trips, aligned with National Trip End Model (NTEM V6.2 and TEMPRO);

- Site-specific land-use trips were derived by applying TRICS trip rates to the site characteristics;
- Duplication of site-specific trips within NTEM growth was prevented by removing households and jobs from the TEMPRO dataset;
- Site-specific trips were calculated for all, large, completed and committed developments, in all scenarios;
- Small sites and windfalls were represented by changes to NTEM growth, not as site-specific trips, in all scenarios;
- Background growth in goods vehicle movements was aligned with the National Transport Model (NTM) and Road Traffic Forecasts 2015 (RTF15), in all scenarios;

Procedures in Development Case / Alternative Development Case Scenarios Only

- Neighbourhood Plan developments were represented by changes to NTEM growth, not as site-specific trips, in the Development Case and Alternative Development Case scenarios;
- Site-specific trips were calculated for all District Plan strategic developments, (specifically the Northern Arc and A2300 Business Park land uses, in Burgess Hill), in the Development Case and Alternative Development Case scenarios;

Procedures in Alternative Development Case Scenario Only

- Site-specific trips were calculated for an additional District Plan strategic development, (specifically the A2300 Science and Technology Park, in Burgess Hill), in the Alternative Development Case scenario.

2.3.6 Breakdown of Land-Use Development Allocations by Scenario

Table 1 gives a breakdown of the modelled land-use allocations in each MSTS Stage-3 model scenario.

Table 1: MSTs Stage 3 Land-Use Development Allocations

Assignment Content	Model Assignment Package AM Peak 2031				
	Reference Development Case	Development Case	Alternative Development Case	Development Case with Remedial Schemes	Alternative Development Case with Remedial Schemes
Travel Demand Components					
Completed Development Since 2008	Mid Sussex completed sites 3,520 households Mid Sussex completed sites 3,719 jobs				
Committed Development	Mid Sussex committed sites 5,240 households Mid Sussex committed sites 1,241 jobs				
Strategic Development	N/A	Mid Sussex Strategic sites 3,500 households Mid Sussex Strategic sites 2,822 jobs			
Neighbourhood Plan Development	N/A	Mid Sussex Neighbourhood sites 1,940 households Mid Sussex Neighbourhood sites 697 jobs			
Windfalls	Mid Sussex windfall sites 652 households				
Science and Technology Park	N/A	N/A	Mid Sussex alternative site 2,500 jobs	N/A	Mid Sussex alternative site 2,500 jobs
Total Land-Use Allocations	8,760 households 4,960 jobs	14,852 households 8,479 jobs	14,852 households 10,979 jobs	14,852 households 8,479 jobs	14,852 households 10,979 jobs

Table 1 indicates that the MSTs S3 assessment represents the following change in land-use development allocations between the various scenarios:

- Development Case change from Reference Development Case:
 - +6,092 households / +3,519 jobs;
- Alternative Development Case change from Reference Development Case:
 - +6,092 households / +6,019 jobs;

2.3.7 Summary of Total Person Trips by Scenario

The land-use development allocations in Table 1, together with NTEM growth have been converted to person trips in the transport model.

Table 2 shows modelled total person trips in each MSTS Stage-3 model scenario at 2031. It also gives a comparison with the 2008 base.

Table 2: MSTS Stage 3 Trip Matrix Total Changes

Model Scenario	All-Mode Person Trips			Highway Trips	
	2008 Base Year AM	Stage-3 2031 Forecast Year AM	Stage-3 2031 AM Change from 2008	Stage-3 2031 AM Forecast Year	Stage-3 2031 PM Forecast Year
Reference Development	205055	232972	+27,917	163822	170988
Development Case	205055	236176	+31,121	164399	171726
Alternative Development	205055	236535	+31,480	164753	172086

Table 2 indicates that, broadly, the 2031 AM model scenarios include in the order of 30,000 more person trips than at base year 2008 AM.

2.3.8 Transport Model Assignment Packages

The elements of forecast travel demand and the future transport network components, described above, were included in the various MSTS S-3 model assignment scenarios for 2031, as summarised in Table 3.

Table 3: Summary of MSTS Stage 3 Model Assignment Packages

Assignment Content	Model Assignment Package AM and PM Peak 2031				
	Reference Development Case	Development Case	Alternative Development Case	Development Case with Remedial Schemes	Alternative Development Case with Remedial Schemes
Travel Demand Components					
Background Growth in car & PT trips in line with NTEM (Adjusted to remove duplication of site-specific trips)	Yes	Yes	Yes	Yes	Yes
Background Growth in HGV trips in line with NTM (RTF15)	Yes	Yes	Yes	Yes	Yes
Completed Development	Yes	Yes	Yes	Yes	Yes
Committed Development	Yes	Yes	Yes	Yes	Yes
Strategic Development	No	Yes	Yes	Yes	Yes
Neighbourhood Plan Development	No	Yes	Yes	Yes	Yes
Windfalls	Yes	Yes	Yes	Yes	Yes
Science and Technology Park	No	No	Yes	No	Yes
Network Intervention Scenarios					
Committed Schemes & Site Accesses	Yes	Yes	Yes	Yes	Yes
Primary and Secondary Remedial Schemes & Site Accesses	No	Yes	Yes	Yes	Yes
Alternative Development Case Schemes & Site Accesses	No	No	Yes	No	Yes
Further Remedial Schemes	No	No	No	Yes	Yes

The packages shown in Table 3 have been assessed using the MSTS S-3 AM and PM peak models at 2031.

