Worthing Borough Council

# WORTHING LOCAL PLAN

## Transport Assessment - Addendum

70033198-TAA
JANUARY 2021

PUBLIC

Worthing Borough Council

# WORTHING LOCAL PLAN

## Transport Assessment - Addendum

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# TRANSPORT ASSESSMENT - ADDENDUM

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# 1 TRANSPORT ASSESSMENT - ADDENDUM

## 1.1 PURPOSE OF ADDENDUM

This document is an addendum to the Worthing Local Plan Transport Assessment (August 2018), produced for Worthing Borough Council (WBC). The Transport Assessment forms part of the evidence base for the emerging Local Plan.

The purpose of this addendum is to present supplementary information in response to Highways England representation DWLP-M-111, received in December 2018. This addendum also includes information which responds to continuing engagement with Highways England during 2019 and 2020. Transport assessment information in relation to the following topic areas is provided:

- Suitability of the traffic model (section 1.3).
- Impact upon the strategic road network (section 1.4).
- Mitigation strategy for the strategic road network (section 1.5).

## 1.2 BACKGROUND

WBC is developing a new Local Plan for the Borough. The existing Development Plan for Worthing is the Worthing Core Strategy which was adopted in 2011 and covered the period to 2026. Since its adoption, changes to the planning system have resulted in the need to prepare a new development plan. The Worthing Local Plan will:

- aim to meet the objectively assessed development and infrastructure needs.
- identify land where development would be appropriate / inappropriate.
- contain a clear strategy for enhancing the natural, built and historic environment.

The plan will cover land use proposals relating to housing business, retail, and transport and will include new land use allocations where they are needed and policies which will be used to assess planning proposals.

Following the Regulation 18 Consultation that took place in late 2018, it is expected that the Submission Stage (Regulation 19) version of the Local Plan will be published for consultation in January / February 2021.

## 1.3 SUITABILITY OF THE TRAFFIC MODEL

The traffic model that is the basis for the traffic assessment is Highways England's A27 strategic traffic model that has been used to assess the Road Investment Strategy (RIS) Period 1 schemes for A27 Worthing and Lancing and A27 Arundel. It is noted that the 'model calibration and validation process….was undertaken successfully and shows the model provides a satisfactory representation of the existing traffic situation across all peaks…..This indicated the modelled data provides a good fit with the observed data and provides a suitable basis for transport forecasting and scheme

appraisal'[1]. Highways England has raised the following representation as part of their response to the Regulation 18 Consultation:

*"Highways England advised that whilst the model was fit for the purposes of economic trunk road option assessment it may not be suitable for assessment of strategic allocations of any Local Plan proposals. This is because Local plans are assessed using different guidance and policies to major highway investment schemes. Accordingly our advice was that the model should be reviewed and amended and re-validated to ensure that it was fit for purpose for Worthing's Local Plan."*

Further representation was submitted in relation to a key feature of Highways England's traffic model; that it reflects average peak periods rather than single peak hours.

*"The modelling work as presented uses an average peak period assessment (averaged over three hours) which is not appropriate for the assessment of the Local Plan. Accordingly, Highways England cannot accept the findings of the report as presented".*

These matters were discussed at a meeting between WBC, Highways England and consultants WSP and Atkins on 13th February 2019. In addition, further requests for information were sent by Highways England to WSP on 7th March 2019, 14th April 2019 and 15th November 2019. This note summarises the information provided by WSP to Highways England during this period, in accordance with the following headings:

- Traffic flows
- Traffic routing
- Journey times
- Trip rates

### 1.3.1. Traffic flows (links)

To address Highways England's representation relating to the traffic model, a number of comparisons have been made to establish the difference between average peak period and peak hour traffic flows and between observed and modelled traffic flows.

The location of sites for the additional traffic flow comparisons (links and junctions) is shown in Figure 1-1, with the locations indicated by blue circles.

[1] A27 Arundel Bypass, Combined Modelling and Appraisal Report (August 2019), sections 3.14 and 3.17

**Figure 1-1 – Location of sites for additional traffic flow comparison**

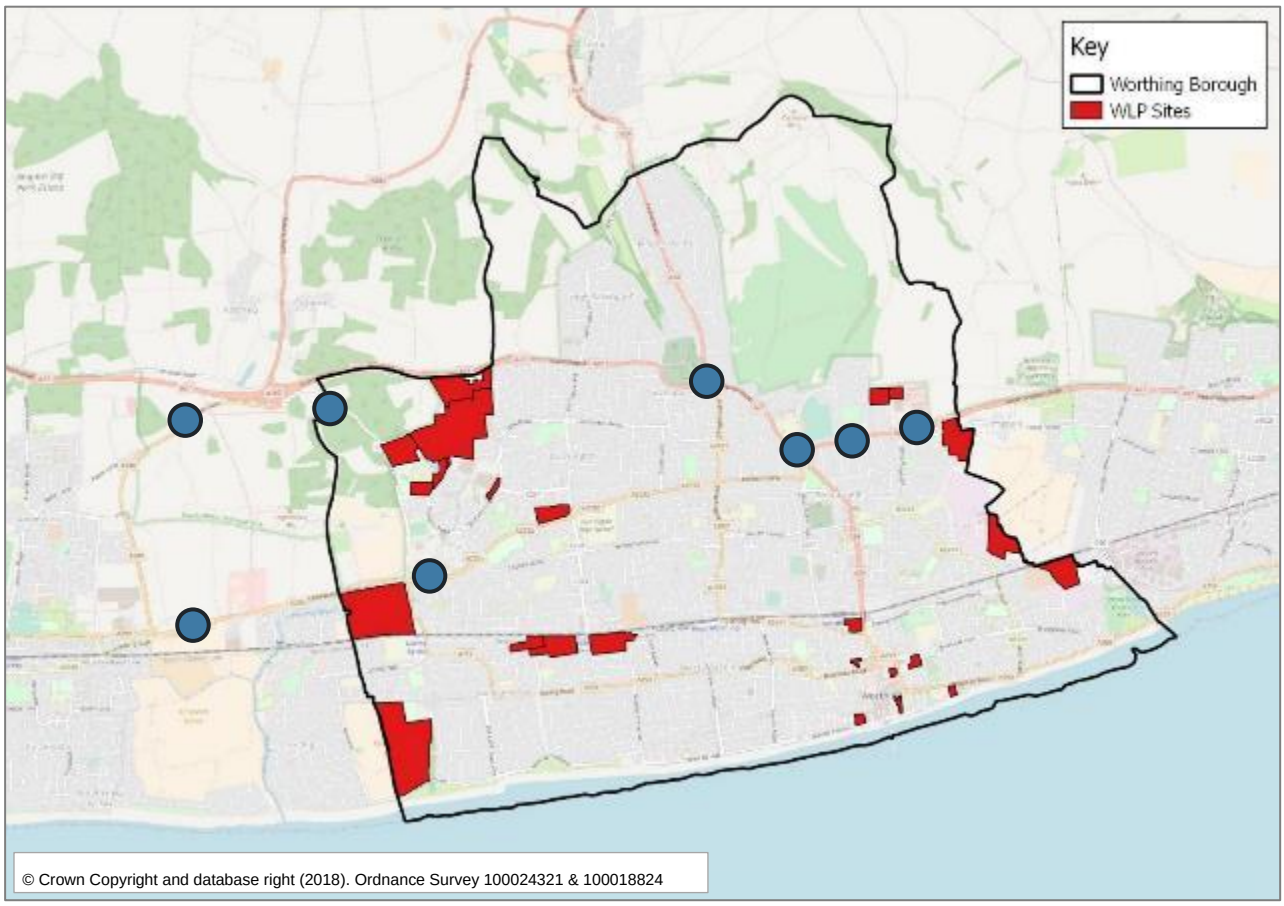



Table 1-1 presents a comparison of the observed data for years 2015 and 2018, for neutral weeks only, for the A27 at Upper Brighton Road, east of Grove Lodge roundabout[2]. Both the average peak period (07:00 – 10:00 and 16:00 – 19:00) and highest peak hour within each period are presented.

