

Appendix D Horsham Highway Model Forecast Report

TECHNICAL NOTE

Job Name: Horsham Transport Study

Job No: 45539

Note No: TN04

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Subject: Reference Case Forecast Modelling

1. Introduction

- 1.1. This note provides an overview of traffic congestion impacts of the Horsham Transport Model reference case forecast scenario. The output plots within this note are intended to identify any areas of forecast congestion that have the potential to be further exasperated by the emerging Horsham Local Plan development trip generation. It is the first stage of testing the impacts of the emerging Local Plan, and should not be seen as a stand-alone exercise, or used to inform other plans or projects.
- 1.2. A base year model has been developed with a base year of 2019 for AM (0800-0900) and PM (1700-1800) peak hours. This model is being used as the basis of which to derive 2036 future forecasts in order to evaluate the highway impact of developments within Horsham District up to the end of the Local Plan period.
- 1.3. The model is being developed within the traffic modelling software SATURN (Simulation and Assignment of Traffic to Urban Road Networks) . The model covers Horsham District and the immediate surrounding network and is a highway only model, being able to predict the routes that drivers choose and the associated congestion and delay impacts of highway travel demand. A Local Model Validation Report has been produced setting out the base year model development and validation.

2. Reference Case Forecasting

- 2.1. The Reference Case Forecasting is set out by establishing predicted changes between the base year model and a future year scenario or conditions. In order to establish robust traffic forecasts the Reference case model has been developed in accordance to DfT Transport Analysis Guidance (TAG) forecasting guidance. The guidance helps limit and define uncertainty around assumptions and traffic growth forecasts that feed into the reference case. This includes guidance on the development of an uncertainty log which summarises all known assumptions that feed into the model and the level of certainty of each assumption. Also Dft TAG provides guidance on the application of background growth assumptions stemming from the National Trip End Model (NTEM).
- 2.2. The Reference Case model will be used as the basis of comparison with emerging Local Plan scenarios and will inform the transport mitigation that would be required to deliver the Local Plan growth in transport terms. The Reference Case therefore includes all growth up to 2036 which results from development in neighbouring authorities and growth in Horsham District, excluding likely growth associated with emerging Local Plan. The Reference Case therefore presents a picture of highway conditions, prior to the addition of the emerging Local Plan developments. The growth included within the Reference Case model is described below.

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- 2.3. Information feeding into the reference case assumptions includes data (housing numbers, employment size) on developments and highway infrastructure schemes that are either committed through accepted planning permission or have a high probability that the outcome will happen as they are within adopted or emerging Local Plans. Emerging Local Plan development would be included where the Local Plan has reached Regulation 19 stage and is the plan that would be submitted to the Planning Inspectorate for examination.
- 2.4. As well as incorporating any committed development within the Horsham district into the reference case scenario, further committed developments within neighbouring authorities are also included. Developments within neighbouring authorities have been reviewed at a case by case basis and have only been included if assumed to have a perceptible impact to the Horsham highway network. Due to the scale of the strategic model having a limited amount of loading points onto the network for the spatially large zoning coverage, it was deemed that committed housing developments of a quantum less than 20 would not be included directly into the model due to the negligible increase in traffic growth at the specific zone locations. This leaves 200 additional dwellings that are not included as background growth within the district, equating to a background growth increase of less than 0.5% within the district. As such, using a proportionate approach, it has been deemed that the general background growth stemming from this would lead to negligible difference in traffic impacts within the model and that the minor background growth of these sites are not applied.
- 2.5. In addition, background growth assumptions have been applied to neighbouring authorities through growth rates; these growth rates are derived from national assumptions about background growth in travel demand, provided by the DfT through the National Trip End Model (NTEM) dataset. This dataset provides growth rates for any given year, based on housing growth, increases in job numbers and demographic changes at a District/Borough Level and is a recognised source of data for the purposes of producing forecast transport models of this nature.
- 2.6. Within Horsham, proposed Local Plan sites for the emerging Local Plan are not added to NTEM growth assumptions. The exemption of any NTEM background growth within Horsham is due to NTEM assumptions being superseded by the greater detailed understanding of the districts committed developments and the function of the Local Plan to deliver forecast housing and employment in comparison to assumptions from growth assumptions derived from NTEM.
- 2.7. Windfall sites within Horsham district have not been included within the forecast as the level of uncertainty of build out, due to the unknown factors of location availability and quantum approximation. In accordance to DfT Tag forecasting guidance, the windfall sites would not fall within the sufficient level of certainty categorisation to be included within the reference case models.
- 2.8. Adjusted NTEM Background growth rates are applied on top of committed developments in neighbouring authority areas. The adjusted NTEM background growth rates take into consideration projected NTEM growth rates for the forecast year of 2036 and subtract growth already applied through individual committed sites input within the model forecasts, so that the entire growth within neighbouring authorities matches with NTEM forecast figures.
- 2.9. Another approach would be to use neighbouring authority Local Development Plans to underpin the total forecast growth from all neighbouring authorities. However, as Local Plan periods differ from authority to authority, and as there is a level of uncertainty regarding employment projections obtained from LDPs, there is an overall level of uncertainty in discerning whether neighbouring LDPs diverge or not from NTEM, therefore it has been assumed that adjusted NTEM figures, in combination with selected developments, provide a robust approach for background growth forecasting over assumptions from LDPs with varying plan periods.
- 2.10.

