Gatwick Airport Northern Runway Project

Post-Covid VISSIM Sensitivity Tests for 2023 and 2047

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1 VISSIM 2032/2047 Post Covid Sensitivities – Executive Summary

1.1. Context

1.1.1 This Technical Note sets out the results of additional VISSIM microsimulation modelling to understand the impacts of post-Covid sensitivity testing on the core scenarios that were presented in the Development Consent Order (DCO) Application for the Northern Runway Project ('the Project'). The core scenarios were presented in **Transport Assessment Annex C: VISSIM Forecasting Report** [APP-261].

1.1.2 A comparison of model performance in the morning (AM) and evening (PM) peaks has been conducted across the following future year scenarios using the VISSIM model:

- 2032 future baseline core;
- 2032 with Project core;
- 2047 future baseline core;
- 2047 with Project core;
- 2032 future baseline post-Covid sensitivity;
- 2032 with Project post-Covid sensitivity;
- 2047 future baseline post-Covid sensitivity; and
- 2047 with Project post-Covid sensitivity.

1.2. Key findings – core model scenarios

1.2.1 The core strategic transport modelling for the Application produced forecasts for the change in traffic flows between the 2016 base model and each future scenario. These changes in traffic volume were applied to the VISSIM base model to produce the VISSIM forecast model for each scenario.

1.2.2 The VISSIM model results show that the network in the vicinity of the Airport would perform better in the 2032 future baseline than in the 2047 future baseline, as is to be expected given growth in background activity alongside growth at the Airport in the absence of the Project. The core 2032 and 2047 with Project scenarios demonstrate that the implementation of the Project and its associated highway works would significantly improve network performance compared to the equivalent future baseline scenario.

1.2.3 The following paragraphs use average speed plots for the worse performing half hour in the AM and PM peaks in the modelled network. Links displayed as pink show vehicles defined as stopped or queueing (<5kph average speed). Red to

yellow colours indicate speeds of between 10 and 25kph, which can be described as a rolling queue. Green colours indicate speeds of over 25kph (15mph).

1.2.4   The core scenario model outcomes in the vicinity of South Terminal and the M23 Spur are shown in Figure 1.

Figure 1: Average speeds, AM and PM peaks, South Terminal Roundabout and M23 Spur, core scenarios
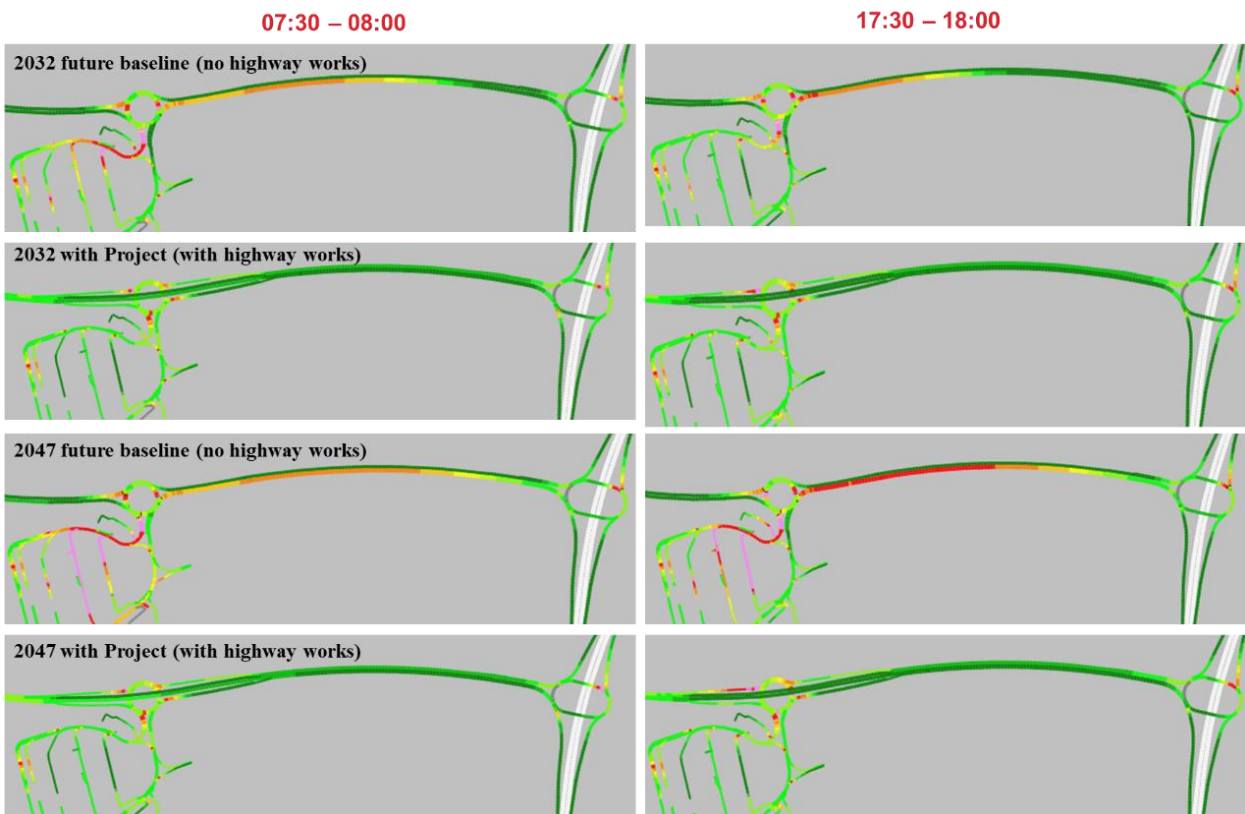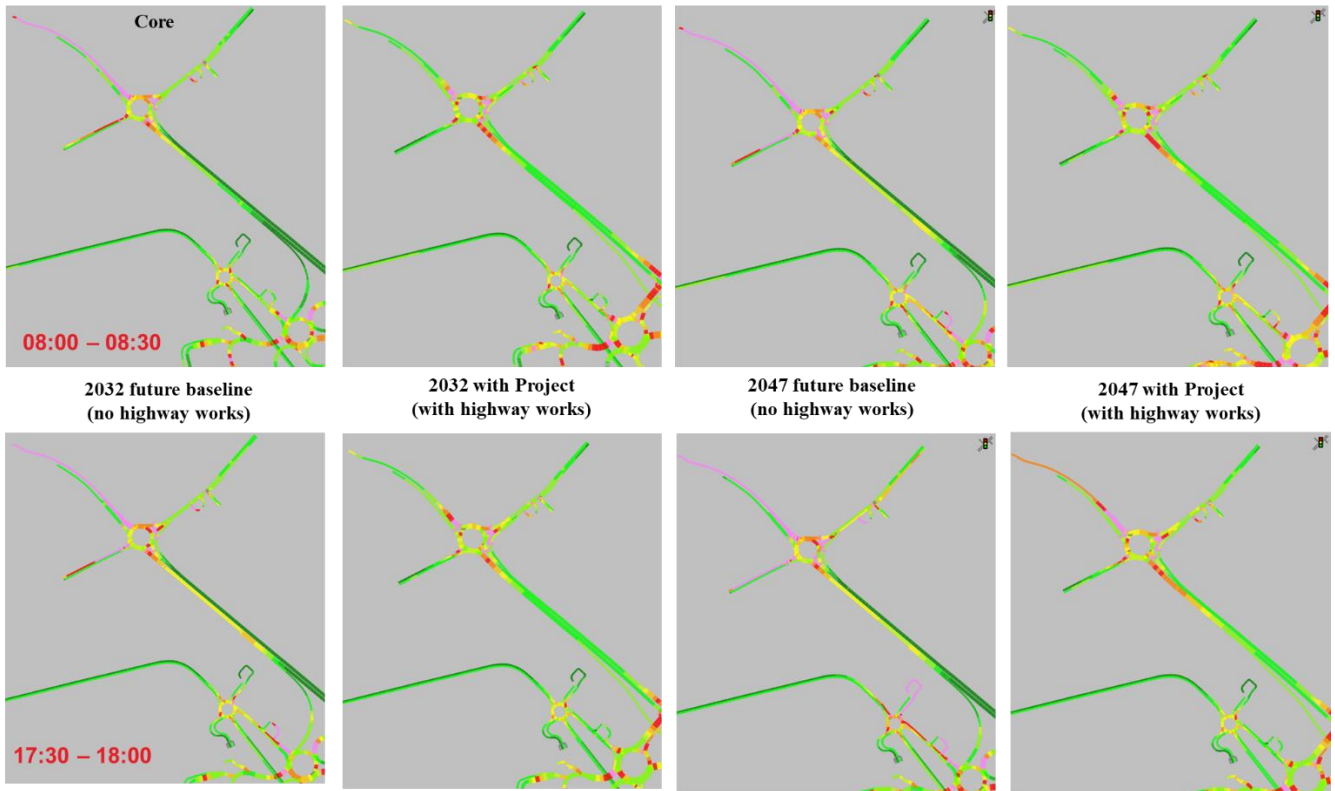

1.2.5   Figure 1 indicates that in the busiest half hours of the AM and PM periods (07:30-08:00 and 17:30-18:00 respectively), rolling queues would be present on the M23 Spur westbound approach at South Terminal Roundabout in the 2032 future baseline scenario, if the Project were not to proceed, but conditions would not be described as severe. Queues would increase in length in the 2047 future baseline scenario. However, by 2047 the queuing would still be contained within the length of the M23 Spur and would not reach M23 Junction 9.

1.2.6   In the 2032 and 2047 with Project scenarios, the introduction of the grade separated junction at South Terminal Roundabout would allow vehicles heading westbound to bypass the roundabout, reducing demand on the roundabout itself and significantly reducing queueing on the M23 Spur.