The table shows that for all comparisons but one, the difference between the peak period and peak hour flow on the A27 in each year and in each direction is less than 5%, and less than 50 vehicles per hour. This level of difference is considered to be non-material, and well within typical daily variation in flow.

The only comparison that indicates a greater level of difference is in the eastbound direction, during the AM, in 2018, where the peak period data is shown to be 9.3% lower than the peak hour data.

[2] Highways England WebTRIS database – sites 30360477 and 30360478. These sites have continuously recorded traffic data between 2015 and 2018

**Table 1-1 - Peak Period and Peak Hour flows – A27 Upper Brighton Road**

| Year | Direction | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| | | Period | Hour | % diff | Period | Hour | % diff |
| **2018** | EB | 1094 | 1206 | -9.3% | 1201 | 1231 | -2.5% |
| | WB | 1124 | 1132 | -0.8% | 1126 | 1144 | -1.6% |
| **2015** | EB | 1153 | 1201 | -4.0% | 1258 | 1302 | -3.4% |
| | WB | 1088 | 1097 | -0.8% | 1048 | 1094 | -4.2% |

To confirm the significance of this difference, the peak period and peak hour data has been compared to Highways England's traffic model flows. The results are presented in Table 1-2.

**Table 1-2 - Comparison of modelled with observed flows – A27 Upper Brighton Road**

| Year | Direction | Model | | AM Period | | AM Hour | | PM Period | | PM Hour | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AM | PM | % diff | GEH | % diff | GEH | % diff | GEH | % diff | GEH |
| **2015** | EB | 1343 | 1249 | 16.5% | 5.4 | 11.8% | 4.0 | -0.7% | 0.3 | -4.1% | 1.5 |
| | WB | 1087 | 1046 | -0.1% | 0.0 | -0.9% | 0.3 | -0.2% | 0.1 | -4.4% | 1.5 |

When the traffic model is compared to the AM and PM peak hour observed data, all modelled flows are within 15% and a GEH of 5.0, which is consistent with WebTAG criteria and indicates a good level of fit between observed and modelled data.

The remainder of the traffic flow comparison presents information for a number of locations across the wider road network.

Table 1-3 presents a comparison of the observed data for years 2015 and 2018 at a location on the route between the A27 / A280 junction and Grove Lodge roundabout via Titnore Lane and the A2032[3]. Table 1-4 presents a comparison between modelled and observed flows at this location.

**Table 1-3 - Peak Period and Peak Hour flows – A2032 Littlehampton Rd**

| Year | Direction | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| | | Period | Hour | % diff | Period | Hour | % diff |
| **2018** | EB | 1096 | 1161 | -5.6% | 1014 | 1100 | -7.8% |
| | WB | 893 | 971 | -8.0% | 997 | 1085 | -8.1% |
| **2015** | EB | 1156 | 1264 | -8.5% | 1003 | 1074 | -6.6% |
| | WB | 866 | 933 | -7.2% | 1006 | 1092 | -7.9% |

The data shows that the peak period flows are consistently between 5 and 9% lower than the peak hour flows, or typically in the order of 80 vehicles lower.

**Table 1-4 - Comparison of modelled with observed flows – A2032 Littlehampton Rd**

| Year | Direction | Model | | AM Period | | AM Hour | | PM Period | | PM Hour | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AM | PM | % diff | GEH | % diff | GEH | % diff | GEH | % diff | GEH |
| **2015** | EB | 1131 | 999 | -2.3% | 0.8 | -11.7% | 3.8 | -0.4% | 0.1 | -7.5% | 2.3 |
| | WB | 856 | 999 | -1.2% | 0.4 | -9.0% | 2.6 | -0.7% | 0.2 | -9.3% | 2.9 |

When the model is compared to the AM and PM peak hour observed data, all modelled flows are within 15% and a GEH of 5.0, which is consistent with WebTAG criteria and indicates a good level of fit between observed and modelled data. This, and the information in Table 1-2, demonstrates that the model provides a suitably accurate representation of both average peak period and peak hour flows at key locations within the traffic model network.

[3] West Sussex County Council (WSCC) database – site 1323. This site provides a complete data set for the years 2015 and 2018 and is located just east of the A259 / A2032 Goring Crossways roundabout.

Additional flow comparisons have been undertaken following a further review of the availability of traffic count information. These include a comparison of modelled with observed flows at Titnore Lane, which is part of the potential alternative route to the A27 via the A2032.

The results are presented in Table 1-5 and show a good level of calibration is achieved in comparison to observed AM and PM peak period flows. When considered against highest peak hour flows, the modelled flows are lower, and outside of GEH of 5 in a southbound direction.

**Table 1-5 - Comparison of modelled with observed flows – Titnore Lane**

| Year | Direction | Model | | AM Period | | AM Hour | | PM Period | | PM Hour | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AM | PM | % diff | GEH | % diff | GEH | % diff | GEH | % diff | GEH |
| **2015** | NB | 459 | 488 | 2.0% | 0.4 | -12.3% | 2.6 | -1.9% | 0.4 | -23.1% | 4.8 |
| | SB | 525 | 436 | 0.4% | 0.1 | -32.3% | 6.9 | -25.3% | 5.0 | -43.8% | 8.3 |

A further comparison of observed and modelled flow has been undertaken at sites outside of the Worthing Local Plan study area, to the west at the junction of the A259 / A280. The total volume of traffic using the main local authority roads to and from the west of the Worthing Local Plan study area, the A280 and the A259, have been considered.

The information presented in Table 1-6 shows a good fit between observed (peak period) and modelled data.

**Table 1-6 - Flow comparison – A280 Water Lane, A259 Littlehampton Rd**

| Location | Direction | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| | | Observed | Modelled | GEH | Observed | Modelled | GEH |
| **A280 Water Lane** | EB | 634 | 645 | 0.4 | 486 | 514 | 1.2 |
| | WB | 507 | 507 | 0.0 | 872 | 862 | 0.4 |
| **A259 Littlehampton Rd** | EB | 1586 | 1568 | 0.5 | 1350 | 1443 | 2.5 |
| | WB | 1047 | 1049 | 0.1 | 1460 | 1478 | 0.5 |

### 1.3.2. Traffic flows (junctions)

Further analysis of traffic flow has been undertaken using observed turning count data[4]. It is noted that this observed turning data is taken from single day's counts and is associated with a lower level of confidence than the link traffic flow data from long-term automatic traffic count (ATC) sites. Therefore, there should be greater caution in comparing observed and modelled flows using this data.