3 MSTS Stage 3 Transport Model Outcomes

3.1 Overview

The future year 2031 AM and PM transport model assignments, for MSTS S3, as itemised in Table 3, were completed and analysed, in order to determine the following:

- The ability of the respective transport networks to handle the corresponding travel demands, without resulting in unacceptable 'stress', congestion and delay for trip movements, when compared with the Reference Development Case;
- The ability of the respective transport networks to handle the corresponding travel demands, without causing adverse impacts on surrounding land-use activities (specifically Ashdown Forest), when compared with the Reference Development Case;
- The need for and appropriate (outline) configuration of, further remedial transport interventions, to mitigate any unacceptable impacts identified above; and
- The fitness for purpose and operational effectiveness of any (outline) remedial interventions identified above.

The focus of the above analysis was on the performance of the Mid Sussex highway network, adjoining roads in West Sussex and East Sussex and the Strategic Road Network (SRN) of A23/M23 (managed by Highways England), rather than the Public Transport (PT) network, because the majority of impacts would be concentrated on road.

- Junctions that would experience Ratio of Flow to Capacity (RFC) >100% in the development cases, with Primary and Secondary (P&S) interventions, but not in the Reference Development Case; and
- Links which, in the development cases (with P&S interventions), would entail a flow change of >10%, alongside an RFC >85%, when compared with the Reference Development Case.

3.2 Highway Analysis of Key Links and Junctions

Performance of the core local highway network in the various scenarios at AM and PM 2031 was established from the MSTS S3 model and results are shown in Table 4 and 5.



Table 4: Highway Junctions with RFC >100% in Development Cases with P&S Interventions

Road Junction Location	2031 AM Peak RFC (Most Congested Arm)			2031 PM Peak RFC (Most Congested Arm)		
	Reference Development Case	Development Case with P&S Schemes	Alternative Case with P&S Schemes	Reference Development Case	Development Case with P&S Schemes	Alternative Case with P&S Schemes
Junctions with RFC >100% in Development Case with P&S Interventions Only						
A272 Cowfold Road/A23 London Road	95%	99%	94%	97%	101%	101%
A2300 / Northern Arc Spine Road	73%	102%	105%	69%	90%	100%
B2115 / B2110 Leechpond Hill, Lower Beeding	94%	101%	99%	61%	70%	68%
Junctions with RFC >100% in Reference Development Case and Development Case with P&S Interventions						
M23/ A264/ A2011 Copthorne (10)	97%	81%	81%	100%	101%	100%
M23 / B2036 (10a)	103%	103%	103%	77%	79%	79%
M23 / A23 Pease Pottage (11)	113%	116%	115%	106%	106%	106%
A264 / A2220 Copthorne	104%	104%	104%	102%	102%	101%
A264 / B2028 Copthorne	102%	103%	103%	104%	106%	106%
A264 / A22 Felbridge	107%	101%	10%	103%	82%	82%
A272 / A281 Cowfold	102%	105%	104%	101%	103%	103%
A272 / B2111 Bedales, Haywards Heath	103%	101%	101%	78%	79%	76%
A273 / B2116 Stonepound, Hassocks	111%	111%	112%	115%	116%	117%
B2112 Fox Hill / A272 Haywards Heath Relief Road	101%	102%	103%	127%	128%	128%
B2110/ B2036 High St	70%	76%	76%	105%	104%	104%
B2110/ B2036 Paddockhurst Rd	95%	96%	97%	102%	103%	101%



Road Junction Location	2031 AM Peak RFC (Most Congested Arm)			2031 PM Peak RFC (Most Congested Arm)		
	Reference Development Case	Development Case with P&S Schemes	Alternative Case with P&S Schemes	Reference Development Case	Development Case with P&S Schemes	Alternative Case with P&S Schemes
B2113 Keymer Road / Station Road, Burgess Hill	106%	106%	106%	107%	107%	106%
B2113 Queen Elizabeth Avenue / Mill Road, Burgess Hill	105%	106%	106%	104%	104%	104%
B2036 London Road / Ardingly Road, Cuckfield	105%	106%	106%	103%	103%	103%

Table 5: Highway Links with Flow Change >10% in Development Cases with P&S Interventions and RFC >85%