1.2.7   Figure 2 shows the core scenario model outcomes in the vicinity of Longbridge and North Terminal Roundabouts in the busiest half hours of the AM and PM peak periods (08:00-08:30 and 17:30-18:00 respectively).

Figure 2: Average speeds, AM and PM peaks, Longbridge and North Terminal Roundabout area, core scenarios

| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |

1.2.8   The 2032 and 2047 future baseline scenarios on Figure 2 indicate queues on the A217 approach. These result from the volumes of traffic on the circulatory carriageway, which reduces opportunities for traffic on the A217 to enter the roundabout at this priority-controlled approach. Circulating traffic is a mixture of traffic which is unrelated to the Airport and traffic leaving the terminals. There would also be rolling queues on the A23 London Road northbound approach extending back towards the northbound merge from the North Terminal Roundabout in the 2032 and 2047 future baseline scenarios. These conditions are not attributable to the Project but would exist if the Project were not to proceed.

1.2.9   The Project and its associated highway works include improvements to the layout of Longbridge Roundabout and a new signal-controlled junction on the A23 London Road allowing vehicles leaving North Terminal wishing to head towards the A23 southbound to do so directly, without the need to perform U-turns at Longbridge Roundabout. The speed limit on A23 London Road would also be

reduced as part of the highway works. The with Project scenarios therefore show improved operation at Longbridge Roundabout with much shorter queues.

1.2.10   Network performance statistics indicate that the implementation of the highway works which form part of the Project in 2032 and 2047 would reduce average network delays and improve network performance compared to conditions that would otherwise arise in the future without the Project.

1.3.   Key findings – post-Covid sensitivity test modelling

1.3.1   The post-Covid sensitivity analysis in the strategic transport model indicated that there is a reduction in background highway demand by up to 14% overall compared to the core modelling used for the Application. Flows on the M23 Spur corridor in the immediate vicinity of the Airport are also generally lower in the post-Covid sensitivity testing than in the core scenarios.

1.3.2   The modelling shows that the relative impacts of introducing the Project and its associated highway works in the post-Covid sensitivity tests are similar to those seen in the core modelling, with the scale of impacts often reduced from those presented in the Application, resulting from lower forecast levels of background traffic and congestion.

1.3.3   Figure 3 shows the post-Covid sensitivity test outcomes in the vicinity of South Terminal Roundabout and the M23 Spur.

Figure 3: Average speeds, AM and PM peaks, South Terminal Roundabout and M23 Spur, post-Covid sensitivity scenarios
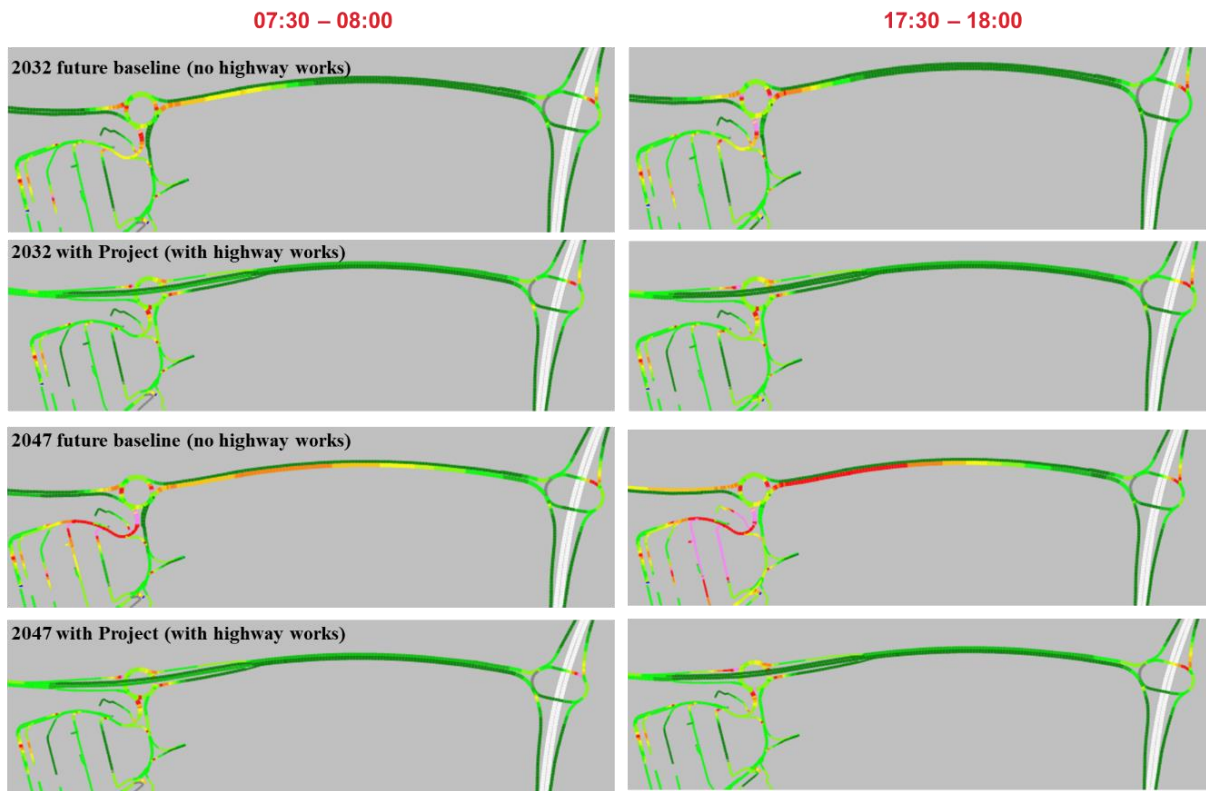
1.3.4 The speed plots in Figure 3 show a reduction in the extent of queueing in the worst performing periods of the peak hours. For example, in the AM (07:30-08:00) and PM (17:30-18:00) periods, queueing at the Spur is shorter than that seen in the equivalent core future baseline scenarios. Queues at South Terminal Roundabout are managed to a large extent by the balance of signal timings at the junction, which explains some of the variation between queues on the Spur and queues within the terminal network.

1.3.5 Figure 4 shows the post-Covid sensitivity test outcomes in the vicinity of Longbridge and North Terminal Roundabouts for the busiest half hours in the morning and evening.

Figure 4: Average speeds, AM and PM peaks, Longbridge and North Terminal Roundabout area, post-Covid sensitivity scenarios
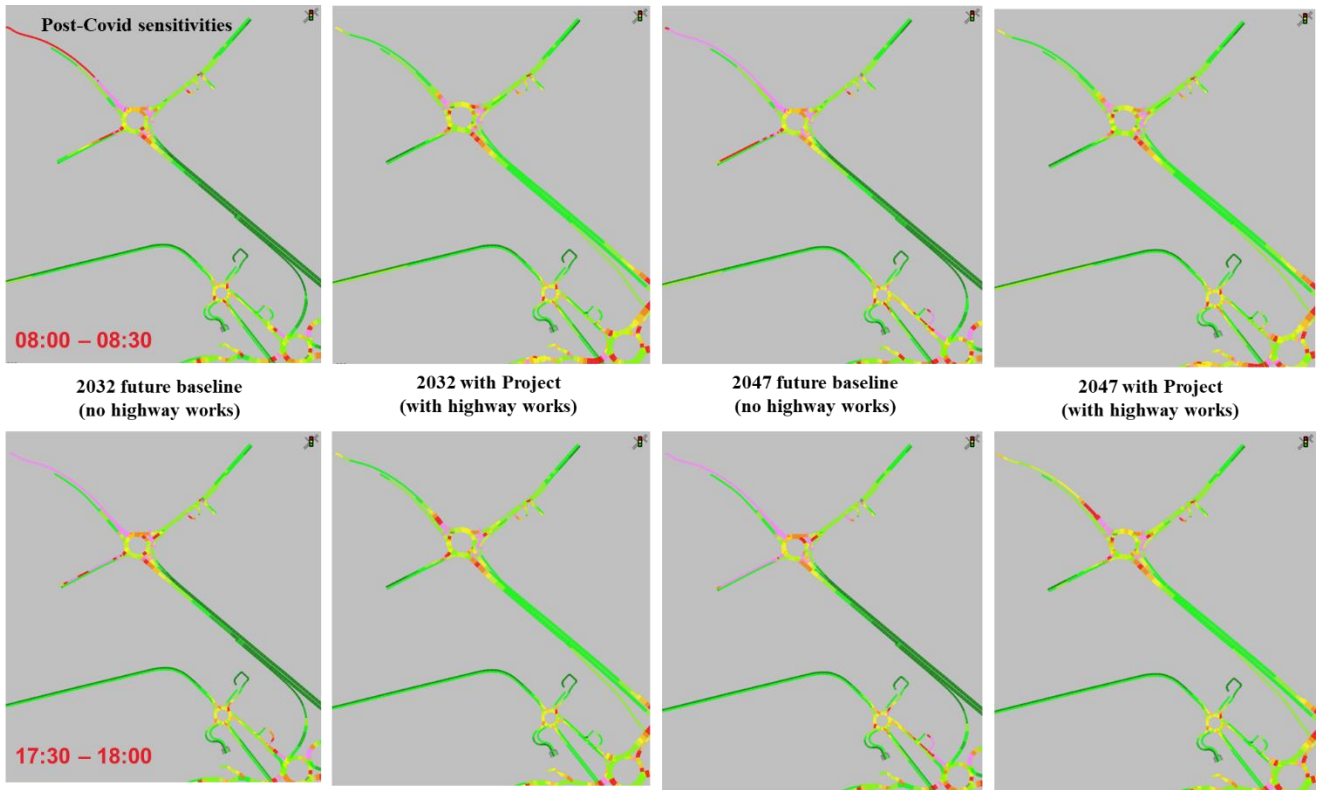
1.3.6   The plots in Figure 4 again show relative differences between the future baseline and with Project scenarios which are comparable with, but reduced from, the core scenarios. For example, in the PM period (17:30-18:00), the extent of queueing on the A23 London Road northbound and A217 approaches in the future baseline scenarios is less than seen in the core scenarios, although there are still queues indicated at the A217 approach in the future baseline scenarios. The with Project scenarios show reduced queue lengths, as was the case for the core scenarios, as a result of the improved layout of Longbridge Roundabout compared to that in place in the future baseline scenarios.