A junction turning count at the A27 / A24 Offington Lane junction has been compared to the modelled flows. Comparisons have been undertaken at a link level rather than turn level. The observed data is from a single day count, and therefore associated with a lower level of confidence than long term ATC data in terms of the data reflecting typical average conditions. The results are presented in Table 1-7.

**Table 1-7 - Comparison of modelled with observed flows – A27 Offington Lane Rdbt**

| A27 Arm | Dir. | Model | | Observed | | Difference | |
|---|---|---|---|---|---|---|---|
| | | AM | PM | AM | PM | AM | PM |
| **A24 Findon Road (North)** | SB | 893 | 1114 | 822 | 1048 | 71 | 65 |
| | NB | 965 | 872 | 953 | 934 | -59 | -61 |
| **A27 Warren Road (East)** | WB | 899 | 701 | 1333 | 1393 | -434 | -692 |
| | EB | 643 | 1041 | 1103 | 1161 | -460 | -120 |
| **A2031 Offington Lane** | NB | 811 | 1034 | 632 | 561 | 179 | 473 |
| | SB | 918 | 784 | 460 | 654 | 458 | 129 |
| **Goodwood Road** | NB | 78 | 94 | 38 | 18 | 40 | 75 |
| | SB | 20 | 121 | 12 | 21 | 8 | 100 |
| **A27 Crockhurst Hill (West)** | EB | 957 | 892 | 837 | 979 | 120 | -87 |
| | WB | 1092 | 1016 | 1134 | 1229 | -42 | -214 |

[4] The available turning count data has been established using the information presented within the A27 Worthing Lancing and A27 Arundel Improvements Traffic Data Collection Report (TDCR) (September 2016)

The modelled and observed flows compare well on three of the five individual arms at this junction, the A24 Findon Road, Goodwood Road, and the A27 Crockhurst Hill (West). The data illustrates an imbalance of modelled traffic flow on the A27 Warren Road (East) and the A2031 Offington Lane arms, with modelled flows lower than observed on the A27 and higher than observed on the A2031. The overall flows at the junction are a close match to observed flows, with total modelled volumes within 5% of observed values.

The junction turning count at the A27 / A24 Grove Lodge Roundabout has been compared to the modelled flows on the same basis as for the A27 Offington Lane roundabout, described above. The results are presented in Table 1-8.

**Table 1-8 - Comparison of modelled with observed flows – A27 Grove Lodge Rdbt**

| A27 Arm | Dir. | Model | | Observed | | Difference | |
|---|---|---|---|---|---|---|---|
| | | AM | PM | AM | PM | AM | PM |
| **Hill Barn Lane** | SB | 58 | 50 | 82 | 98 | -24 | -48 |
| | NB | 43 | 48 | 103 | 97 | -77 | -49 |
| **A27 Upper Brighton Road (East)** | WB | 1092 | 1062 | 1131 | 1118 | -39 | -56 |
| | EB | 1349 | 1287 | 1160 | 1291 | 189 | -5 |
| **A24 Broadwater St West** | NB | 1042 | 822 | 910 | 908 | 131 | -86 |
| | SB | 544 | 939 | 670 | 677 | -126 | 262 |
| **A27 Warren Road (West)** | EB | 643 | 1041 | 1115 | 1173 | -472 | -132 |
| | WB | 899 | 701 | 1305 | 1232 | -405 | -531 |

The modelled and observed flows compare well on three of the four individual arms at this junction, Hill Barn Lane, A27 Upper Brighton Road (East) and A24 Broadwater St West. For Hill Barn Lane the flows are low which limits the size of the actual differences; the proportional differences at this location are not significant to the overall junction as this arm has much lower flow than the three main arms.

The data illustrates the modelled flows for the A27 Warren Road (West) are lower than observed. This correlates with the information presented in Table 1-7 for A27 Warren Road. The overall flows at the junction are within 15% of observed values, with modelled lower than observed.

It can be concluded from this comparison that there is a good overall fit between total observed and modelled flows at both the A27 Offington Lane roundabout and the A27 Grove Lodge roundabout. At a link level, there is also a good fit between observed and modelled flows with the particular

exception of the A27 Warren Road arm on both the Offington Lane and Grove Lodge Roundabout junctions, where modelled flows are lower than observed values.

The junction turning count at the A27 / Upper Brighton Road / Lyons Way has been compared to the modelled flows on the same basis as for the locations in Tables 1-7 and 1-8. The results are presented in Table 1-9.

**Table 1-9 - Comparison of modelled with observed flows – A27 / Lyons Way**

| A27 Arm | Dir. | Model | | Observed | | Difference | |
|---|---|---|---|---|---|---|---|
| | | AM | PM | AM | PM | AM | PM |
| **Lyons Way** | SB | 127 | 144 | 242 | 521 | -115 | -378 |
| | NB | 98 | 198 | 138 | 210 | -40 | -12 |
| **A27 Sompting Bypass (E)** | WB | 1244 | 1299 | 1279 | 1214 | -35 | 85 |
| | EB | 1661 | 1667 | 1728 | 1766 | -67 | -99 |
| **Upper Brighton Road** | NB | 122 | 86 | 305 | 293 | -182 | -206 |
| | SB | 97 | 137 | 78 | 148 | 19 | -11 |
| **A27 Sompting Bypass (W)** | EB | 1744 | 1853 | 1525 | 1541 | 220 | 312 |
| | WB | 1381 | 1380 | 1406 | 1445 | -25 | -65 |

The modelled and observed flows compare well for most of the movements at this junction, with particularly good fit between observed and modelled flows on the A27 arms. There is a lower volume of trips in the model on the Lyons Way southbound movement, associated with how the traffic model represents retail trips. The Upper Brighton Road northbound movement is lower than observed. The overall flows at the junction are a close match to observed flows, with total modelled volumes within approximately 5% of observed values.

### 1.3.3. Traffic Routing

The potential for the use of the A2032 as a diversion route to the A27 within the traffic model has been considered. It is necessary to consider whether differences in model journey times along the A2032 and A27 routes could result in unrealistic routing within the model, with Highways England considering that this may contribute to the model potentially under-estimating flows on the A27.

For the purposes of assessing traffic routing within the model, the route from the A27 / A280 / Titnore Lane junction to just east of the Grove Lodge roundabout has been considered (locations highlighted on Figures 1-2 and 1-3, below).

The route via the A27 is circa 3.8 miles, and via the A2032 is 5.0 miles which suggests it would be unlikely in principle for the alternative route via the A2032 to be an attractive diversionary route, except in the event of a significant incident on the A27. For reference, the modelled journey time (base year) on these routes is presented in Table 1-10 and shows that the A2032 route is, broadly, 100 – 200 seconds slower than the A27.