Road Junction Location	2031 AM Peak RFC (Link)			2031 PM Peak RFC (Link)		
	Reference Development Case	Development Case with P&S Schemes	Alternative Case with P&S Schemes	Reference Development Case	Development Case with P&S Schemes	Alternative Case with P&S Schemes
Links with RFC >85% & Flow Increase >10% in Development/Alternative Cases, with P&S Schemes, but not in Reference Development Case						
B2272 E/B from A272 / A273 to B2028, Haywards Heath	90%	101% (Flow +12%)	95%	74%	77%	77%
Junction Road from Leylands Road to Janes Lane	83.1%	91.4% (Flow +10%)	95.8% (Flow +35%)	75.9%	83.2% (Flow +10%)	93.2% (Flow +23%)
Leylands Road from Mill Road to Junction Road	68.3%	88.5% (Flow +30%)	90.1% (Flow +32%)	83.3%	81.6%	93.5% (Flow +12%)

Table 4 indicates road junctions where there would be unacceptable stress in the Development Case and, or, Alternative Development Case, but not in the Reference Development Case. It also shows locations where excessive stress would occur in the Reference Development Case.

Table 5 shows road links where there would be unacceptable stress in the Development Case and, or, Alternative Development Case, but not in the Reference Development Case.

It should be noted that the PM assignments have been undertaken using the SATURN highway model only, not the full multi-modal model mechanisms in the AM model, (e.g. destination choice and mode choice). Hence, the PM outcomes are only intended as indicative of impacts on the Strategic Road Network (SRN) and not as definitive results for the local Mid Sussex network. It is not considered to be appropriate to determine a need for further mitigation on the basis of the indicative PM model.

The results from the analysis shown in Table 4 and 5 have been used to devise further, outline, remedial interventions, which, when combined with the P&S interventions should resolve the predicted 'stress'. These interventions have only been examined at an indicative, outline level, to determine that they could be accommodated within the highway boundaries. However, they have not been developed as detailed designs.

There are three road junctions which may require further remedial intervention, as follows:

- At A272 Cowfold Road/A23 London Road (on the SRN), an RFC of 99% is predicted in the AM Development Case; and 101% in the PM Development Case and Alternative Development Case.

The stress is caused by a shortfall in capacity on the give-way approach from London Road. This could be resolved by introducing a roundabout junction on A272.

- At A2300 / Northern Arc Spine Road, the proposed roundabout is predicted to operate above capacity in the AM Development Case (102%) and Alternative Development Case (105%); and in the PM Alternative Development Case (100%).

This could be resolved by increasing the size of the roundabout and widening the approach arms.

- At B2115 / B2110 Leechpond Hill, the slight increase in traffic flows on B2110 and B2115, in the AM Development Case, is caused by traffic using the A23 improvement between Handcross and Warninglid, which would cause mild congestion on the westbound approach from B2110 east, where right turning traffic will block ahead movements on this arm.

This could be resolved by widening of the eastern arm to allow a ghost-island right turn.

There are three road links which may require further remedial intervention, as follows:

- The B2272 eastbound between the A272 / A273 roundabout at Butlers Green and B2028, The Broadway, in Haywards Heath, in the AM Development Case.

Here, the flow would increase by 12% from the Reference Development Case and link RFC would be 101%. The problem would reflect inadequate capacity at the A272 Haywards Heath Relief Road / B2112 Wivelsfield Road junction, in the Reference Development Case and in all other scenarios. A remedial capacity improvement would be needed at this junction, in the Reference Development Case for AM and PM 2031.

If this Relief Road junction improvement was made, the A272 Haywards Heath Relief Road would draw traffic away from the B2272 between the A272 / A273 roundabout at Butlers Green / B2028 and, thereby, relieve the marginal stress on this section of the B2272. The B2272 issue should not, therefore, be seen as a constraint on the District Plan being approved and implemented and would not require remedial mitigation.

- Junction Road in Burgess Hill, northbound between the junctions of Leylands Road and Janes Lane, in the AM Development Case and in the AM and PM Alternative Development Case.

At this location, it is not possible to determine if further mitigation would be needed, because the coarse network and zoning detail in Burgess Hill, inhibits the strategic model from replicating, truly, all available network capacity, route choices and traffic demands at a local level.

- Leylands Road in Burgess Hill, eastbound between the junctions of Mill Road and Junction Road, in the AM Development Case and in the AM and PM Alternative Development Case.

Here, again it is not possible to determine if further mitigation would be necessary, because of the coarseness of the strategic model within Burgess Hill.

3.3 Remedial Highway Interventions to Resolve Network Stress

Remedial junction interventions have been designed in outline, for the locations identified in section 3.2, to mitigate the performance problems predicted in Table 4. These schemes have been assessed on their fitness for purpose, using the strategic transport model and localised junction models.

The predicted results of the assessment are shown in Table 6.