1.3.7   The pattern of network performance between the post-Covid sensitivity scenarios remains similar to that seen in the core scenarios, in that conditions worsen over time in the future baseline scenarios and the with Project scenarios show considerably better operation overall than in the future baseline.

1.3.8   The analysis clearly shows the network operation and performance benefits produced by the introduction of the highway works which are part of the Project, which not only address the additional traffic demand associated with the Project but would also improve conditions for non-airport road users.

2 Introduction

2.1. Purpose of this document

2.1.1 The Development Consent Order (DCO) Application for the Northern Runway Project ('the Project') draws upon a range of traffic modelling assumptions to assess the proposals. These modelling assumptions cover the base (or existing conditions) and future years, forming the basis for different scenarios. The modelling work has been undertaken in line with the Department for Transport's (DfT) Transport Analysis Guidance (TAG) and is referred to in this note as the 'core' modelling.

2.1.2 Full details about the strategic transport modelling which supports the Application are provided in **Transport Assessment Annex B: Strategic Transport Modelling Report** [APP-260].

2.1.3 As documented in **Accounting for Covid-19 in Transport Modelling** [AS-121], following updates to DfT guidance in TAG Unit M4 Forecasting and Uncertainty and at the request of the Examining Authority (ExA), post-Covid sensitivity tests were undertaken using the strategic transport model. Those tests help to identify the potential implications for the assessment in the Application should the impacts of the Covid-19 pandemic on travel behaviour be sustained.

2.1.4 Further work has now been undertaken to develop equivalent post-Covid sensitivity tests in the VISSIM microsimulation model. The sensitivity testing is based on the methodology set out in **Transport Assessment Annex C: VISSIM Forecasting Report** [APP-261].

2.1.5 This technical note describes the sensitivity tests and presents the outcomes of those tests, alongside the outcomes from the core VISSIM modelling which were presented in the Application (in the **Transport Assessment** [AS-079] and **Transport Assessment Annex C: VISSIM Forecasting Report** [APP-261]).

3 Approach and methodology

3.1. Scenarios

3.1.1   The VISSIM modelling reported in the Application and in this note covers 'future baseline' and 'with Project' scenarios.

3.1.2   Future baseline conditions are those in future years without the Project. The future baseline scenarios include planned developments and transport schemes that are sufficiently certain (using the TAG classification of certainty); other background growth in non-airport traffic resulting from general population and employment growth; and growth at the Airport that would take place in the absence of the Project.

3.1.3   The future baseline scenarios also include the signalisation of North Terminal and South Terminal Roundabouts, which is part of GAL's Capital Investment Programme. The scheme is under discussion between GAL and National Highways (NH) for delivery prior to the commencement of dual runway operations.

3.1.4   The with Project scenarios include the additional growth in activity at the Airport which would result from the Project and include the highway works that form part of the Project.

3.1.5   The following four core future year VISSIM scenarios were reported in the **Transport Assessment** [AS-079]; the analysis of these is covered in **Transport Assessment Annex C: VISSIM Forecasting Report** [APP-261].

- 2032 future baseline: this tests the operation of the future baseline highway network in 2032 without the Project.
- 2032 with Project: this tests the operation of the network in 2032 with the Project in place and assumes that the Project highway works are complete by this time.
- 2047 future baseline: this tests the operation of the future baseline highway network in 2047 without the Project.
- 2047 with Project: this tests the operation of the network in 2047 with the Project in place and assumes that the Project highway works are complete by this time.

3.1.6   For this technical note, post-Covid sensitivity tests in VISSIM have been run for the same scenarios and the results have been compared back to the outcomes from the core modelling.

3.1.7 The supporting assumptions for traffic demand in each scenario are set out in **Transport Assessment Annex B: Strategic Transport Modelling Report [APP-260]** for the core modelling and in **Accounting for Covid-19 in Transport Modelling** [AS-121] for the post-Covid sensitivity tests. Outputs from the strategic demand and highway models inform the inputs to the VISSIM models using the same process as set out in **Transport Assessment Annex C: VISSIM Forecasting Report** [APP-261].

3.1.8 The post-Covid sensitivity scenarios have been prepared following the same approach used for the core scenarios presented in the Application. They have first been prepared and run through the strategic model, the outputs of which have then been fed into the VISSIM model for more detailed localised assessment. Further details on how these scenarios were produced in VISSIM are provided later in this note.

3.2. Network arrangement summary

Future baseline arrangements

3.2.1 In the 2032 and 2047 core and post-Covid future baseline scenarios the highway arrangement is assumed to be the existing arrangement, as modified by the works proposed as part of the Capital Improvement Programme, which involves signalisation at North and South Terminal Roundabouts.

3.2.2 Figure 5 presents the future baseline configuration of North Terminal Roundabout. Under the Capital Improvement Programme proposals, each entry arm to the roundabout will be signalised. Gatwick Way will remain as a segregated left-in-left-out configuration into the bypass lane from Airport Way to North Terminal.

**Figure 5: North Terminal Roundabout – future baseline**
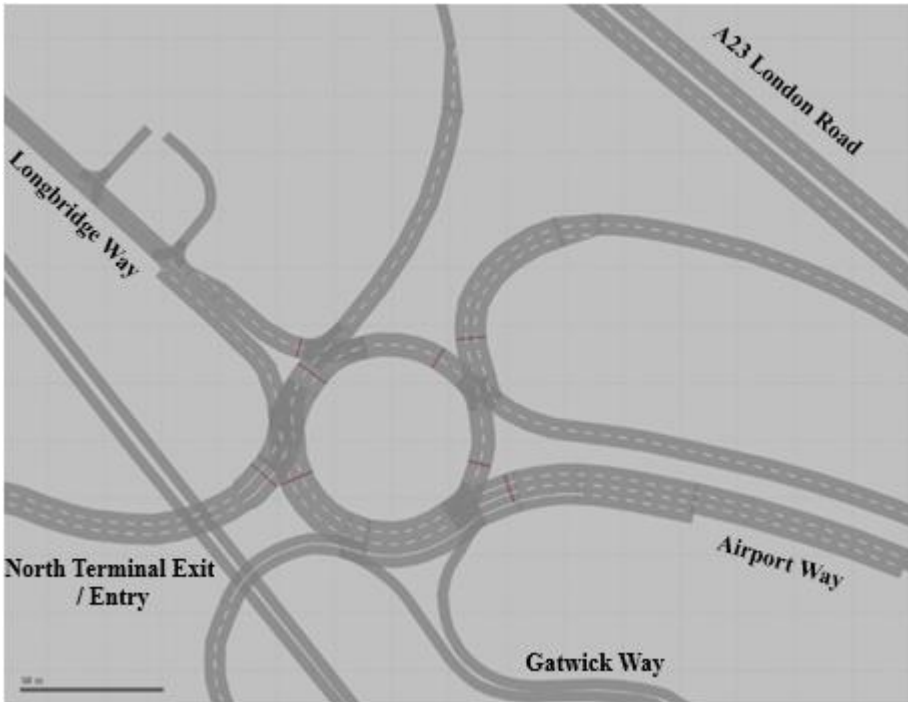
3.2.3   Figure 6 presents the configuration of South Terminal Roundabout in the future baseline. Under the Capital Improvement Programme proposals each arm of the South Terminal Roundabout would be signalised.

Figure 6: South Terminal Roundabout – future baseline
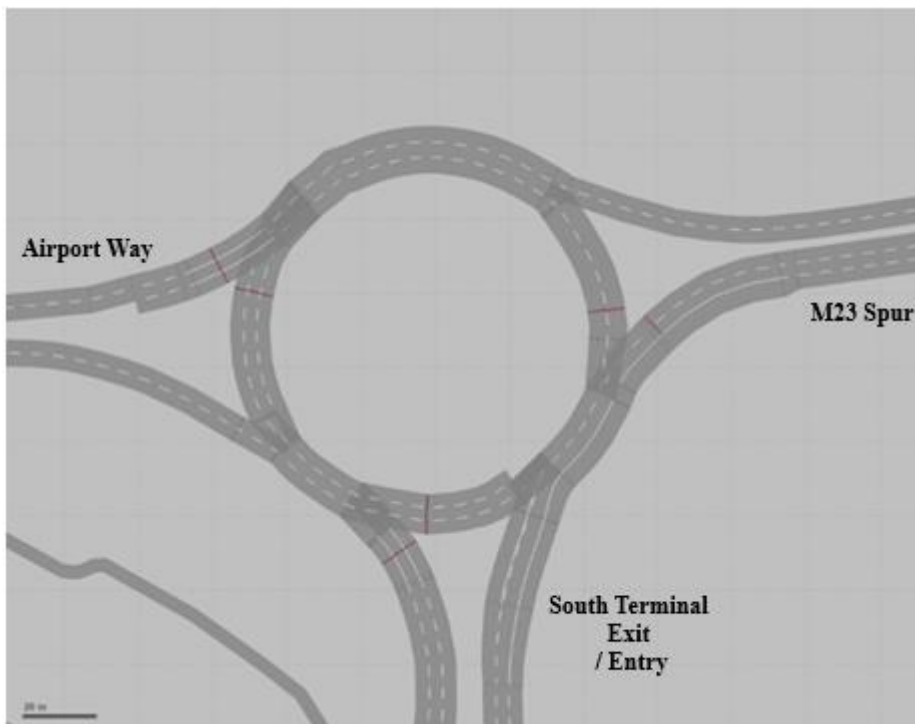
3.2.4   Figure 7 presents the VISSIM layout for Longbridge Roundabout in the future baseline scenario. This is unchanged from the existing configuration.