**Table 1-10 - Modelled journey times (s) – A27 and A2032**

| Route | Direction | Base Year | |
|---|---|---|---|
| | | AM | PM |
| **A27** | EB | 624 | 518 |
| | WB | 503 | 435 |
| **A2032** | EB | 763 | 726 |
| | WB | 621 | 627 |

This data illustrates that the journey time on the potential A2032 diversionary route is greater than on the A27 route. To confirm whether there is any issue within the transport model relating to a realistic or unrealistic diversion of traffic away from the A27, a 'select link' analysis has been undertaken to identify any routing of traffic along the A2032. This has been undertaken on both the traffic model base year and the forecast year scenarios.

The select link analysis for all scenarios illustrates that no traffic within the model uses the A2032 route and therefore there is no under-estimation of flow on the A27 that would result from this issue. The select link analysis for the base year scenario is illustrated in Figure 1-2 and Figure 1-3, using the AM peak scenario (PM and forecast scenarios show the same pattern of routing).

**Figure 1-2 - Select Link Analysis - Routing via Titnore Lane (AM Northbound)**

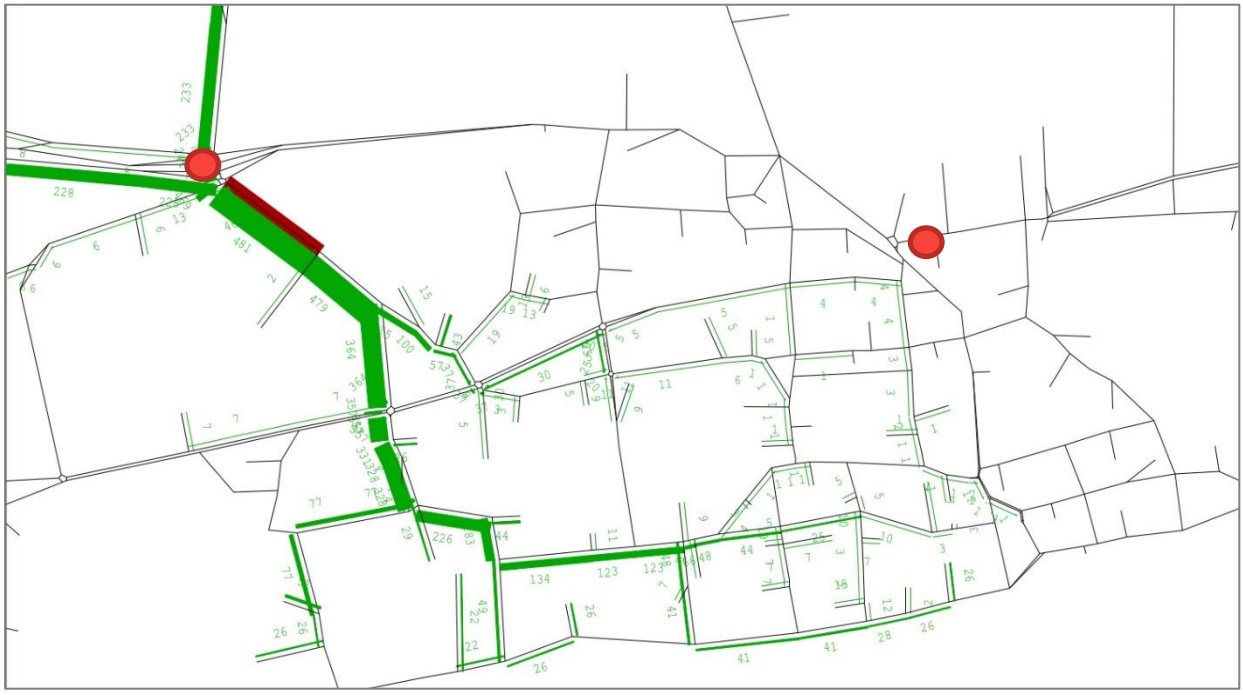
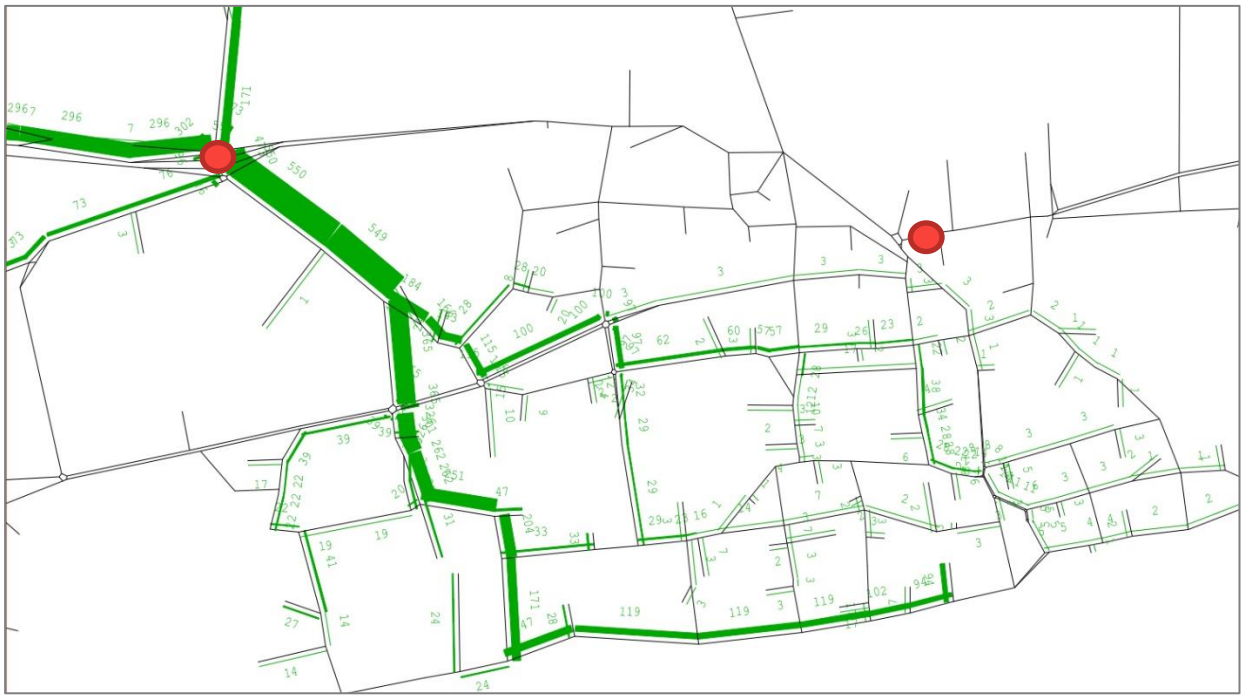