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Table 1: Reference Case Forecasting Assumptions

Zone Type	Committed Developments	NTEM Derived Background Growth
Horsham District Zones	✓	×
Neighbouring Authority Zones	✓	✓

- 2.11. The list of Committed Developments and those within the adopted Local Plan can be found within Appendix A.
- 2.12. Model convergence statistics and generalised cost statistics can be found within Appendix C.
- 2.13. Committed highway infrastructure schemes input within the reference case are shown in Appendix D.

3. Congestion Hotspots

- 3.1. Two indicators are used that highlight points of congestion within the forecast scenario models. This includes the measure of maximum junction turning Volume over Capacity Ratios (V/C) and link delay.
- 3.2. V/C is a standard measure of the performance of junctions and links and reflect how a junction performs based on the volume of traffic and the capacity.
- 3.3. When V/C ratios reach about 85%, rapid deterioration in network performance is experienced. A V/C ratio of 100% indicates a junction is at capacity. This results in increasing queues and delays.
- 3.4. Table 1 below indicates those junctions which are shown to have a V/C greater than 100% in the AM peak. The table also indicates whether the junctions are within or outside Horsham District. Table 2 shows the same information for the PM peak.
- 3.5. In addition, in the AM Peak period there were a total of 22 junctions with a volume capacity of between 85% and 100% within the Horsham District boundary. There were also approximately 31 junctions with the same capacity range outside of the district boundary.
- 3.6. In the PM Peak period, there were a total of 18 junctions with a volume capacity of between 85% and 100% within the Horsham District boundary. There were also approximately 19 junctions with the same capacity range on the strategic road network outside of the district boundary.
- 3.7. Link delay will include delays from junctions and also delays attributed to the link factors of a road, where the volume of traffic reaches the capacity, thus the general flow of traffic is slowed down causing delay. This type of delay is more typical on roads with merging traffic such as dual carriageways and motorways.
- 3.8. Plots within Appendix B highlight the key indicators of congestion hotspots within Horsham District, highway network within neighbouring authorities that are in close proximity to Horsham and also Highways England's Strategic Road Network (SRN) to the East of Horsham District are included in the assessment.

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Table 2: AM Peak Period Descriptions of Junctions over 100% Volume Capacity Ratio

Junction	Volume Capacity Ratio %	In Horsham District
A2300 northbound slip to A23	129	Highways England
A272 eastbound approach to A24/A272 junction	124	✓
A24 southbound signals before A24/A27 junction	120	✓
A272 Wineham Lane Junction	117	✓
A23 at Pangdean Farm	115	
A24 Northbound signalised junction with A27	114	✓
B2118 merge onto A23 northbound	113	
A264 Eastbound exit at Bewbush Manor Roundabout	112	✓
B2237/Wimblehurst Road	108	✓
A281/East Street	107	✓
A264 exit at Moorhead Roundabout	107	✓
B2130/A281 junction at Elmbridge Village	107	
A23 northbound slip road entry before M23 J11	107	
London Road approach at Washington Roundabout	106	✓
A27 westbound signals at the A24/A27 junction	106	✓
A264/Lyons Road Junction	105	✓
M23 Junction 9 southbound onslip entry to mainline	104	Highways England
A272/A281 roundabout at Cowfold	104	✓
A283 approach at Washington Roundabout	104	✓
A281/B2237 junction Horsham Centre	104	✓
A23 northbound Slip road exit at M23 Junction 11 roundabout	103	Highways England
A283 Amberley Road Roundabout Storrington	103	✓ (SDNPA)
A281/Springfield Road Junction	103	✓
North Street/ Kings Road Roundabout	102	✓
B2133/A29 junction in Adversane	102	✓
A27 signals over the A24/A27 junction	102	✓
A24 Southbound Exit at Findon/A280 roundabout	102	
Brighton Road entry at Longbridge Roundabout	102	
M23 Junction 9 southbound onslip entry to mainline	102	Highways England
A283 High Street/North Street Junction Storrington	102	✓
A264 entry at M23 Junction 11 roundabout	102	
Storrington EB Approach to Washington Roundabout	101	✓
A264 Exit at M23 Junction 11 roundabout	101	Highways England
Five Oaks Roundabout and approach	101	✓
Harwood Road/Redkiln Way Roundabout	101	✓
A24/A264 roundabout at the northbound slip road to Farthings Hill Interchange	101	✓
Bewbush Manor Roundabout Sullivan Drive exit	101	✓