Figure 7: Longbridge Roundabout – future baseline
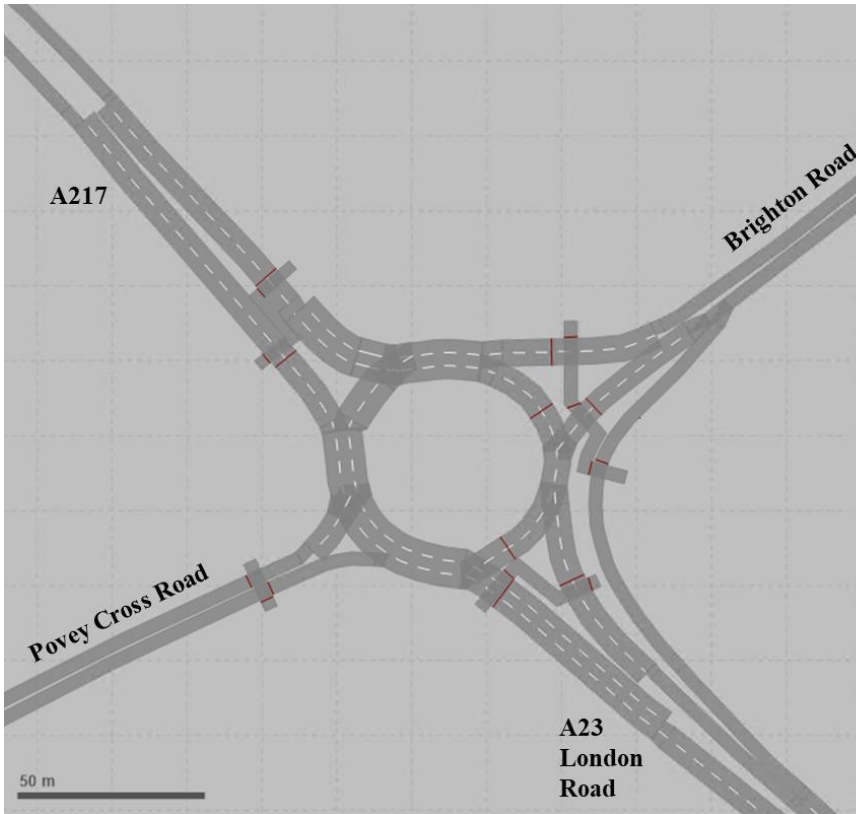
With Project arrangements

3.2.5   In the 2032 with Project (with highway works) and 2047 with Project (with highway works) core and post-Covid sensitivity scenarios, the highway works which form part of the Project are assumed to be complete and are included in the models. Full details of the network arrangements for the with Project scenario are set out in sections 3 and 4 of the **Transport Assessment Annex C: VISSIM Forecasting Report** [APP-261].

3.2.6   Figure 8 illustrates the arrangement of North Terminal Roundabout and the new signalised junction on A23 London Road in the with Project scenario.
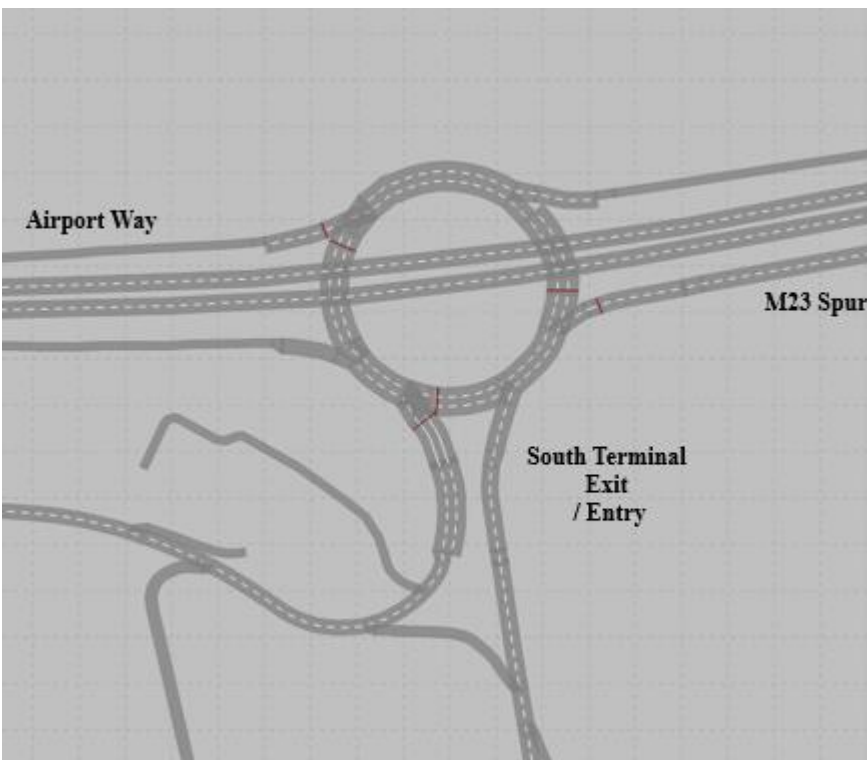
3.2.7   The with Project arrangement in the North Terminal area includes a new signalised junction on the A23 London Road, beneath a flyover which allows northbound traffic to bypass the North Terminal Roundabout towards Longbridge Roundabout. At North Terminal Roundabout, there would be signalisation of Airport Way, the North Terminal exit, and the approach from A23 London Road, whilst Longbridge Way would be priority controlled.

**Figure 8: North Terminal Roundabout – with Project**

Figure 9: South Terminal Roundabout – with Project

3.2.8   Figure 9 illustrates the with Project arrangement of South Terminal Roundabout. South Terminal Roundabout would become a grade-separated junction, with the flyover allowing the free flow of mainline traffic between the Gatwick Spur and Airport Way. All approaches to the roundabout would be signalised to address safety concerns in relation to approach speeds.

3.2.9   Figure 10 shows the with Project arrangement of Longbridge Roundabout. Improvements to Longbridge Roundabout would include an enhanced and enlarged roundabout, with signalisation of the A217 approach in addition to the existing A23 Brighton Road and A23 London Road signalised approaches. As part of these works, the exit to A23 Brighton Road would also be widened, extending the two lane exit beyond the pedestrian crossing and improving the flow of traffic off the roundabout heading north towards Horley. Pedestrian crossings would be revised to suit the new configuration, with widening to accommodate cyclists as part of the proposed active travel improvements.

3.2.10 For the post-Covid sensitivity VISSIM scenarios, minor alterations were made to signal timings within the model to optimise scenario performance.

Figure 10: Longbridge Roundabout – with Project
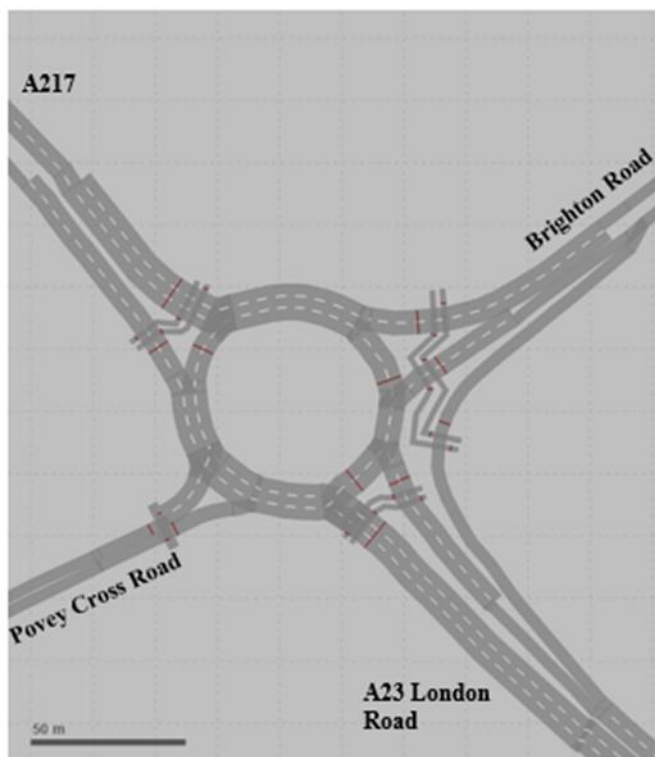
3.3. Traffic flows

3.3.1 The traffic flows contained in the core 2032 and 2047 future baseline and with Project scenarios reported in this note are unchanged from those modelled and presented within the **Transport Assessment Annex C: VISSIM Forecasting Report** [APP-261].

3.3.2 The traffic flows for the VISSIM post-Covid sensitivity tests reported in this note are drawn from the post-Covid strategic model sensitivity tests reported in **Accounting for Covid-19 in Transport Modelling** [AS-121]. Traffic flows in these sensitivity scenarios differ from those in the core scenarios because the post-Covid scenarios are verified against observed traffic data in 2023. However, forecast demand related to the Airport is the same as that in the core tests. The demand process for converting strategic modelling data into VISSIM input matrices is the same as set out in section 4 of **Transport Assessment Annex C: VISSIM Forecasting Report** [APP-261].