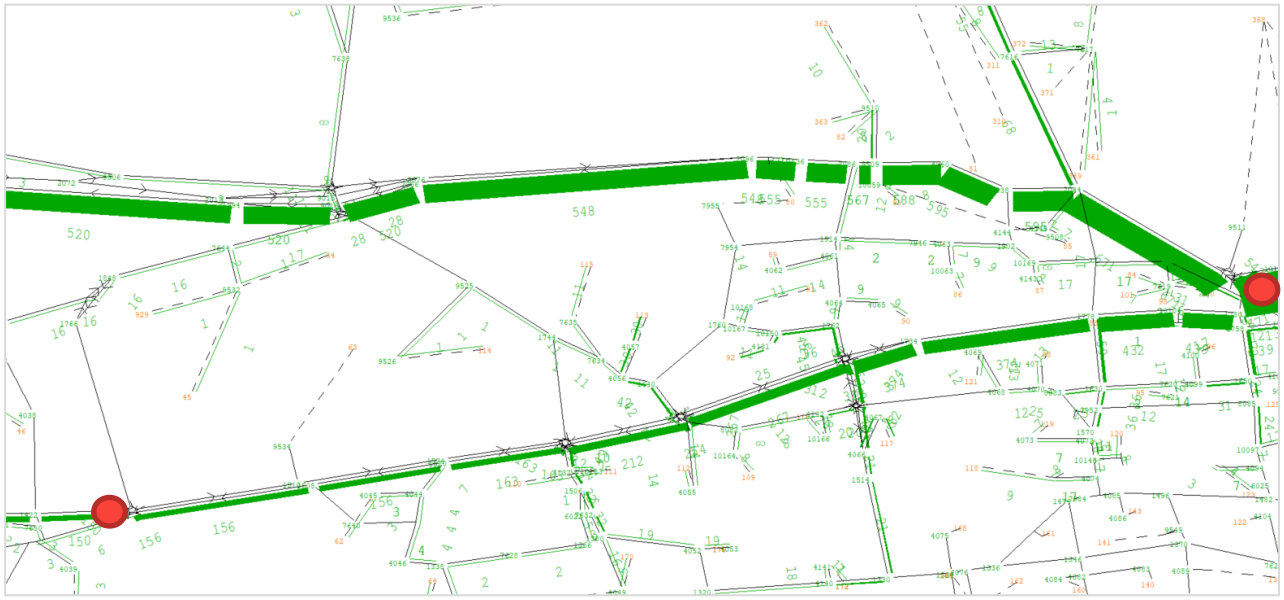
**Figure 1-3 - Select Link Analysis - Routing via Titnore Lane (AM Southbound)**



Routing within the traffic model has also been considered between the A280 / A259 junction to the west, and just east of Grove Lodge roundabout. The route via the A27 is longer, at circa 5.9 miles compared with circa 4.6 miles via the A2032. A select link analysis has been undertaken and Figures 1-4 and 1-5 illustrate the routing within the model between the A280 / A259 junction and just east of Grove Lodge roundabout.

**Figure 1-4 - Select Link Analysis - West of A280 / A259 junction (AM eastbound)**

**Figure 1-5 - Select Link Analysis - A27 east of Grove Lodge roundabout (AM westbound)**



The analysis shows that trips that pass these two points use the route via the A2032. To accompany this analysis, the model calibration results have been considered in order to confirm the absolute level of volume within the traffic model on the two routes to and from the A280 / A259 junction is correct. This is demonstrated within Table 1-6 and confirms there is no difference in modelled flows that would suggest the routing of traffic within the model is incorrect.

### 1.3.4. Journey Times

The journey time information that was processed and used for the purposes of developing the Highways England's A27 traffic model has been reviewed. The source of the journey time data is Trafficmaster[5]. The journey time data used to validate the model reflects average peak period conditions. The journey time for the peak hour has been extracted from this data.

Both measures of journey time have then been compared to the A27 traffic model journey time. The extent of network considered in this assessment is consistent with one of the journey time routes that was used to validate the model. This includes the full extent of the A27 within Worthing Borough, from the junction of A27 / A280 to the west, to the junction of A27 / A283 to the east. The results of the assessment are presented in Table 1-11, with journey times presented in seconds.

**Table 1-11 - Peak Period and Peak Hour journey times – A27 through Worthing Borough**

| Aggregation | Direction | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| | | Observed | Modelled | % diff | Observed | Modelled | % diff |
| **Peak Period** | EB | 1161 | 1199 | 3.3% | 1066 | 1015 | -4.8% |
| | WB | 1115 | 1098 | -1.5% | 1120 | 1111 | -0.8% |
| **Peak Hour** | EB | 1242 | 1199 | -3.5% | 1141 | 1015 | -11.0% |
| | WB | 1288 | 1098 | -14.8% | 1194 | 1111 | -7.0% |

The data illustrates that the peak hour journey times are greater than the average peak period by between 1 and 2 minutes on average, for journey times that are in the order of 20 minutes. When the modelled journey time is compared to the AM and PM peak hour observed journey time data, all journey times remain within 15%, which is consistent with WebTAG criteria and indicates a good level of fit between observed and modelled data. This demonstrates that the model provides a suitably accurate representation of both average peak period and peak hour journey times.

Highways England has requested similar data be presented for a journey time along the same route from the A27 / A280 junction to the west through to Lambleys Lane in the east. Processed Trafficmaster data for that specific timing point is not available, therefore the nearest available timing point has been considered which is at the A27 / Lyons Way / Upper Brighton Road junction. The results of the assessment are presented in Table 1-12.

[5] Data made available via the DfT purchased from Trafficmaster which contains Global Positioning System (GPS) derived journey times of vehicles

**Table 1-12 - Peak Period and Peak Hour journey times – A27 / A280 to Lyons Way**

| Aggregation | Direction | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| | | Observed | Modelled | % diff | Observed | Modelled | % diff |
| **Peak Period** | EB | 719 | 686 | -4.6% | 662 | 585 | -11.6% |
| | WB | 593 | 569 | -4.0% | 538 | 485 | -9.9% |
| **Peak Hour** | EB | 755 | 686 | -9.1% | 696 | 585 | -15.9% |
| | WB | 642 | 569 | -11.4% | 539 | 485 | -10.0% |

It should be noted that the journey times presented in Table 1-12 are for a shorter section of road network than has been subject to model validation. All comparisons indicate modelled journey times being lower than observed journey times. The data shows that seven out of the eight comparisons fall within 15% difference and one comparison that falls outside of 15%, (the peak hour data aggregation in the PM peak). The model is around 8 seconds too slow to fall within 15% of the observed journey times.

### 1.3.5. Trip Rates

Highways England raised the following representation as part of their response to the Regulation 18 Consultation:

*In addition to this fundamental concern with the modelling approach, we require further details on the TRICS rates and some more detail information on the trip distribution. For example, all leisure and retail trips have been excluded as they are assumed to be linked or internal! "*

Further information was submitted to Highways England for review and the trip rate information was confirmed to be satisfactory on 15th January 2020.

### 1.3.6. Summary of suitability of traffic model

Highways England's A27 traffic model has been used to assess the RIS1 schemes for A27 Worthing and Lancing and A27 Arundel and is the basis for the traffic assessment of the WBC Local Plan. The 'model calibration and validation process…was undertaken successfully and shows the model provides a satisfactory representation of the existing traffic situation across all peaks'. The further analysis of the suitability of the model has confirmed the following:

- Traffic flows – The additional link flow comparisons have shown a very good fit between the observed and modelled flow data, including on the A27, at both peak period and peak hour levels. The total flows at key A27 junctions are within 15% of observed values.