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Junction	Volume Capacity Ratio %	In Horsham District
B2195 Exit at Moorhead Roundabout	101	✓
Brighton Road exit at Longbridge Roundabout	101	
A271 exit at Longbridge roundabout	100	
M23 Northbound slip road merge at J10	100	
Rusper Road Roundabout	100	✓
Kerves Lane/A281	100	✓
A264 Eb Approach to A24 Junction	100	✓
A24 NB Approach to Robin Hood Roundabout	100	✓
Slip road to A24 southbound from A27 (A24/A27 junction)	100	✓

Table 3: PM Peak Period Description of Junctions over 100% Volume Capacity Ratio

Junction Description	Volume Capacity Ratio %	In District Boundary
B281/New Street Junction Horsham Town Centre	124	✓
A27 westbound signals at the A24/A27 junction	121	✓
A23 at Pangdean Farm	115	
M23 Junction 9 southbound onslip entry to mainline	114	Highways England
A24 Northbound signalised junction with A27	113	✓
A264 exit at Moorhead Roundabout	112	✓
London Road approach at Washington Roundabout	108	✓
A23 northbound offslip at the roundabout at Hickstead	108	Highways England
A283 approach at Washington Roundabout	107	✓
B2237 exit at Hop Oast Roundabout	107	✓
A283 High Street/North Street Junction Storrington	107	✓
A272/A8281 roundabout south of Cowfold	107	✓
A272 eastbound approach to A24/A27 junction	106	✓
A264 Eastbound exit at Bewbush Manor Roundabout	106	✓
B2237/Wimblehurst Road	104	✓
M23 Junction 9 southbound onslip entry to mainline	104	Highways England
B2130/A281 junction at Elmbirdge Village	104	
Forrest Road/ Tower Road junction at Colgate	104	✓
A281/Springfield Road Junction	103	✓
M23 southbound slip at M23 junction 11 roundabout	103	Highways England
A23/A273 junction at Pyecombe	103	Highways England
Rusper Road/Ifield Green	103	✓
A281/B2237 junction Horsham Centre	103	✓
A24/Langhurst Wood Road junction	103	✓
A264 EB Approach to A24 Junction	102	✓

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Junction Description	Volume Capacity Ratio %	In District Boundary
A281 West Road/ Henfield Road	102	✓
A283 /A29 South Roundabout Pulborough	102	✓
St Leanords Road/A281	102	✓
A283 Amberley Road Roundabout Storrington	102	✓
A24 southbound signals before A24/A27 junction	102	✓
A24 Southbound Exit at Flindon/A280 roundabout	101	
B2237 WB approach to Robin Hood Roundabout	101	✓
Crawley Road/Harwood Road Junction	101	✓
A272 junction at turn to approach A23 slip road northbound at Bolney	101	Highways England
A24/A264 roundabout at the northbound slip road to Farthings Hill Interchange	101	✓
Bewbush Manor Roundabout Sullivan Drive exit	101	✓
B2237/Hurst Road	101	✓
B2195 Exit at Moorhead Roundabout	101	✓
Bar Lane/A24 junction	100	✓
A24 SB Off Slip[at Highwood Mill	100	✓
A272/A281 roundabout north of Cowfold	100	✓
Slip road to A24 southbound from A27 (A24/A27 junction)	100	✓

DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed	Approved
45539/ Reference Case Forecast Congestion Hotspots /TN04	01	24.01.20	RD	PG	PG	PG