3.4. VISSIM model results generation

3.4.1 For all VISSIM results presented in this report, results are presented as averages of 20 random seed runs. This method for results generation is standard industry practice.

3.4.2 The random seed function within microsimulation modelling introduces the randomisation of the way in which vehicles load onto the network, subject to fixed total volumes, within each defined time period. It also distributes different driver characteristics between vehicles. This process is used to test the sensitivity of the model to flow variations.

3.4.3 Appendix 1 presents graphs showing Vehicle Hours Travelled (VHT) in the AM and PM peak for each of the 20 runs completed for each modelled scenario included in this report. All graphs show a good level of model stability across the 20 model runs with sensible confidence intervals.

4 Model operation results

4.1. Introduction

4.1.1 This technical note analyses the overall performance, network performance and journey time results across the network in each of these scenarios to understand the impact of accounting for Covid-19.

4.1.2 The analysis contained in this section looks at the operational performance in the AM and PM peak periods, for the 2032 future baseline, 2032 with Project, 2047 future baseline, and 2047 with Project core and post-Covid sensitivities scenarios.

4.2. Strategic modelling outcomes – post-Covid sensitivities

4.2.1 To provide an overview of the outcomes of the post-Covid sensitivity testing in the strategic model reported in **Accounting for Covid-19 in Transport Modelling** [AS-121], key points are summarised below:

- Based on traffic count data from 2023 across the strategic and local network and information on rail patronage, there has been a reduction in background highway and rail demand of up to 14% compared with that assessed in the core modelling reported in the Application. This reduction generally indicates that the future baseline scenarios will contain less road traffic congestion or rail crowding than that shown in the Application modelling.
- There are some localised increases in flows shown in the future baseline and with Project post-Covid sensitivity tests as a consequence of changes in highway infrastructure in certain areas (unrelated to the Airport and associated with revised scheme delivery dates) and the impacts of rerouting owing to reduced congestion releasing capacity at pinch points. The with Project flow increases, compared to the equivalent future baseline scenario, follow a similar pattern to that presented in the Application.
- Comparison of flows on the M23 Spur corridor show total entry flows in the morning and evening peak periods are lower in the post-Covid sensitivity testing than in the core modelling for the Application.
- The analysis shows that the impacts of the Project in the post-Covid sensitivity tests are similar to or in many cases reduced from those presented in the Application, given the lower forecast levels of traffic and congestion levels.

4.3. VISSIM model speed plots and flow information

4.3.1 Selected flow comparisons and average speed plots from half-hourly or hourly time periods within the overall AM and PM peak model periods have been used to present model operation at North Terminal Roundabout, South Terminal

Roundabout, Longbridge Roundabout and on the A23 London Road to the southeast of the Airport, where it meets Gatwick Road. The speed plots presented provide a visual indication of the level of congestion on different parts of the modelled network and this is the most appropriate method for demonstrating model operation within VISSIM.

4.3.2   Speed plots have been provided for the worst performing half hours of both the AM and PM peaks, and flow comparisons have been provided for the equivalent hour in the AM and PM. A full set of flow comparisons for all analysis hours is provided in Appendix 2 and full set of speed plots for all analysis half hours is provided in Appendix 3 for both the core and post-Covid scenarios.

4.3.3   The colouring shown in the speed plots is consistent with that presented in the **Transport Assessment Annex C: VISSIM Forecasting Report** [APP-261] and follows the key shown in Figure 11. Links displayed as pink show vehicles defined as stopped or queueing (<5kph average speed). Red to yellow colours indicate speeds of between 10 and 25kph, which can be described as a rolling queue. Green colours indicate speeds of over 25kph (15mph).

Figure 11: Speed plot key (kph)
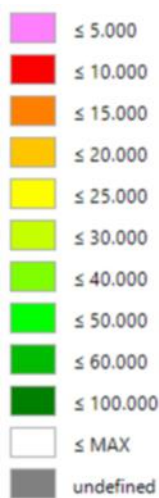
North Terminal Roundabout operation

4.3.4   This section looks at the operational comparison of the four future year scenarios for the North Terminal Roundabout across the AM peak and PM peak, and differences between core and post-Covid sensitivity scenarios.

4.3.5   The 2032 with Project and the 2047 with Project scenarios include the proposed new northbound flyover on A23 London Road, avoiding the roundabout, and the new signalised junction where the route leaving North Terminal meets the A23 London Road.

AM peak period – average speed comparisons

4.3.6   Figure 12 shows the operational AM peak speed plots for the period 08:30-09:00 at the North Terminal Roundabout, for the core scenarios. Figure 13 shows the same information for the same time period from the post-Covid sensitivity test scenarios.

Figure 12: Speed Plots – AM Peak – 08:30-09:00 North Terminal Roundabout operation (core)
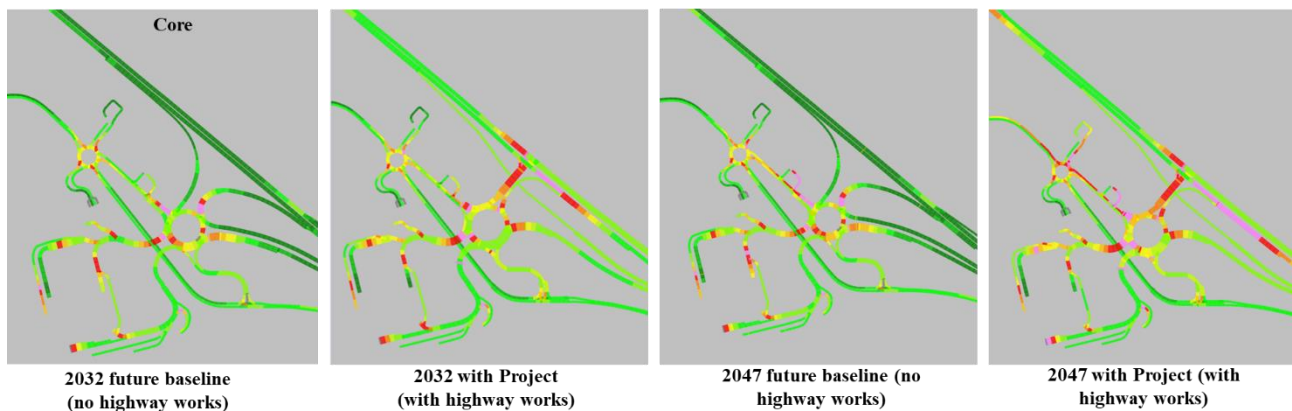
Figure 13: Speed Plots - AM Peak - 08:30-09:00 North Terminal Roundabout operation (post-Covid)
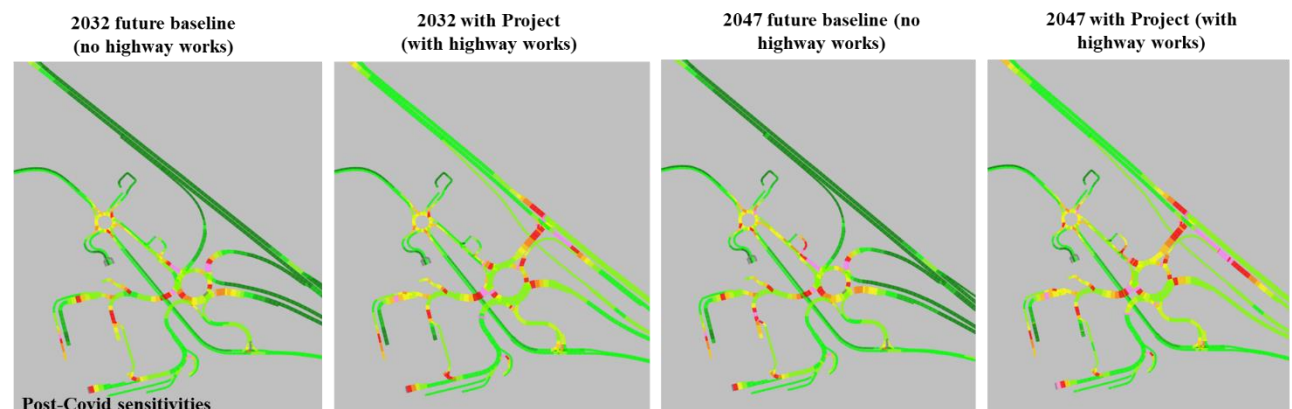
4.3.7   For the core scenarios in the AM peak (Figure 12) there is generally little difference in terms of performance between the 2032 and 2047 future baseline
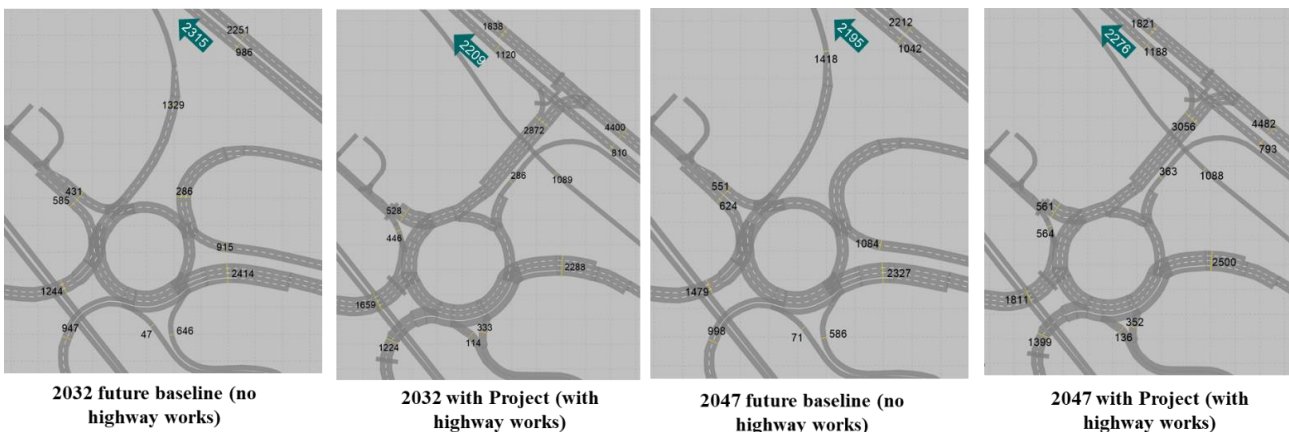
scenarios. Queues on the Longbridge Way approach to North Terminal Roundabout are slightly longer in the 2047 future baseline scenario than in the 2032 future baseline.