- Traffic routing – Analysis has shown that the traffic routing within the model is intuitive for key routes associated with the A27 and A2032, and there is no issue that would result in a specific under-estimation of flow on these routes.
- Journey time – The traffic model validates well against observed journey time data along the A27 through Worthing Borough, and for shorter sections of the route through the Worthing urban area.
- Trip rates – Assumptions have been agreed as suitable for the purposes of the Local Plan transport assessment.

The A27 modelled traffic data has been shown to provide a good fit with the observed data and provides a suitable basis for transport forecasting and scheme. There is one noted limitation in relation to the modelled traffic flows on the A24 Warren Road, between the A27 Offington junction and the A27 Grove Lodge roundabout. The modelled flows for the A24 Warren Road are lower the level of observed flow when compared with observed turning count data. This limitation has been considered further in relation to the operational assessment of these junctions and is described further in section 1.4.

## 1.4 IMPACT UPON THE STRATEGIC ROAD NETWORK

The Worthing Local Plan Transport Assessment (August 2018) describes the transport impacts of the proposed Local Plan sites (Chapter 5). As part of the assessment, an 'area of influence' was established for further, more detailed investigation which included three specific junctions on the strategic road network:

- Beeches Avenue / A27
- Lyons Way / Upper Brighton Road / A27
- A27 / A280 / Titnore Lane

These junctions were subject to operational assessment (Transport Assessment, Chapter 6) with conclusions drawn that there would be no material impact upon the overall performance of these junctions.

Chapter 7 of the Transport Assessment sets out a mitigation package that includes a number of highway interventions on the local authority road network, areas for road safety mitigation and areas of potential walking and cycling intervention. Sustainable transport measures are described as part of the package, including measures to manage the level of vehicular trip generation from new developments to manage the potential impacts upon the local and strategic road networks.

Highways England required more detailed consideration of two further junctions of the strategic road network. These junctions are:

- A27 / A24 Grove Lodge Roundabout
- A27 / A24 / Offington Lane

For the operational modelling of the A27 / A24 Grove Lodge Roundabout and the A27 / A24 / Offington Lane junction, modelled traffic demand flows have been extracted from the traffic model and the results of the operational assessment for these junctions is presented below.

To address the limitations of the model flows noted in section 1.3.6, the following methodology has been followed for the operational assessment of these junctions. The difference between the traffic

model forecast and base year traffic volumes has been added to the observed turning movements to establish a flow forecast that reflects a level of growth in addition to current observed traffic volumes.

### 1.4.1. A27 / A24 / Grove Lodge Roundabout

Tables 1-13 and 1-14 present the results of the operational assessment.

Commensurate with the increase in traffic volumes resulting from the Worthing Local Plan sites, the information in Tables 1-13 to 1-14 show a slight overall increase in queuing and delay.

These tables illustrate that the maximum Degree of Saturation, on the A24 Warren Road approach, would be 91.2%, with performance relatively similar to Do Minimum conditions. This level of performance would suggest that the Local Plan sites do not result in a significant adverse impact on the performance of the junction, and some performance improvement could be achieved through a reduction in vehicular trip making as an outcome of the implementation of sustainable transport measures.

**Table 1-13 - Traffic flow forecast – Grove Lodge Rdbt performance – 2033 AM Peak**

| Arm | Link | Do Minimum | | | With WLP | | |
|---|---|---|---|---|---|---|---|
| | | DoS | MMQ (pcu) | Delay (s) | DoS | MMQ (pcu) | Delay (s) |
| Hill Barn Lane Left Ahead | 1/1 | 21.4% | 0.9 | 8.3 | 17.4% | 0.5 | 7.6 |
| Upper Brighton Rd Ahead Left | 3/1+3/2 | 74.0% | 12.2 | 11.3 | 77.8% | 13.9 | 12.4 |
| Upper Br'ton Rd Exit Ped Ahead | 4/1 | 78.4% | 12.0 | 6.7 | 81.8% | 14.1 | 7.8 |
| Upper Br'ton Rd Internal Ahead | 5/1 | 51.9% | 5.6 | 28.3 | 49.6% | 5.3 | 27.9 |
| Upper Br'ton Rd Internal Right Ahead | 5/2 | 51.4% | 5.5 | 29.1 | 49.2% | 5.1 | 29.0 |
| Broadwater St West Ahead | 6/1 | 55.7% | 9.4 | 24.4 | 62.5% | 11.2 | 25.3 |
| Broadwater St West Ahead | 6/2 | 60.1% | 11.1 | 25.1 | 58.8% | 11.0 | 24.1 |
| Br'dwater St W Internal Right | 7/1 | 51.2% | 8.8 | 14.1 | 50.9% | 8.7 | 14.2 |
| Br'dwater St W Internal Right Right2 | 7/2 | 52.4% | 9.1 | 15.3 | 51.8% | 8.8 | 16.2 |
| Warren Rd Exit Ped Ahead | 8/1 | 41.6% | 1.2 | 2.4 | 43.2% | 1.5 | 2.6 |
| Warren Rd Exit Ped Ahead | 8/2 | 44.3% | 1.8 | 2.6 | 45.1% | 1.9 | 2.7 |
| Warren Rd Ahead Ahead2 | 9/1 | 81.7% | 19.4 | 26.1 | 84.1% | 21.2 | 26.3 |
| Warren Rd Ahead | 9/2 | 35.0% | 5.7 | 14.0 | 33.6% | 5.4 | 12.8 |
| Warren Road Internal Right Right2 | 10/1+10/2 | 79.7% | 14.3 | 18.8 | 85.1% | 15.6 | 26.5 |

**Table 1-14 - Traffic flow forecast – Grove Lodge Rdbt performance – 2033 PM Peak**

| Arm | Link | Do Minimum | | | With WLP | | |
|---|---|---|---|---|---|---|---|
| | | DoS | MMQ (pcu) | Delay (s) | DoS | MMQ (pcu) | Delay (s) |
| Hill Barn Lane Left Ahead | 1/1 | 47.3% | 2.5 | 15.4 | 54.3% | 3.7 | 21.2 |
| Upper Brighton Rd Ahead Left | 3/1+3/2 | 78.7% | 13.6 | 12.4 | 87.6% | 19.4 | 15.5 |
| Upper Br'ton Rd Exit Ped Ahead | 4/1 | 85.6% | 18.4 | 9.8 | 87.2% | 11.3 | 8.9 |
| Upper Br'ton Rd Internal Ahead | 5/1 | 57.3% | 6.6 | 34.1 | 67.6% | 5.4 | 48.9 |
| Upper Br'ton Rd Internal Right Ahead | 5/2 | 57.7% | 6.3 | 34.4 | 68.2% | 7.7 | 54.4 |
| Broadwater St West Ahead | 6/1 | 54.1% | 8.5 | 27.1 | 49.8% | 10.2 | 32.2 |
| Broadwater St West Ahead | 6/2 | 70.8% | 13.3 | 31.4 | 76.3% | 20.0 | 40.6 |
| Br'dwater St W Internal Right | 7/1 | 56.0% | 10.7 | 13.3 | 63.0% | 11.5 | 20.5 |
| Br'dwater St W Internal Right Right2 | 7/2 | 56.7% | 10.8 | 14.8 | 63.0% | 11.5 | 20.5 |
| Warren Rd Exit Ped Ahead | 8/1 | 45.6% | 1.2 | 2.5 | 47.0% | 1.1 | 2.2 |
| Warren Rd Exit Ped Ahead | 8/2 | 47.5% | 1.8 | 2.6 | 48.8% | 1.6 | 2.3 |
| Warren Rd Ahead Ahead2 | 9/1 | 86.8% | 22.8 | 29.5 | 91.2% | 33.4 | 42.1 |
| Warren Rd Ahead | 9/2 | 32.4% | 5.1 | 13.2 | 32.9% | 6.9 | 17.2 |
| Warren Road Internal Right Right2 | 10/1+10/2 | 86.3% | 18.7 | 22.3 | 89.2% | 26.4 | 28.9 |