Table 6: Highway Junction Performance Before and After Remedial Intervention

Road Junction Location	2031 AM Peak RFC (Most Congested Arm)			2031 PM Peak RFC (Most Congested Arm)		
	SATURN Before Intervention	SATURN After Intervention	ARCADY/ PICADY After Intervention	SATURN Before Intervention	SATURN After Intervention	ARCADY/ PICADY After Intervention
Development Case						
A272 Cowfold Road/A23 London Road	99%	60.5%	82%	101%	73.9%	82%
A2300 / Northern Arc Spine Road	102%	76.6%	96%	90%	46.0%	79%
B2115 / B2110 Leechpond Hill, Lower Beeding	101%	94.0%	99%	70%	69.8%	
Alternative Development Case						
A272 Cowfold Road/A23 London Road	94%	70.6%	82%	101%	86.1%	97%
A2300 / Northern Arc Spine Road	105%	76.4%	97%	100%	52.2%	97%
B2115 / B2110 Leechpond Hill, Lower Beeding	99%	85.7%		68%	69.1%	

Table 6 shows that the proposed outline remedial interventions will resolve the stress problems, by reducing the high RFC problems to more acceptable levels, predicted to be below 95% RFC in the strategic MSTS model and below 100% RFC in the localised junction models.

The assessment, using detailed junction modelling tools, indicated that the following interventions could perform satisfactorily:

- A272 Cowfold Road/A23 London Road:
 - Replacement of existing priority junction with roundabout; and
 - 2-lane flared approaches on each approach arm.
- A2300 / Northern Arc Spine – Further enlargement of proposed A2300 scheme roundabout on dual 2-lane carriageway, with:
 - 2-lane approaches, widening to 3 lanes, from A2300 west and from Northern Arc Spine Road North;
 - 1-lane approach, widening to 3 lanes, from Jane Murray Way / Business Park south; and
 - 1-lane approach, widening to 2 lanes, from A2300 east.
- B2115 / B2110 Leechpond Hill, Lower Beeding:
 - Widening of B2110 eastern arm, to allow a ghost-island right turn.

Since the stress at these junctions (before mitigation) is expected to be resolved by the proposed remedial interventions, they should not be a constraint on the District Plan being delivered. Resolving these issues should enable approval of the District Plan.

3.4 Analysis of Traffic Impact at M23/A23 Junctions

Outcomes from the 2031 AM and PM MSTS S3 modelling of the M23/A23 Strategic Road Network, confirmed that the following road links, junctions and bridges on A23, south of M23 J11, would not show unacceptable performance and stress, in any of the forecast scenarios:

-
- A23 / B2110 / B2114 – Handcross;
 - A23 / B2115 – Warninglid;
 - A23 / A2300 – Hickstead;
 - A23 / B2118 – Sayers Common;
 - A23 / B2117 – Hurstpierpoint;
 - A23 / A273 / A281 – Pyecombe intersection.

Only one A23 junction would experience marginally unacceptable stress in the Development Case and Alternative Development Case, but not in the Reference Development Case (as described in section 3.2), namely:

- A23 / A272 – Bolney.

An appropriate remedial roundabout scheme has been identified, which would mitigate the marginal stress at A23 / A272 west junction, (as described in section 3.3).

On M23, there would be three locations where impact mitigation would be required, to resolve RFC >100% in all of the Reference Development Case, Development Case and Alternative Development Case scenarios at 2031. These are as follows:

- M23 / A264 / A2011 (J10) – Copthorne, in PM peak;
- M23 / B2036 (J10a) – Maidenbower, in AM peak;
- M23 / A23 (J11) – Pease Pottage, in AM and PM peaks.

Since stress is predicted at these M23 junctions in all scenarios, they should not be a constraint on the District Plan being delivered. Resolving these issues should not be a condition for approval of the District Plan.

An assessment was also made of the layout standard that would be required at the entry merging and exit diverging slip roads, at M23 and A23 junctions, in the respective MSTS S3 scenarios, during AM and PM peaks 2031. Junctions where layout improvements would be needed in the Development Case or Alternative Development Case and in the Reference Development Case are itemised below:

M23 J9 Gatwick

- Northbound exit diverging slip in the AM peak;
- Northbound entry merging slip and southbound exit diverging and entry merging slips in the AM and PM peaks;

M23 J10 Copthorne

- Southbound exit diverging slip in the AM and PM peaks;

M23 J11 Pease Pottage

- Northbound exit diverging slip in the PM peak;

A23 / B2115 Warninglid

- Northbound exit diverging upstream mainline in the AM peak;

A23 / A2300 Hickstead

- Northbound exit diverging upstream mainline in the AM peak;
- Southbound entry merging downstream mainline in the PM peak;

A23 / B2118 Sayers Common

- Northbound entry merging downstream mainline in the AM peak;
- Southbound exit diverging upstream mainline in the PM peak;

A23 / B2117 Hurstpierpoint

- Northbound exit diverging upstream and downstream mainline in the AM peak;
- Southbound entry merging downstream mainline in the PM peak;

A23 / A281 Red House

- Northbound exit diverging upstream and downstream mainline in the AM peak;
- Southbound entry merging upstream and downstream mainline in the PM peak;

A23 / A273 Pyecombe

- Northbound exit diverging downstream mainline in the AM peak;

- Northbound entry merging upstream and downstream mainline in the AM peak;
- Southbound exit diverging upstream and downstream mainline in the PM peak;
- Southbound entry merging upstream and downstream mainline in the AM and PM peaks.