4.3.8   The introduction of the Project highway works in the core with Project scenarios includes the new signalised junction where the North Terminal exit meets the A23 London Road. Queuing is generally contained within the approaches at this junction; as would be expected the plots show longer queues on the northbound approach on the A23 London Road in the 2047 with Project than in the 2032 with Project scenario. The Project highway works include a reduction in the speed limit on Airport Way and A23 London Road which is indicated by the lighter green colour on these roads in the with Project scenarios compared to the future baseline scenarios.

4.3.9   In the post-Covid sensitivity tests (Figure 13) the operation of the 2032 future baseline and 2047 future baseline scenarios are also very similar, with marginal differences in queuing at approaches. Queueing on Longbridge way is slightly worse in the 2047 future baseline compared to the 2032 future baseline. This is similar to the situation indicated in the core scenarios.

4.3.10   The post-Covid sensitivity tests for the 2032 and 2047 with Project scenarios indicates that the extent of queueing on the A23 London Road northbound approach to the new signalised junction would be reduced compared to the core scenarios.
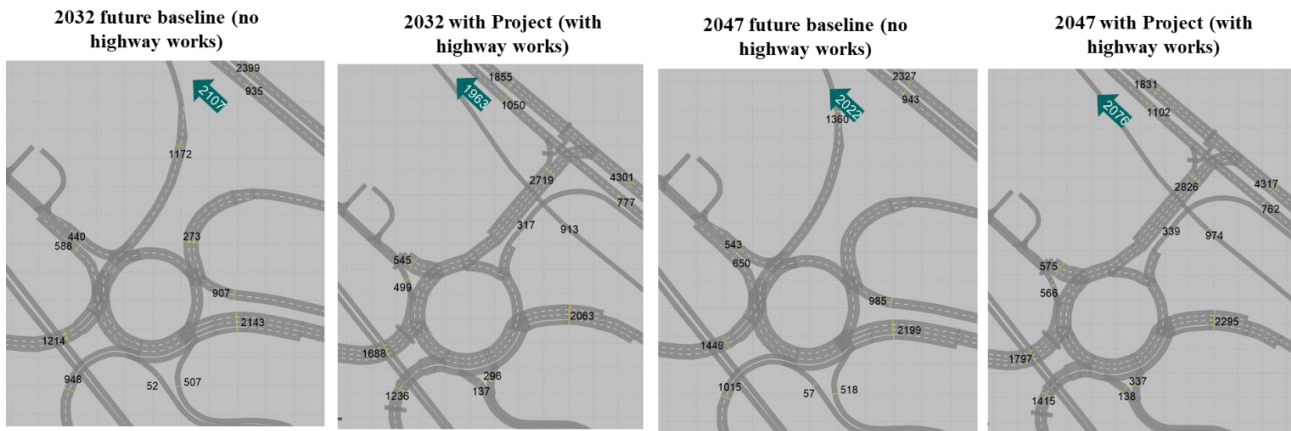
AM peak period – flow comparisons

4.3.11   Figure 14 shows the AM peak flow comparisons for the period 08:00 to 09:00 in the core scenarios. Figure 15 shows the same information for the post-Covid sensitivity test scenarios.

Figure 14: Flow Comparisons AM peak – 08:00-09:00 –North Terminal Roundabout (core)

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Figure 15: Flow Comparisons AM peak – 08:00-09:00 –North Terminal Roundabout (post-Covid)
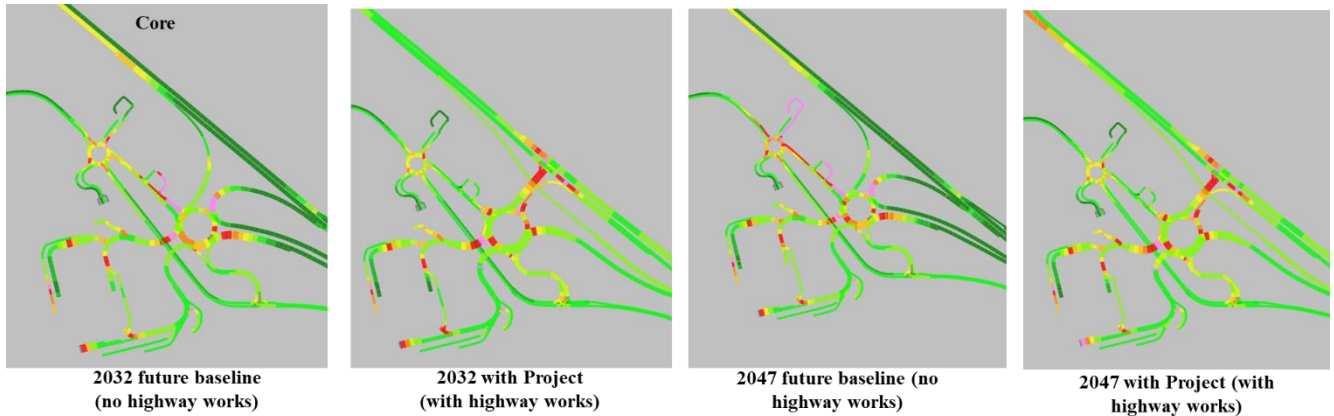

4.3.12 In the core scenarios (Figure 14) there are higher flows out of North Terminal in the with Project scenario compared to the equivalent future baseline scenario in each year. As a result of introducing the northbound flyover from Airport Way to A23 London Road, there is a slight reduction in flows on the Airport Way approach at North Terminal Roundabout in the 2032 with Project scenario compared to that in the 2032 future baseline scenario, as vehicles heading north can bypass the roundabout.

4.3.13 The post-Covid sensitivity tests (Figure 15) show reductions in the A23 northbound flows compared to the core scenarios. There are also small reductions in the flows at the Airport Way approach to North Terminal Roundabout across all scenarios in the post-Covid sensitivities scenarios compared to the core scenarios.

PM peak period – average speed comparisons

4.3.14 Figure 16 shows the operational PM peak speed plots (17:30-18:00) at the North Terminal Roundabout, for the core scenarios. Figure 17 shows the same information for the same time period from the post-Covid sensitivity test scenarios.

Figure 16: Speed Plots PM peak – 17:30-18:00 - North Terminal Roundabout operation (core)

| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |

Figure 17: Speed Plots PM peak – 17:30-18:00 - North Terminal Roundabout operation (post-Covid)
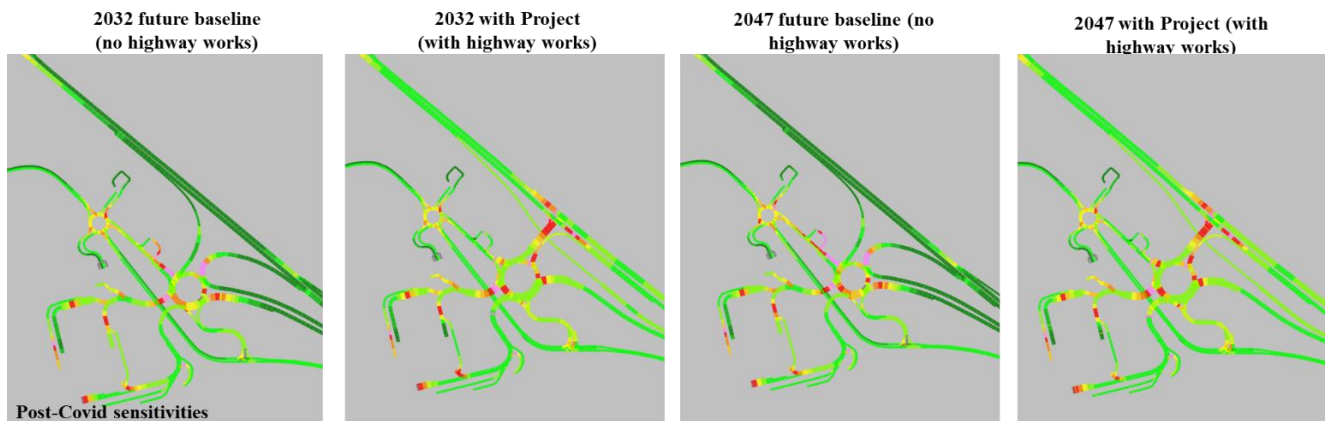
4.3.15   In the PM peak core scenarios (Figure 16) the most notable difference between the 2032 and 2047 future baseline scenarios is longer queues on Longbridge Way approach to the North Terminal Roundabout in the 2047 future baseline scenario, which extend back to the roundabout with Perimeter Road.

4.3.16   The introduction of the Project highway works in the core with Project scenarios introduces the new signalised junction on the A23 London Road, where queueing would be contained within the approaches in both 2032 and 2047. The effect of the proposed reduction in the speed limit on Airport Way and A23 London Road is indicated by the lighter green colour on these roads in the with Project scenarios.