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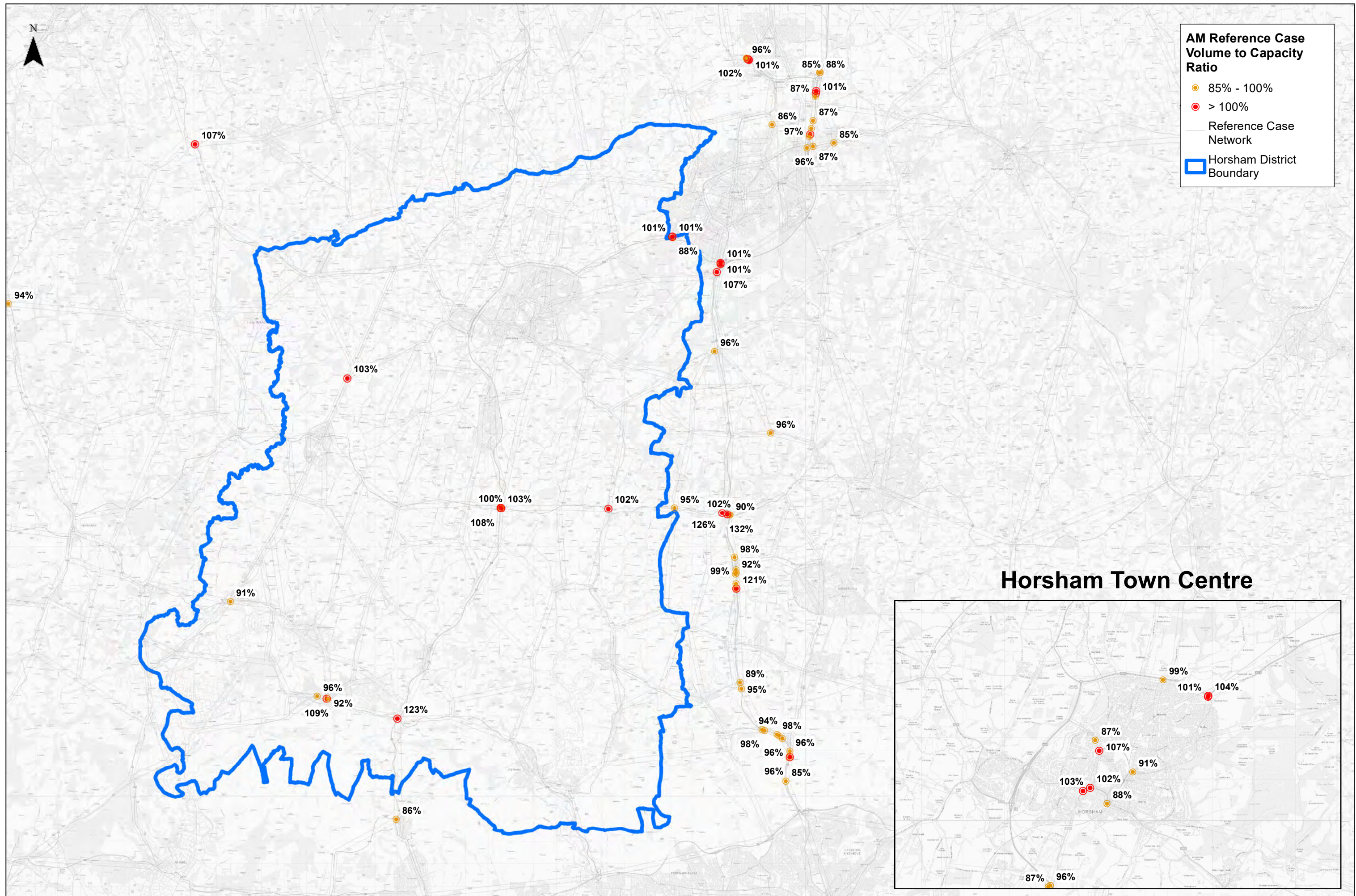
Scenario 1-1000 homes pa : c 9,304 new homes needed	Plan Period	Overall		Employment	Schools
West of Ifield (SA101)	2,500	10,000		750 B1a,b / 220 B1b/B8	1 x Secondary + 2xPrimary
East of Billingshurst (SA118)	650			410 B1a,b / 120 B1b/B8	1xPrimary
West of Kilnwood Vale Extension (SA341)	800			270 B1a,b / 80 B1b/B8	1xPrimary
Rookwood (SA394)	900			310 B1a,b / 90 B1b/B8	1xPrimary
West of Southwater (SA119)	800			410 B1a,b / 120 B1b/B8	1xSecondary + 1xPrimary
North Horsham densification (SA296)	250			6.4 ha	nil
Ashington	600				1xPrimary or expansion of existing
Barns Green	50				nil
Billingshurst	0			19,200 sqm	nil
Broadbridge Heath	150			3.7 ha	nil
Cowfold	75				nil
Henfield	350				nil
Horsham - Forest ward	100			3.7 ha	nil
Lower Beeding	35				nil
North Horsham parish	300				nil
Partridge Green	200			3.9 ha	nil
Pulborough	275			3 ha	nil
Rudgwick	50				nil
Small Dole	20				nil
Steyning	50				nil
Storrington & Sullington	100				nil
Thakeham	50				nil
Upper Beeding	70				nil
Warnham	50			3 ha	nil
West Chiltington	25				nil
North and south of Buck Barn Petrol Filling Station	0			5.5 ha	nil
Land South of Hop Oast Roundabout	0			1 ha	nil
TOTAL	8,450				