At the above SRN locations, the mitigation would be needed in the Reference Development Case, so they should not be a constraint on the District Plan being delivered. Resolving these issues should not be a condition for approval of the District Plan.

There were no SRN junctions where layout improvements would be needed in the Development Case but not in the Reference Development Case.

However, there were several junctions where layout improvements would be needed in the Alternative Development Case but not in the Reference Development Case, as follows:

A23 / A2300 Hickstead

- Northbound exit diverging upstream mainline in the PM peak;

A23 / B2118 Sayers Common

- Northbound entry merging upstream and downstream mainline in the AM peak;
- Northbound entry merging downstream mainline in the PM peak;
- Southbound exit diverging upstream and downstream mainline in the PM peak;

A23 / B2117 Hurstpierpoint

- Southbound entry merging upstream and downstream mainline in the PM peak;

A23 / A281 Red House

- Northbound exit diverging upstream mainline in the PM peak;

A23 / A273 Pyecombe

- Northbound entry merging downstream mainline in the PM peak;

At the above SRN locations, mitigation would not be needed in the Reference Development Case, so they could be a constraint on the Alternative Development Case District Plan being delivered. Resolving these issues would probably be a condition for approval of the Alternative Development Case.

3.5 Analysis of Traffic Flows through Ashdown Forest

An assessment was made of whether or not the levels of development proposed by the MSDC Pre-Submission District Plan (June 2015) would impact upon the local air quality of the environmentally sensitive area of Ashdown Forest Special Area of Conservation (SAC), lying to the south east of East Grinstead.

The Habitats Regulations Assessment for the District Plan identified a potential impact on the Ashdown Forest SAC as a result of atmospheric pollution. This impact would arise from increased traffic emissions as a consequence of new development. The threshold for determining significant traffic impact upon air quality was set in the Habitats Regulations Assessment, using the Department for Transport's Design Manual for Roads and Bridges (DMRB). The threshold was defined as a 2-way flow increase of 1,000 vehicles or more, annual average daily traffic (AADT).

The MSTS S3 model included several key roads that access or cross Ashdown Forest, namely:

- A275 (Lewes – East Grinstead);
- A22 (Uckfield – East Grinstead);
- A26 (Uckfield – Crowborough);
- B2110 (East Grinstead – Royal Tunbridge Wells);
- B2188 (Maresfield – Groombridge);
- B2026 (B2188 – B2110); and
- Coleman's Hatch road (East – West through Ashdown Forest).

Owing to the strategic nature of the MSTS and the location of Ashdown Forest on the north east periphery of the network, the model could not provide meaningful flow assignments for B2188, B2026 or Coleman’s Hatch Road. These links were added into the 2008 West Sussex model for the purpose of the MSTS S3 study, but the zoning was too coarse to enable reliable traffic assignment, here, in the model. However, an assessment was made of future traffic impacts on A275, A22, A26 and B2110, which pass by, or through, Ashdown Forest. The assessment represented a ‘worst case’ for these routes, which were modelled as carrying additional traffic that might otherwise travel on B2118, B2026 and Coleman’s Hatch Road, within the SAC. Representative local flow factors were used to convert AM peak hour model outputs, at 2031, to AADT. Synthesised PM peak hour flows were not used, because the PM results had not been assembled from the same robust, multi-modal and variable demand assignment as the AM. The resulting AADT flows on the Ashdown Forest routes in the forecast District Plan scenarios were compared with the Reference Development Case. These scenarios included the District Plan remedial interventions for the Development Case and Alternative Development Case, as described in section 3.3, above. Outcomes from then analysis are shown in Table 7.

Table 7: Daily Traffic Impact on Ashdown Forest Highway Routes

Road Link Section	Two-Way Annual Average Daily Traffic Flow (Vehicles)		
	Reference Development Case	Development Case RFC with P&S and Remedial Interventions	Alternative Development Case RFC with P&S and Remedial Interventions
Two-Way Annual Average Daily Traffic Flow (Vehicles)			
A275	6179	6194	6141
A22	5594	5369	5170
A26	4351	4311	4450
B2110	2460	2339	2333
Two-Way AADT Change from Reference Development Case (Vehicles)			
A275	-	15	-38
A22	-	-225	-423
A26	-	-39	99
B2110	-	-121	-126

Table 7 shows that there would be a small AADT increase in Ashdown Forest, at 2031, on A275 with the Development Case and on A26 with the Alternative Development Case, but these increases would fall a long way short of the threshold measure of significance, namely a flow increase of 1,000 vehicles or more, 2-way AADT, when compared with the forecast Reference Development Case.