4.3.17   Queues in the core scenarios on the approach to the North Terminal Roundabout from Airport Way are shorter in the with Project scenarios compared to the equivalent future baseline scenarios.

4.3.18   The average speed plots for the post-Covid sensitivity scenarios (Figure 17) show a similar pattern of change across scenarios as was seen in the core

scenarios. The 2047 future baseline scenario has slightly more queuing on the Longbridge Way approach to North Terminal Roundabout, however the extent of queuing is reduced in the post-Covid sensitivity test and does not reach the roundabout with Perimeter Road.

4.3.19   There is similar level of queueing at the approaches to the new North Terminal/A23 signalised junction in the with Project post-Covid sensitivity tests scenarios compared to the core scenarios.
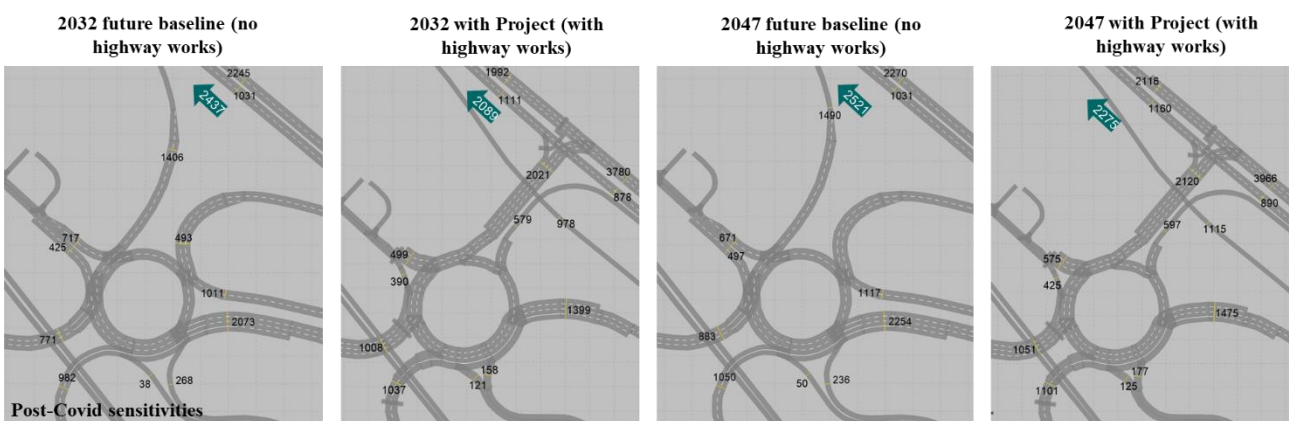
PM peak period – flow comparisons

4.3.20   Figure 18 shows the PM peak flow comparisons for the period 17:00 to 18:00 in the core scenarios. Figure 19 shows the same information for the post-Covid sensitivity test scenarios.

Figure 18: Flow Comparisons PM peak – 17:00-18:00 – North Terminal Roundabout (core)

| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |
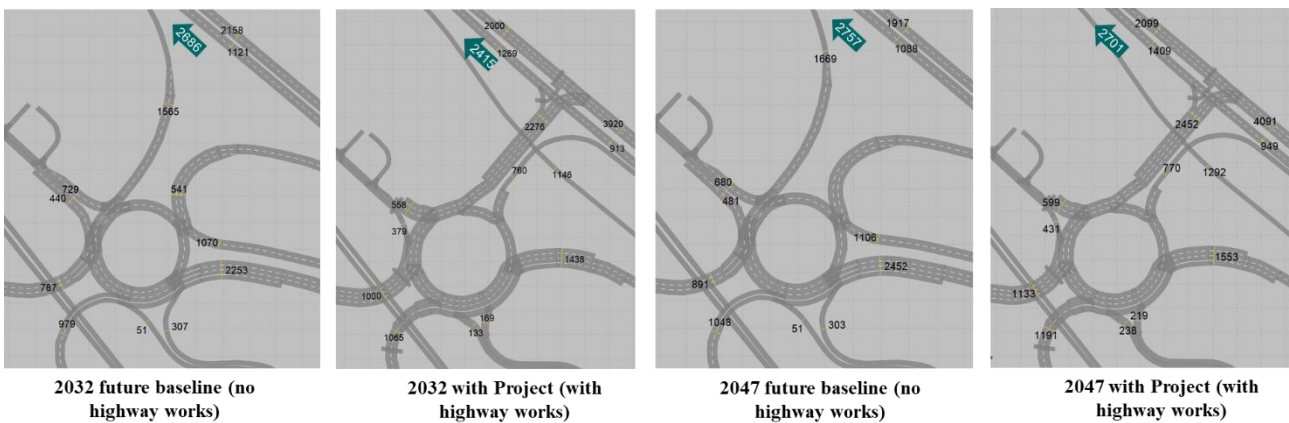
Figure 19: Flow Comparisons PM peak – 17:00-18:00 – North Terminal Roundabout (post-Covid)

| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |

4.3.21   For the core scenarios (Figure 18) the flows across the PM peak are generally higher in the 2047 future baseline scenario compared to the 2032 future baseline scenario.

4.3.22   There are higher flows out of North Terminal in the core with Project scenarios compared to the future baseline scenarios in both years. Flows heading northbound to Longbridge Roundabout are slightly lower in the with Project scenarios compared to the future baseline scenarios due to the introduction of the new signalised junction, allowing vehicles from North Terminal Roundabout to turn right and head southbound at this junction.

4.3.23   Across all post-Covid sensitivity scenarios (Figure 19) flows on A23 London Road northbound are lower than in the equivalent core scenario. This is due to lower levels of background traffic, particularly from the M23 Spur. The largest reduction is found in the 2032 with Project and 2047 with Project scenarios.

4.3.24   There are also reductions in flows at the Airport Way approach to North Terminal Roundabout across all scenarios in the post-Covid scenarios compared to the core scenarios.

South Terminal Roundabout and M23 Spur operation

4.3.25   This section looks at the operational comparison of the four future year scenarios for the South Terminal Roundabout and M23 Spur across the AM peak and PM peak, and the differences between core and post-Covid sensitivity scenarios.

4.3.26   The 2032 and 2047 with Project scenarios include the new highway works proposed, featuring a grade separated roundabout at South Terminal with a flyover for eastbound and westbound through traffic between the M23 Spur and Airport Way.

AM peak period – average speed comparisons

4.3.27   Figure 20 shows the operational AM peak speed plots for the period 07:30-08:00 at the South Terminal Roundabout and M23 Spur, for the core scenarios. Figure 21 shows the same information for the same time period from the post-Covid sensitivity test scenarios.

Figure 20: Speed Plots AM peak – 07:30-08:00 - South Terminal Roundabout and M23 Spur operation (core)
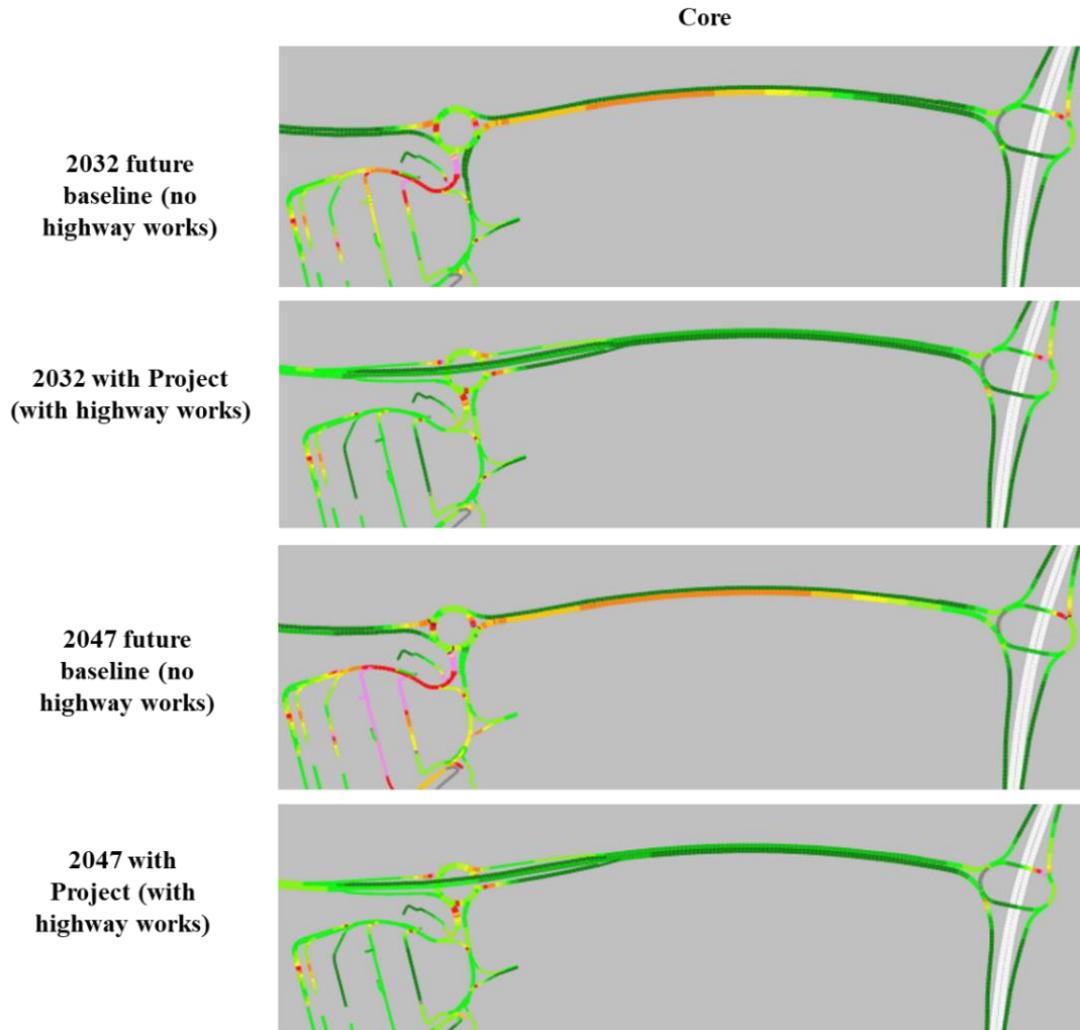
Figure 21: Speed Plots AM peak – 07:30-08:00 - South Terminal Roundabout and M23 Spur operation (post-Covid)