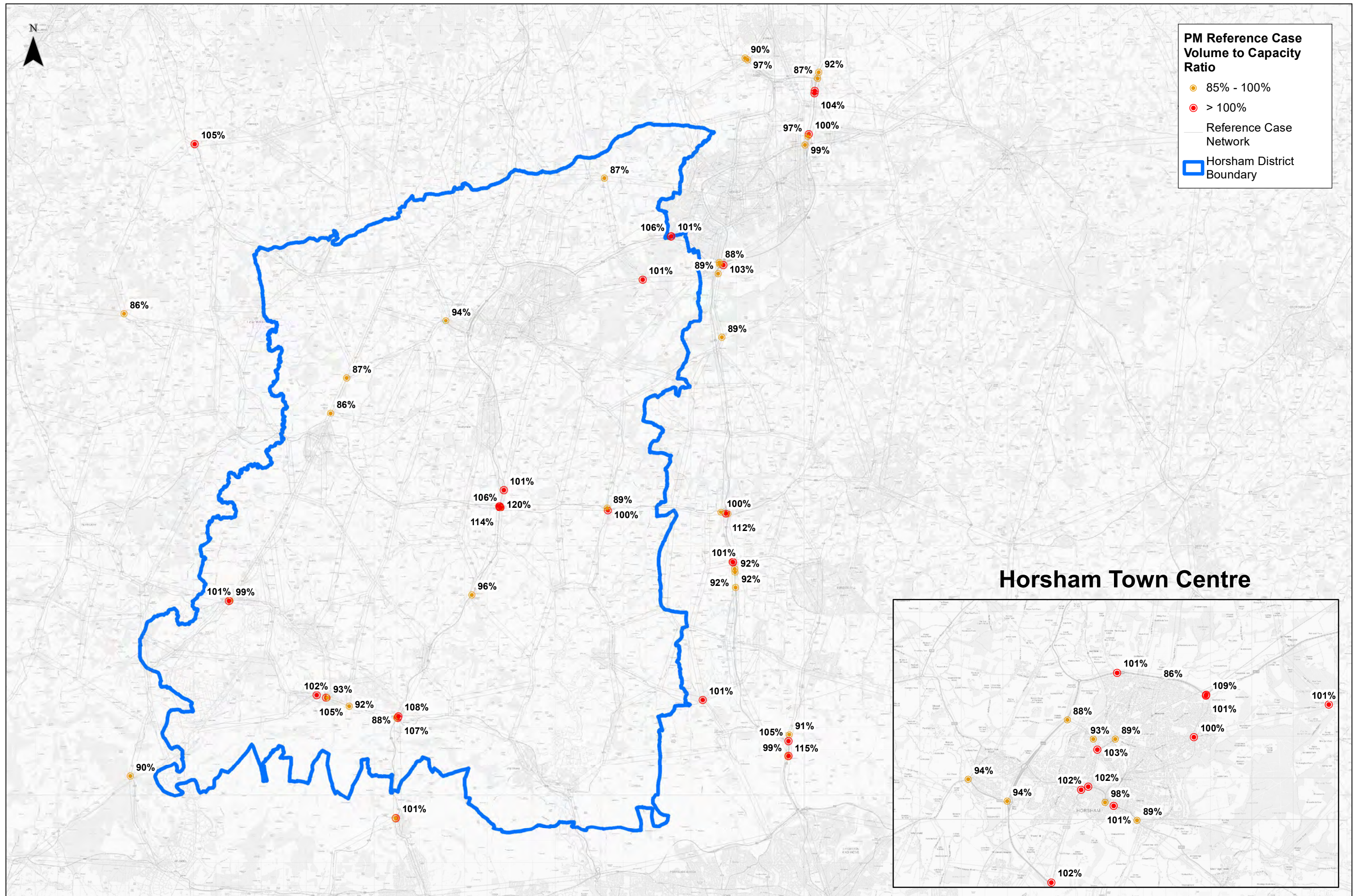
Scenario 2 : Medium Growth 1164 Homes p.a : New settlement plus settlement hierarchy (Mayfield): c 12,274 new homes needed	Plan Period	Overall		Employment	Schools
Mayfield (SA414)	1,900	7000		680 B1a,b / 200 B1b/B8	1xSecondary + 2xPrimary
West of Ifield (SA101)	2,500	10,000		750 B1a,b / 220 B1b/B8	1 x Secondary + 2xPrimary
West of Southwater (SA119)	800			410 B1a,b / 120 B1b/B8	1xSecondary + 1xPrimary
East of Billingshurst (SA118)	650			410 B1a,b / 120 B1b/B8	1xPrimary
Rookwood (SA394)	900			310 B1a,b / 90 B1b/B8	1xPrimary
West of Kilnwood Vale Extension (SA341)	800			270 B1a,b / 80 B1b/B8	1xPrimary
North Horsham densification	500			6.4 ha	nil
Ashington	600				1xPrimary or expansion of existing
Barns Green	50				nil
Billingshurst	0			19,200 sqm	
Broadbridge Heath	150			3.7 ha	nil
Cowfold	75				nil
Henfield	0				nil
Christs Hospital	30				nil
Horsham - Forest ward	100			3.7 ha	nil
Lower Beeding	35				nil
North Horsham parish	300				nil
Partridge Green	200			3.9 ha	nil
Pulborough	275			3 ha	nil
Rudgwick	50				nil
Small Dole	20				nil
Steyning	50				nil
Storrington & Sullington	100				nil
Thakeham	50				nil
Upper Beeding	70				nil
Warnham	50			3 ha	nil
West Chiltington	25				nil
North and south of Buck Barn Petrol Filling Station	0			5.5 ha	nil
Land South of Hop Oast Roundabout	0			1 ha	nil
TOTAL	10,280				