It is evident that the Mid Sussex District Plan, as represented in MSTS S3, would not cause traffic flows on the key routes to impact significantly upon Ashdown Forest.

In fact, the District Plan scenarios would generally result in a modest reduction (or only a very slight increase) in traffic on the assessed routes in Ashdown Forest.

4 Assessment of District Plan Extra Development Case on Ashdown Forest

4.1 Overview

A further assessment was made, using the MSTS S-3 transport model, of an 'Additional Development Case' scenario, based on a theoretical maximum development ceiling, to align with the Strategic Housing Land Availability Assessment (SHLAA), published by MSDC in May 2015. This was undertaken, primarily, to examine the likely impact of additional housing upon the Ashdown Forest, but it also provides an indication of the impacts upon the wider transport network.

This Additional Development Case scenario tested the provision of 1,106 more homes, compared with the Development Case and it incorporated appropriate remedial interventions to mitigate adverse impacts on the wider transport network and surroundings.

4.2 Context for Impact Assessment

The need for and scope of, the assessment of likely impacts of the 'Additional Development Case' upon Ashdown Forest mirrors the reasoning applied in section 3.5 for the 'Development Case' and 'Alternative Development Case'.

4.3 General Approach used for Impact Assessment

For the assessment, a modified variation of the MSTS Stage-3 SATURN highway model was used, to derive assignment outputs from an Additional Development Case, which were then interrogated to establish likely impacts.

The test was run using 'actual flow' outputs from the AM peak 2031 model, only. Although sensitivity tests were previously undertaken with a robustly synthesised, 'worst-case', PM peak 2031 model, for parts of the S-3 study, the PM peak has not been used for the Additional Development Case impact upon Ashdown Forest, because the PM flows are from a highway-only (and not multi-modal) PM model.

This PM model was not assembled from the same, fully multi-modal and variable demand assignment as the AM. This means that the PM model can give unreliable, exaggerated traffic flow forecasts on some parts of the road network (e.g. Ashdown Forest), where, in reality, people would make travel choices to minimise journey costs, thereby moderating the volume of traffic.

The 'worst-case' PM highway-only traffic flows are suitable for assessing impacts on the Highways England Strategic Road Network (SRN), but not for an assessment that seeks, primarily, to appraise transport impacts on the Ashdown Forest.

4.4 Assessment Method

In scope, this task primarily considered the likely impact on the Ashdown Forest of building out residential development to a maximum, theoretical, ceiling number of homes, based on the Mid Sussex SHLAA, published in May 2015. The methodology employed and the results generated provide an indication of the impacts upon the wider transport network.

The Additional Development Case scenario represents an uplift of total residential allocations from the MSTS S-3 Development and Alternative Development Cases, to account for all sites that are considered to be suitable, available and achievable for development, as identified in the SHLAA.

It was first considered if additional remedial mitigation schemes would be needed in the Additional development Case, to overcome adverse and unacceptable stress on the highway network, at AM peak 2031, in a similar procedure to that used for the Development and Alternative Development Cases.

On advice from MSDC, It has been assumed that the revised components of residential development and comparative change from Development Case to Additional Development Case would be as follows:

Committed Allocations –

- Development Case: 5,240 homes;
- Additional Development Case: 5,240 homes;

- Change: 0 homes;

District Plan Strategic Allocations –

- Development Case: 3,500 homes;
- Additional Development Case: 3,500 homes;
- Change: 0 homes;

Neighbourhood Plan Allocations –

- Development Case: 2,053 homes;
- Additional Development Case: 3,159 homes;
- Change: +1,106 homes;

Windfall Allocations –

- Development Case: 539 homes;
- Additional Development Case: 539 homes;
- Change: 0 homes;

Total Scenario Allocations –

- Development Case: 11,332 homes;
- Additional Development Case: 12,438 homes;
- Change: +1,106 homes;

Overall, the assessment has included an additional 1,106 homes in the Additional Development Case, compared with the MSTS S-3 Development Case.

For the Additional Development Case scenario, the MSTS multi-modal model has been run, first, with Primary and Secondary network interventions only. Outcome levels of network stress have been assessed in terms of Ratio of Flow to Capacity (RFC), as in the Development Case, to provide an indication of likely stress on the wider highway network.

The outcomes from this test have been assessed to determine locations where

further remedial interventions would be needed, to mitigate adverse stress. Finally, the model scenario was re-run with network remedial interventions included, to determine outturn traffic impacts through the Ashdown Forest.