### 1.4.2. A27 / A24 / Offington Lane junction

Tables 1-15 and 1-16 present the results of the operational assessment using the forecast flows which are informed by the observed turning movements.

**Table 1-15 - Traffic flow forecast - A27 Offington Lane Junction - 2033 AM Peak**

| Arm | Do Minimum | | | With WLP | | |
|---|---|---|---|---|---|---|
| | RFC | Queue (pcu) | Delay (s) | RFC | Queue (pcu) | Delay (s) |
| A - A24 Findon Road | 0.65 | 2 | 7 | 0.67 | 2 | 8 |
| B - A24 Warren Road | 0.83 | 5 | 12 | 0.84 | 5 | 12 |
| C - Offington Lane | 0.65 | 2 | 10 | 0.64 | 2 | 10 |
| D - Goodwood Road | 0.84 | 3 | 219 | 1.07 | 5 | 331 |
| E - A27 Crockhurst Hill | 0.65 | 2 | 7 | 0.65 | 2 | 7 |

**Table 1-16 - Traffic flow forecast - A27 Offington Lane Junction - 2033 PM Peak**

| Arm | Do Minimum | | | With WLP | | |
|---|---|---|---|---|---|---|
| | RFC | Queue (pcu) | Delay (s) | RFC | Queue (pcu) | Delay (s) |
| A - A24 Findon Road | 0.80 | 4 | 14 | 0.80 | 4 | 14 |
| B - A24 Warren Road | 1.03 | 43 | 81 | 1.11 | 109 | 177 |
| C - Offington Lane | 0.52 | 1 | 8 | 0.43 | 1 | 7 |
| D - Goodwood Road | 0.00 | 0 | 0 | 0.00 | 0 | 0 |
| E - A27 Crockhurst Hill | 0.71 | 2 | 7 | 0.70 | 2 | 7 |

Commensurate with the increase in traffic volumes resulting from the Worthing Local Plan sites, the information in Tables 1-15 and 1-16 show an overall increase in queuing and delay. The impact upon the A27 Crockhurst Hill and A24 Warren Road arms is negligible during the AM peak. The A24

Warren Road RFC increases from 1.03 to 1.11 during the PM peak, with queuing more than doubled. However, the queue length would not extend back to the A27 / Grove Lodge Roundabout.

Highways England maintains concern in relation to proposals that have the potential to impact the safe and efficient operation of the A27 / A24 trunk road. With reference to the operational assessment results, it is shown that the conditions on the A24 Warren Road approach of the A27 Offington Lane would be exacerbated by an increase in traffic movements, with queuing increasing from 43 to 109 pcu's.

Collision analysis presented within the WLP Transport Assessment (August 2018) identifies locations where collision clusters are observed, and this includes the A27 / A24 / Offington Lane junction. To consider the collision record at this junction in further detail, the analysis has been updated with more recent collision data (for the period July 2015 to October 2020) and the results for this particular junction are presented in Table 1-17. The number of collisions over the 5-year period is limited to 10, and only one serious incident during that period of time. The updated data does not change any conclusions from the WLP Transport Assessment.

**Table 1-17 - A27 Offington Lane Junction – Collision data**

| Location | Severity | | | Total |
|---|---|---|---|---|
| | Slight | Serious | Fatal | |
| **A27 / A24** | 9 | 1 | 0 | 10 |

The mitigation strategy for the strategic road network, and in particular to mitigate the queuing increase on the A24 Warren Road arm of the A27 Offington Lane junction, is described in section 1.5.

## 1.5 MITIGATION STRATEGY FOR THE STRATEGIC ROAD NETWORK

Highways England has set out the following in its representation DWLP-M-111.

*"As the Council is aware there is currently no preferred scheme for the A27 improvements in Worthing. Therefore the Local Plan requires morning and evening peak hour assessments including mitigation if required."*

The strategy and policy position that informs decisions relating to transport mitigation has continued to change in the period between the completion of the WLP Transport Assessment (August 2018) and the planned Submission Stage (Regulation 19) consultation in early 2021. Key developments in strategy and policy include:

- UK Government committed in 2019 to a legally binding target of net zero emissions by 2050, and subsequently announced a policy to ban the sale of new cars and vans powered wholly by petrol and diesel, by 2030.

- Many Local Authorities (including Adur & Worthing Councils) have declared climate emergencies and developed carbon reduction action plans. WSCC followed their declaration with the adoption of a Climate Change Strategy which targets net zero carbon emissions by 2030. Adur & Worthing Councils have developed and adopted a Carbon Neutral Plan which explains how the Councils will work towards a 2030 net zero target.
- 'Gear change: a bold vision for cycling and walking', was published by the DfT in 2020, setting out a travel revolution in England's communities. A Local Cycling and Walking Infrastructure Plan (LCWIP)[6] has been developed following widespread consultation throughout Adur and Worthing. The UK Government has also outlined a £2bn package to support active travel and WSCC has identified a range of projects including new Findon Valley to Findon Village footways / cycleways, 'school gate' improvements including Bikeability training, and an active travel improvements programme. Cycle lanes had been provided on the A24 in Worthing as part of 'Tranche 1' active travel measures, however the original layout will be re-instated.
- The DfT's RIS2 (2020) has announced investment in roads to support a high quality and resilient transport network, reflecting the mixed-use of roads by vehicles, pedestrians, cyclists and horse-riders. RIS2 includes commitment to a package of improvements between Worthing and Lancing to enhance the road capacity and flow of traffic.

In 2020, the COVID-19 global pandemic and associated social distancing regulations continue to bring about significant short-term changes to travel behaviour, including a reduced need to travel as a result of home working, reduced reliance on public transport and increased levels of walking and cycling. The policy impetus at local and national levels continues to focus on facilitating an increase in public transport, walking and cycling as alternatives to the private car, and whilst the medium to long-term trends are uncertain, it is clear that schemes which help people access these modes can have a significant economic, environmental and social benefit.

In the context of the evolving policy and strategy context described above and potential short to medium term changes in travel behaviour relating to mode shift and increasing home / virtual working, the focus of the mitigation strategy is to 'identify appropriate and proportionate mitigation measures, and ensure that what is proposed promotes sustainable transport outcomes and avoids unnecessary works to the SRN[7]'.