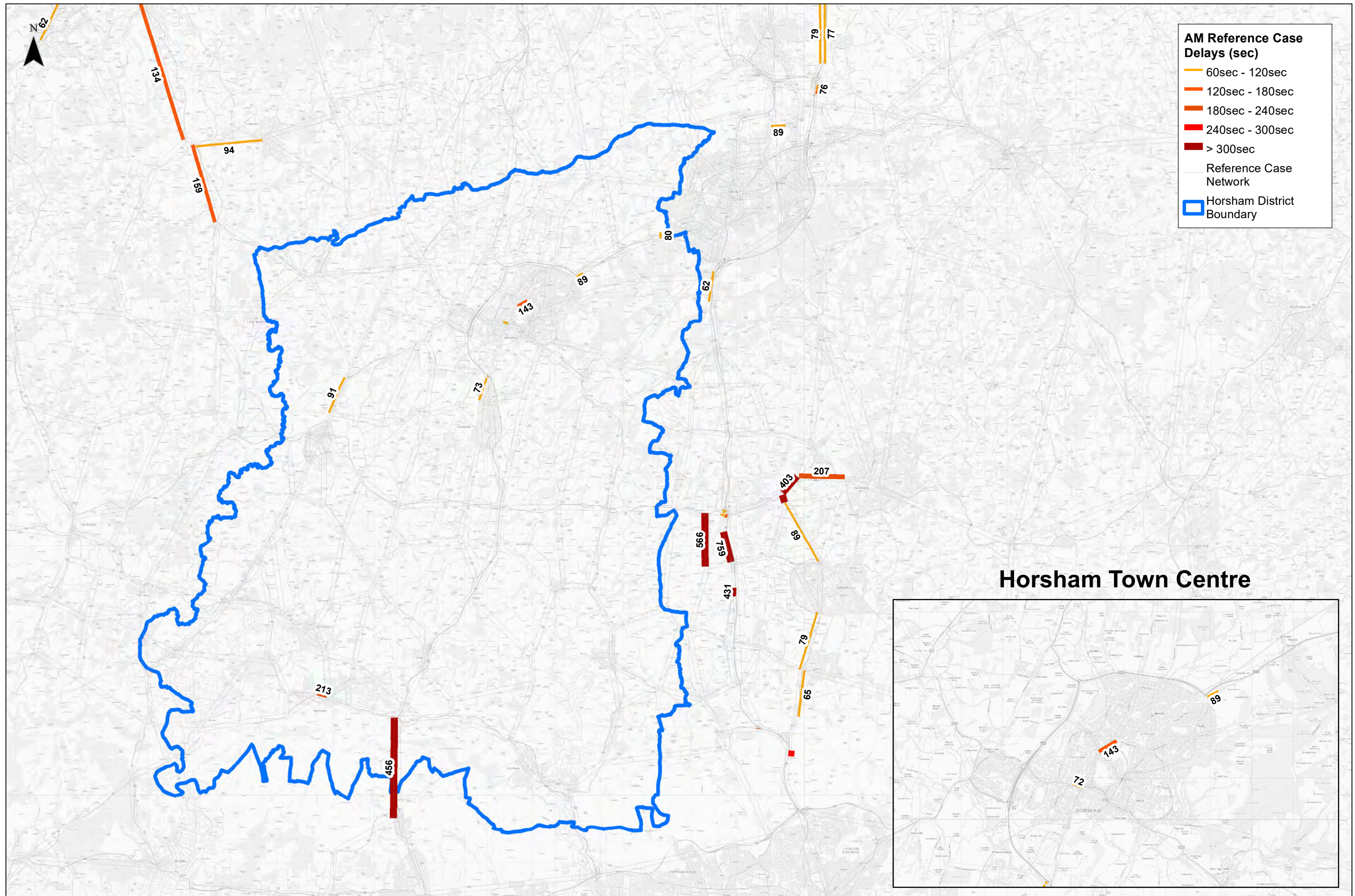
Scenario 3: Medium Growth 1164 Homes p.a : New settlement plus settlement hierarchy (Buck Barn) c12,274 new homes needed				Employment	Schools
Site	Plan Period	Overall			
Buckbarn (SA716)	2,100	3,500		680 B1a,b / 200 B1b/B8	2xPrimary
West of Ifield (SA101)	2,500	10,000		750 B1a,b / 220 B1b/B8	1 x Secondary + 2xPrimary
West of Southwater (SA119)	800			410 B1a,b / 120 B1b/B8	1 x Secondary + 1xPrimary
East of Billingshurst (SA118)	650			410 B1a,b / 120 B1b/B8	1xPrimary
Rookwood (SA394)	900			310 B1a,b / 90 B1b/B8	1xPrimary
West of Kilnwood Vale Extension (SA341)	800			270 B1a,b / 80 B1b/B8	1xPrimary
North Horsham densification (SA296)	500			6.4 ha	nil
Ashington	600				1xPrimary or expansion of existing
Barns Green	50				nil
Billingshurst	0			19,200 sqm	nil
Broadbridge Heath	150			3.7 ha	nil
Christs Hospital	30				nil
Cowfold	0				nil
Henfield	350				nil
Horsham - Forest ward	100			3.7 ha	nil
Lower Beeding	35				nil
North Horsham parish	300				nil
Partridge Green	200			3.9 ha	nil
Pulborough	275			3 ha	nil
Rudgwick	50				nil
Small Dole	20				nil
Steyning	50				nil
Storrington & Sullington	100				nil
Thakeham	50				nil
Upper Beeding	70				nil
Warnham	50			3 ha	nil
West Chiltington	25				nil
North and south of Buck Barn Petrol Filling Station	0			5.5 ha	nil
Land South of Hop Oast Roundabout	0			1 ha	nil
TOTAL	10,755				