4.5 Assessment Outcomes

Below, Table 8 highlights road junctions with an RFC in excess of 100% in the Reference Development Case, Development Case and Additional Development Case scenarios. Table 9 indicates highway links with a predicted RFC greater than 85% and with a flow change of more than 10%. Table 10 itemises road junctions requiring remedial interventions and compares their performance in the Development Case with those in the Additional Development Case, before and after mitigation.

Table 8: Highway Junctions with RFC > 100% at AM Peak 2031

Road Junction Location	2031 AM Peak RFC (Most Congested Arm)		
	Reference Development Case	Development Case with P&S Schemes	Additional Development Case with P&S Schemes
Junctions with RFC >100% in Dev. & Additional Dev. Cases with P&S Interventions Only			
A272 Cowfold Road/A23 London Road	95%	99%	99%
A2300 / Northern Arc Spine Road	73%	102%	103%
B2115 / B2110 Leechpond Hill, Lower Beeding	94%	101%	101%
Junctions with RFC >100% in Ref. Case, Dev. Case & Additional Dev. Case with P&S Interventions			
M23/ A264/ A2011 Copthorne (10)	97%	81%	84%
M23 / B2036 (10a)	103%	103%	105%
M23 / A23 Pease Pottage (11)	113%	116%	116%
A264 / A220 Copthorne	104%	104%	105%
A264 / B2028 Copthorne	102%	103%	103%
A264 / A22 Felbridge	107%	101%	101%
A272 / A281 Cowfold	102%	105%	105%
A272 / B2111 Bedales, Haywards Heath	103%	101%	101%
A273 / B2116 Stonepound, Hassocks	111%	111%	111%
B2112 Fox Hill / Haywards Heath Relief Road	101%	102%	103%
B2110/ B2036 High St	70%	76%	77%
B2110/ B2036 Paddockhurst Rd	95%	96%	98%
B2113 Keymer Road / Station Road, Burgess Hill	106%	106%	106%
B2113 Queen Elizabeth Avenue / Mill Road, Burgess Hill	105%	106%	106%
B2036 London Road / Ardingly Road, Cuckfield	105%	106%	106%

Table 8 reveals that the Additional Development Case would cause very little extra stress on key junctions in the model above and beyond the impact of the Development Case.

The road locations requiring further remedial intervention would be no different in the Additional Development Case than in the Development Case. As in MSTS Stage 3, at AM peak 2031, these locations would comprise A2300 / Northern Arc Link in Burgess Hill and B2115 / B2110 in Lower Beeding. Intervention has also been considered for A272 / A23 in Bolney, but this is a borderline requirement and would not strictly be necessary for an RFC <100%.

There would be a very slight increase in RFC at some of the junctions in the Additional Development Case, but the differences are not considered to be significant in terms of requiring additional impact mitigation.

Table 9: Highway Links with RFC >85% and Flow Change >10% in Development & Additional Development Cases with P&S Interventions

Road Junction Location	2031 AM Peak RFC (Link)		
	Reference Development Case	Development Case with P&S Schemes	Additional Development Case with P&S Schemes
Links with RFC >85% & Flow Increase >10% in Dev. & Additional Dev. Cases, with P&S Schemes, but not in Reference Development Case			
A272 E/B from A273 to B2028, Haywards Heath	90%	101% (Flow +12%)	101% (Flow +12%)
Junction Road from Leylands Road to Janes Lane	83.1%	91.4% (Flow +10%)	92.3% (Flow +11%)
Leylands Road from Mill Road to Junction Road	68.3%	88.5% (Flow +30%)	88.8% (Flow +30%)

Table 9 suggests that the differences in highway link impact between the Development Case and the Additional Development Case (both with P&S Schemes) are minimal. As in MSTS S-3, no remedial intervention is considered necessary in either scenario, for these links, for the reasons given in the analysis of the Development Case scenario, set out in Section 3 of this report.

Table 10: Highway Junctions Requiring Remedial Intervention

Road Junction Location	2031 AM Peak RFC (Most Congested Arm)

	SATURN Before Additional Mitigation	SATURN After Additional Mitigation
Development Case		
A272 Cowfold Road/A23 London Road	99%	60.5%
A2300 / Northern Arc Spine Road	102%	76.6%
B2115 / B2110 Leechpond Hill, Lower Beeding	101%	94.0%
Additional Development Case		
A272 Cowfold Road/A23 London Road	94%	61.3%
A2300 / Northern Arc Spine Road	103%	77.6%
B2115 / B2110 Leechpond Hill, Lower Beeding	101%	95.4%

Table 10 shows the performance of the road junctions that would require remedial intervention in both the Development Case and Additional Development Case scenarios. Performance is measured in terms of RFC, before and after further mitigation is introduced.

Testing of mitigation schemes for these junctions, in SATURN, has indicated that the following intervention layout configurations could perform satisfactorily, with RFC <100%:

A272 Cowfold Road/A23 London Road:

- Replacement of priority junction with roundabout; and
- 2-lane flared approaches on each arm.