To illustrate the level of mitigation that a sustainable mitigation package might provide to the performance of the A27 Offington Lane junction, a 10% reduction in vehicular trip making associated with the new Local Plan development sites has been applied to the forecast traffic flows. This is the lower end of the range which national guidance[8] cites. 'Targets being used at present tend to be reductions on what would be expected without a travel plan of 10 – 20%'. This reduction reflects the impact of the sustainable measures described within section 7.2 of the WLP Transport Assessment (August 2018). and the societal move towards part-time home working.

[6] Local Cycling & Walking Infrastructure Plan, Adur & Worthing Councils (2020)
[7] The strategic road network – Planning for the future, Highways England (September 2015)
[8] Good Practice Guidelines: Delivering Travel Plans through the Planning Process, DCLG, DfT (April 2009)

Furthermore, a 5% reduction in general vehicular trip making has been applied to the forecast traffic flows to reflect the impact of broader policy changes and societal trends associated with active travel and home working. This % reduction remains less than the target and illustrative out-turn levels of reduction described within section 7.2 of the WLP Transport Assessment (August 2018).

Tables 1-18 and 1-19 illustrate the improvement in performance that would be achieved with a sustainable mitigation package which reduces vehicular traffic at this location.

**Table 1-18 - Flow forecast (mitigation) - A27 Offington Lane – 2033 AM Peak**

| Arm | Do Minimum | | | With WLP & mitigation | | |
|---|---|---|---|---|---|---|
| | RFC | Queue (pcu) | Delay (s) | RFC | Queue (pcu) | Delay (s) |
| A - A24 Findon Road | 0.65 | 2 | 7 | 0.62 | 2 | 7 |
| B - A24 Warren Road | 0.83 | 5 | 11 | 0.79 | 4 | 9 |
| C - Offington Lane | 0.65 | 2 | 10 | 0.62 | 2 | 9 |
| D - Goodwood Road | 0.84 | 3 | 219 | 0.57 | 1 | 104 |
| E - A27 Crockhurst Hill | 0.65 | 2 | 7 | 0.62 | 2 | 7 |

**Table 1-19 - Observed flow forecast - A27 Offington Lane mitigation – 2033 PM Peak**

| Arm | Do Minimum | | | With WLP & mitigation | | |
|---|---|---|---|---|---|---|
| | RFC | Queue (pcu) | Delay (s) | RFC | Queue (pcu) | Delay (s) |
| A - A24 Findon Road | 0.80 | 4 | 14 | 0.76 | 3 | 11 |
| B - A24 Warren Road | 1.03 | 43 | 81 | 1.04 | 53 | 95 |
| C - Offington Lane | 0.52 | 1 | 8 | 0.54 | 1 | 8 |
| D - Goodwood Road | 0.00 | 0 | 0 | 0.23 | 0 | 117 |
| E - A27 Crockhurst Hill | 0.71 | 2 | 7 | 0.71 | 3 | 8 |

The results of the operational assessment illustrate that this mitigation strategy has the potential to return the junction to a level of performance that is an improvement to or consistent with Do Minimum conditions.

Although the focus of the mitigation strategy is to promote sustainable travel outcomes, the potential for improvements to the highway layout at Offington Corner have also been considered through a process of engagement with Highways England.

The junction is a compact 5-arm roundabout and can be considered unconventional in the context of typical strategic road network junction layouts. The layout reflects the urban nature of the location and the land use constraints in the immediate vicinity of the junction. It has been established that the existing layout does not meet current Design Manual for Roads and Bridges (DMRB) guidance 'Geometric design of roundabouts' (CD 116) including in the following aspects:

- Width of circulating carriageway between 1 to 1.2x maximum entry width (section 3.6)
- Lane widths min 3m max 4.5m, 4.5m is appropriate at single lane entry and 3 – 3.5m is appropriate at multi-lane entry (section 3.14)
- Entry path radius for normal roundabout not to exceed 100m for a 25m long curve in proximity to the give way line (section 3.26)
- Exit kerb radii should exceed the largest entry kerb radius (section 3.29)
- Exit kerb radius in the range of 20m – 100m for normal roundabout, 40m is desirable (section 3.29.3)

Concept design studies have established that whilst it is possible to improve the layout such that it meets some of the design standards, it is not possible to achieve a junction that is fully compliant with CD 116 while achieving an improved level of junction capacity. Furthermore, the continued commitment to improving this section of the A27 through Worthing as part of RIS2 may result in any intermediate junction improvement being both abortive and unnecessary.

A mitigation strategy that focuses upon the reduction of private car trips is consistent with policy and guidance and has been shown in the conservative operational analysis in Tables 1-18 and 1-19 to be an effective approach. Such an approach would be accompanied by site-specific monitoring to ensure that practical reductions in the level of trip-making are achieved through investment in these measures.

## 1.6 SUMMARY AND CONCLUSION

The WLP Transport Assessment (August 2018) demonstrated that the proposed Local Plan sites would not have any significant impact on the performance of the SRN. The land use development proposed as part of the Worthing Local Plan is, overall, relatively modest due to constraints relating to the extent of the Borough, the existing urban area and environmental constraints in the north of the Borough.

This transport assessment addendum has provided supplementary information to address points raised by Highways England in relation to the suitability of the traffic model, the impact upon the strategic road network and the mitigation strategy.

Further information has been provided to confirm that the traffic model, which informs the assessment, provides a satisfactory representation of the existing traffic situation across all peaks.

The further analysis has confirmed a very good fit between observed and modelled flow data at peak period and peak hour levels. Furthermore, analysis on traffic routing and journey time also illustrates a good representation of observed conditions. Trip rates and trip distribution have been agreed as suitable for the purposes of the Local Plan assessment.

Additional operational assessment of the SRN has been undertaken as part of this addendum, for the A27 / A24 Grove Lodge Roundabout and the A27 / A24 Offington Lane junctions. The forecasting methodology for this assessment addressed one noted limitation within the traffic model flows (see section 1.3.6).

The operational assessment for the A27 / A24 Grove Lodge Roundabout demonstrated no significant adverse impact on the performance of the junction. At the A27 / A24 Offington Lane junction, the A24 Warren Road arm is operating over-capacity in the forecast Do Minimum scenario and this performance is exacerbated with additional Local Plan traffic, with forecast queuing levels doubling, but not extending back to the A27 / Grove Lodge Roundabout.

Concept design studies have established that whilst it is possible to improve the A27 / A24 Offington Lane junction layout within existing constraints such that it meets some of the design standards, it is not possible to achieve a junction that is fully compliant with design standards while achieving an improved level of junction capacity. Instead, achieving a relatively modest mode shift target that is proportionate to the Local Plan proposals and with the benefits of other sustainable travel investment, a level of performance that is close to or better than conditions without the Local Plan sites can be achieved.

A mitigation package and strategy has been proposed that is considered to provide a sufficient and proportionate framework for addressing any individual and cumulative impacts of development on the transport network. The mitigation strategy is consistent with policy and would avoid potentially abortive and unnecessary works to the SRN.

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