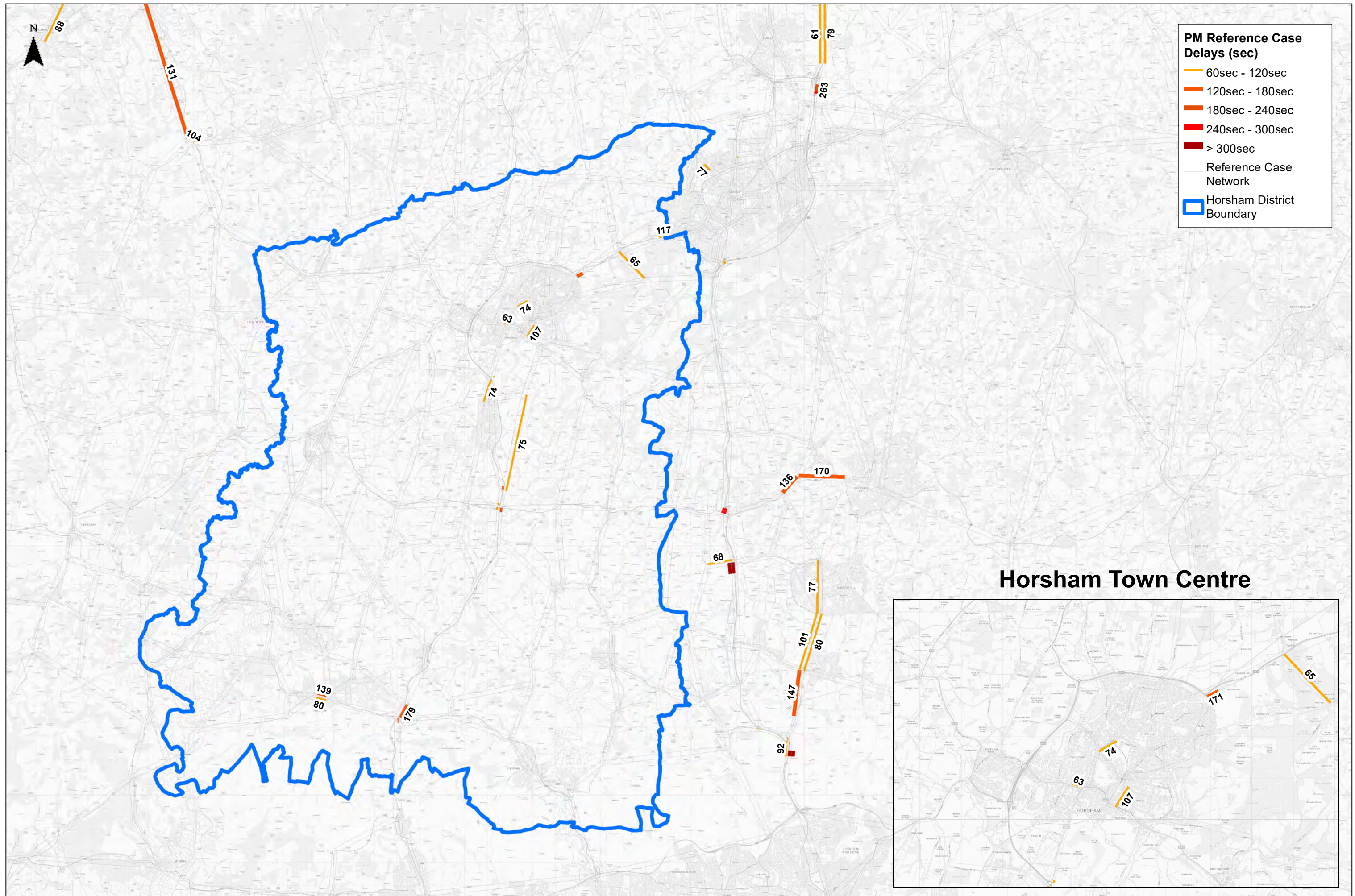
Scenario 4: Medium Growth 1164 Homes p.a : New settlement plus settlement hierarchy (Adversane) c12,274 new homes needed				Employment	Schools
Site	Plan Period	Overall			
Adversane	2,100	3,500		2.0 ha	1 x Secondary + 2xPrimary
West of Ifield (SA101)	2,500	10,000		750 B1a,b / 220 B1b/B8	1 x Secondary + 2xPrimary
West of Southwater (SA119)	800			410 B1a,b / 120 B1b/B8	1xPrimary
East of Billingshurst (SA118)	650			410 B1a,b / 120 B1b/B8	1xPrimary
Rookwood (SA394)	900			310 B1a,b / 90 B1b/B8	1xPrimary
West of Kilnwood Vale Extension (SA341)	800			270 B1a,b / 80 B1b/B8	1xPrimary
North Horsham densification (SA296)	500			6.4 ha	nil
Ashington	600				1xPrimary or expansion of existing
Barns Green	50				nil
Billingshurst	0			19,200 sqm	nil
Broadbridge Heath	150			3.7 ha	nil
Cowfold	75				nil
Christs Hospital	30				nil
Henfield	350				nil
Horsham - Forest ward	100			3.7 ha	nil
Lower Beeding	35				nil
North Horsham parish	300				nil
Partridge Green	200			3.9 ha	nil
Pulborough	275			3 ha	nil
Rudgwick	50				nil
Small Dole	20				nil
Steyning	50				nil
Storrington & Sullington	100				nil
Thakeham	50				nil
Upper Beeding	70				nil
Warnham	50			3 ha	nil
West Chiltington	25				nil
North and south of Buck Barn Petrol Filling Station	0			5.5 ha	nil
Land South of Hop Oast Roundabout	0			1 ha	nil
TOTAL	10,830				