A2300 / Northern Arc Spine – Enlarged roundabout on dual 2-lane carriageway:

- 2-lane approaches, widening to 3 lanes, from A2300 west and from Northern Arc Spine Road North;
- 1-lane approach, widening to 3 lanes, from Jane Murray Way / Business Park south; and
- 1-lane approach, widening to 2 lanes, from A2300 east.

B2115 / B2110 Leechpond Hill, Lower Beeding:

- Widened B2110 eastern arm, to allow a ghost-island right turn.

The assessment shows that the additional mitigation would provide marginally less stress relief in the Additional Development Case than in the Development Case. This reflects the greater volume of traffic predicted at the junctions in the SHLAA Maximum scenario.

In Table 11 there is a comparison of predicted 2-way AADT flows, at 2031 on the key roads through Ashdown Forest, in the respective Development Case, Alternative Development Case and Additional Development Case scenarios.

Table 11: Ashdown Forest 2031 AADT – Additional Development Case with Mitigation

Road Link Section	Two-Way Annual Average Daily Traffic Flow (Vehicles)			Additional Development Case with P&S and Remedial Interventions
	Reference Development Case	Development Case RFC with P&S and Remedial Interventions	Alternative Development Case RFC with P&S and Remedial Interventions	
Two-Way Annual Average Daily Traffic Flow (Vehicles)				
A275	6179	6194	6141	6210
A22	5594	5369	5170	5384
A26	4351	4311	4450	4305
B2110	2460	2339	2333	2340
Two-Way AADT Change from Reference Development Case (Vehicles)				
A275	-	15	-38	31
A22	-	-225	-423	-210
A26	-	-39	99	-46
B2110	-	-121	-126	-120

Results in Table 11 suggest that the Additional Development Case and the Extra Development Case scenario would not cause any more severe traffic impact on Ashdown Forest, compared with the Reference Development Case, than either of the other two scenarios. Each of the road links would experience a small decrease in AADT flow, except for A275 which would have a small AADT increase. None of

the flow impacts in the Additional Development Case would approach the significance threshold of a flow increase of 1,000 vehicles, or more, 2-way AADT.

The overarching finding from the MSDC District Plan impact tests, on Ashdown Forest, is that the assessed variations in land-use trip patterns and differences in highway network configurations, between District Plan scenarios and the Reference Development Case, are not significant, in terms of predicted AADT flows through Ashdown Forest.

Ultimately, it is not apparent that any District Plan scenario will have a significant impact upon Ashdown Forest traffic, when compared with the Reference Development Case alternative.

5 Conclusions

This interim assessment has considered the likely impact of the Mid Sussex Pre-Submission District Plan (2014-2031), published by Mid Sussex District Council (MSDC) for consultation in June 2015 and its associated trip movements, upon the performance of the local and strategic transport network and upon the Ashdown Forest. It has also considered the likely impact of an Additional Development Case scenario, based on a theoretical maximum development ceiling, to align with the Strategic Housing Land Availability Assessment (SHLAA), published by MSDC in May 2015. It also takes account of accompanying MSDC proposals for employment land. The assessment has been undertaken using the Mid Sussex Transport Study Stage-3 multi-modal transport model.

By appraising the 'Development Case' and 'Alternative Development Case' scenarios, the study has identified where remedial transport interventions could be needed, in forecast year 2031 (AM and PM peaks), in order to mitigate any unacceptable stresses on the performance of the transport network, when compared with an equivalent 'Reference Development Case' scenario. It has also determined appropriate outline scheme layouts for these remedial transport interventions.

A further assessment was made, using the MSTS S-3 transport model, of an 'Additional Development Case' scenario, based on a theoretical maximum development ceiling, to align with the Strategic Housing Land Availability Assessment (SHLAA), published by MSDC in May 2015. This Additional Development Case scenario tested the provision of 1,106 more homes, compared with the Development Case and was undertaken, primarily, to examine the likely impact of additional housing upon the Ashdown Forest, but it also provides an indication of the impacts upon the wider transport network.

The appraisal shows that any changes in highway link and junction impact in the Additional Development Case compared with the Development Case are minimal, with the same, primary, secondary and further remedial transport scheme interventions included in both scenarios. Therefore, no further mitigation is considered necessary in the Additional Development Case.

Ultimately, it is concluded that the levels of development proposed in the Pre-Submission District Plan (June 2015) would not worsen the performance of the highway transport network, relative to the Reference Development Case, provided that the proposed remedial schemes are introduced and would not have any adverse impacts upon traffic flows in Ashdown Forest.

The higher levels of development, subsequently tested, would also not have any adverse impacts upon traffic flows in Ashdown Forest and would not worsen the performance of the highway transport network, relative to the Reference Development Case, provided that the proposed remedial schemes are introduced.