Scenario 5: High Growth: Urban Extension and New Settlements (c15,874 new homes needed)				Employment	Schools
Site	Plan Period	Overall			
Adversane	2,100	3,500		2.0 ha	1 x Secondary + 2xPrimary
Buckbarn (SA716)	2,100	3500		680 B1a,b / 200 B1b/B8	2xPrimary
Mayfield (SA414)	1,900	7,000		680 B1a,b / 200 B1b/B8	1xSecondary + 2xPrimary
West of Ifield (SA101)	2,500	10,000		750 B1a,b / 220 B1b/B8	1xSecondary + 2xPrimary
West of Southwater (SA119)	800			410 B1a,b / 120 B1b/B8	1xSecondary + 1xPrimary
East of Billingshurst (SA118)	650			410 B1a,b / 120 B1b/B8	1xPrimary
Rookwood (SA394)	900			310 B1a,b / 90 B1b/B8	1xPrimary
West of Kilnwood Vale Extension (SA341)	800			270 B1a,b / 80 B1b/B8	1xPrimary
North Horsham densification (SA296)	500			6.4 ha	nil
Ashington	600				1xPrimary or expansion of existing
Barns Green	50				nil
Billingshurst	0			19,200 sqm	
Broadbridge Heath	150			3.7 ha	nil
Christs Hospital	30				nil
Cowfold	0				nil
Henfield	0				nil
Horsham - Forest ward	100				nil
Lower Beeding	35				nil
North Horsham parish	300				nil
Partridge Green	200			3.9 ha	nil
Pulborough	275			3 ha	nil
Rudgwick	50				nil
Small Dole	20				nil
Steyning	50				nil
Storrington & Sullington	100				nil
Thakeham	50				nil
Upper Beeding	70				nil
Warnham	50			3 ha	nil
West Chiltington	25				nil
North and south of Buck Barn Petrol Filling Station	0			5.5 ha	nil
Land South of Hop Oast Roundabout	0			1 ha	nil
TOTAL	14,405				









VOT/PPM and VOC/PPK Values User Class and Time Period

User Class	AM		PM	
	PPM	PPK	PPM	PPK
Car Commute	1.00	0.42	1.00	0.31
Car Other	1.00	0.33	1.00	0.45
Car Business	1.00	0.17	1.00	0.26
LGV	1.00	0.51	1.00	0.53
HGV	1.00	1.32	1.00	1.06

2036 AM Convergence Statistics AM

AM			
Iteration	% Gap/ Delta	% Flow	%Cost Delays
39	0.0090	98.5	99.7
40	0.0082	98.8	99.7
41	0.0071	98.8	99.7
42	0.0087	98.9	99.7

2036 PM Convergence Statistics PM

PM			
Iteration	% Gap/ Delta	% Flow	%Cost Delays
33	0.050	98.7	99.0
34	0.058	98.6	99.1
35	0.064	98.9	99.0
36	0.069	98.6	99.0

Reference Case Highway Schemes
A27 Arrundel Bypass
Adversane - Brindsbury Field
M23 Smart Motorway
M23 J10
A2011 Crawley Avenue / A2004 Northgate Avenue / Hazelwick Avenue Proposed Improvements
Fleming Way Gatwick Rd Roundabout
East Billingham - New Road
A24 Great Daux Roundabout
A24 Robin Hood Roundabout
A24 - Farthing Hill Interchange
Newbridge Roundabout
Horsam Enterprise Park Access
Cheals Roundabout
M23 J11 Improvements
Kilnwood Vale Main Access
A2300 / Cuckfield Lane Roundabout
North Horsham Development associated infrastructure
Hop Oast Roundabout