Post-Covid Sensitivities
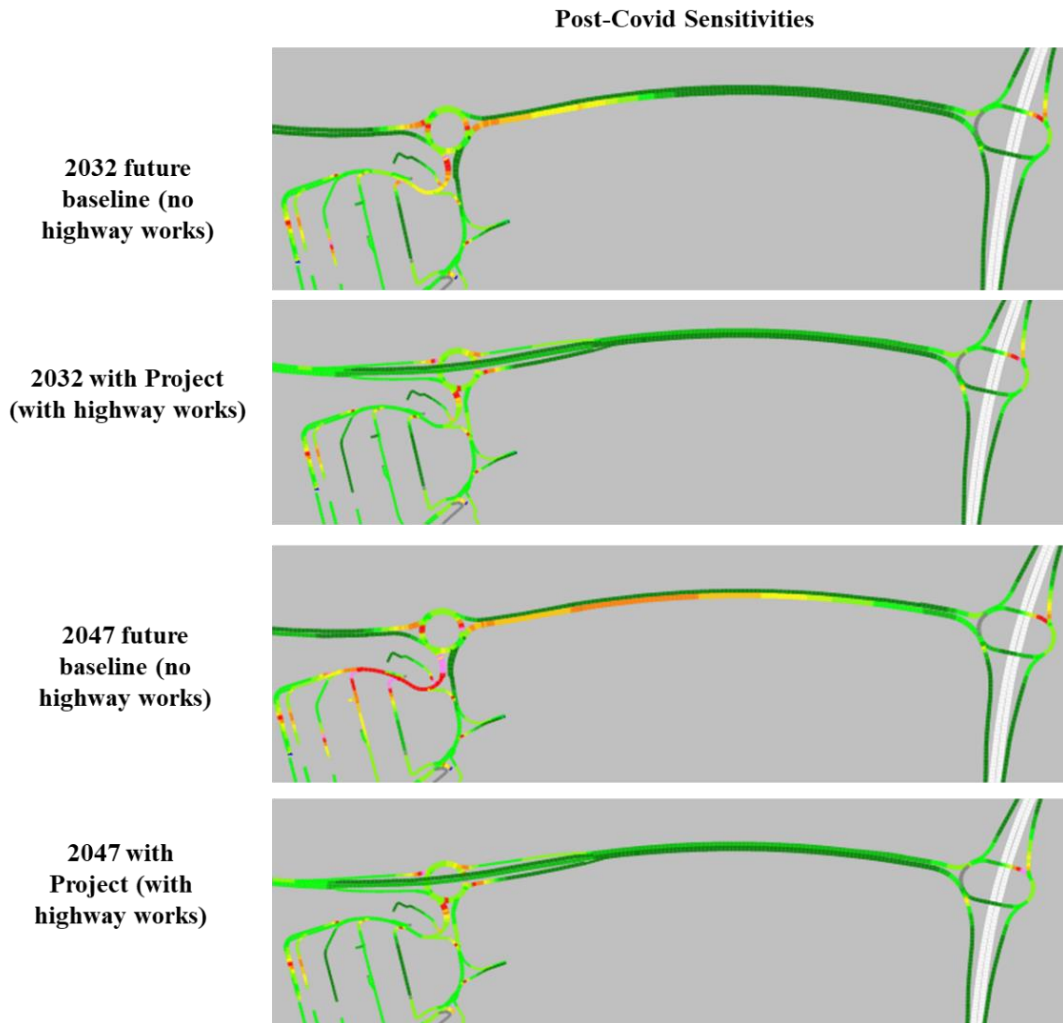
4.3.28   In the core scenarios (Figure 20) the 2032 future baseline AM peak shows queues at the South Terminal exit approach to South Terminal Roundabout, which increase and extend further into the forecourt and along the M23 Spur in the 2047 future baseline scenario, although they do not reach M23 Junction 9.

4.3.29   The core with Project scenarios show a significant improvement in performance compared to the future baseline scenarios. The improvement is due to the new grade separated roundabout which removes through traffic from the roundabout. Signal optimisation at the roundabout also reduces the extent of queuing in the forecourts.

4.3.30   Similar to the core scenarios, the post-Covid sensitivity tests (Figure 21) show queues at the South Terminal exit approach to South Terminal Roundabout and on the M23 Spur in both future baseline scenarios.

4.3.31   The post-Covid sensitivity scenarios with the Project show the same kind of improvement in performance compared to the future baseline scenarios as is seen in the core models. They also show less queuing in South Terminal than the core scenarios, although by 2047 queues would extend back towards the forecourt areas. Queues on the M23 Spur are also shorter in the post-Covid sensitivity tests. For the with Project post-Covid sensitivity scenarios, there is no significant difference in queueing from the core scenarios, but queues are short in both cases.

AM peak period – flow comparisons

4.3.32   Figure 22 shows the AM peak flow comparisons for the period 08:00 to 09:00 in the core scenarios. Figure 23 shows the same information for the post-Covid sensitivity test scenarios.

Figure 22: Flow Comparisons AM peak – 07:00-08:00 - South Terminal Roundabout and M23 Spur operation (core)
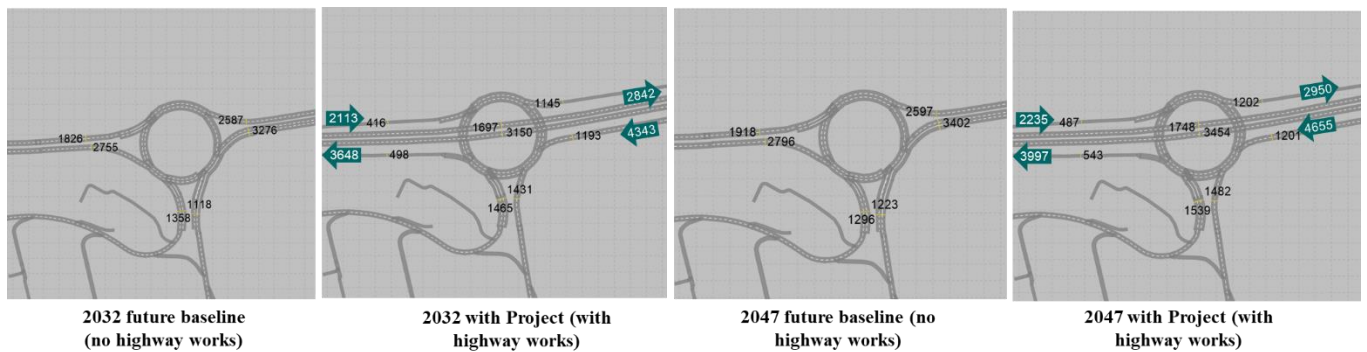
Figure 23: Flow Comparison AM peak – 07:00-08:00 - South Terminal Roundabout and M23 Spur operation (post-Covid)
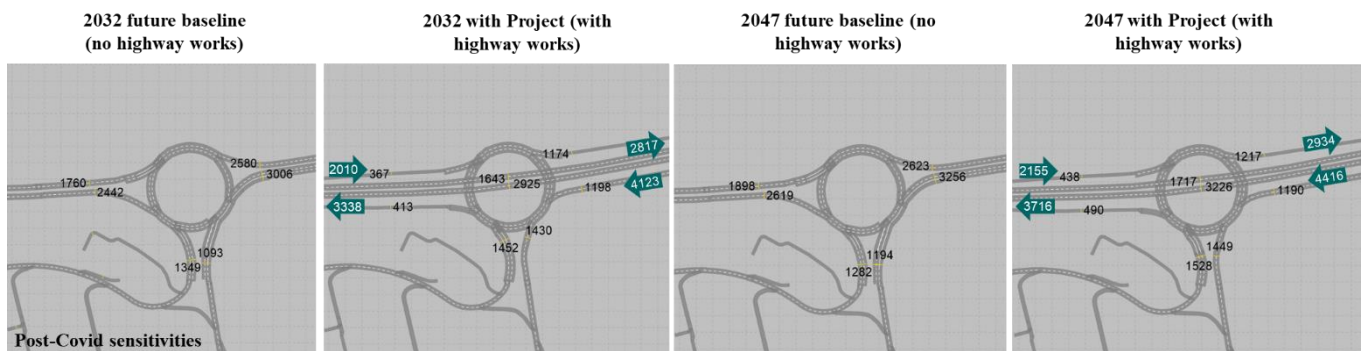
4.3.33   The core with Project scenarios (Figure 22) show a large increase in westbound traffic flows from the M23 compared to the equivalent future baseline scenarios, likely to be the result of the introduction of the grade separated roundabout reducing congestion on the approaches to the roundabout and thus allowing additional traffic to pass through along the M23 Spur.

4.3.34   The core scenarios also show higher flows out of South Terminal in the with Project scenarios compared to the future baseline scenarios. This reflects the reduced level of queueing seen in the speed plots for the respective scenarios.

4.3.35   In the post-Covid sensitivity tests (Figure 23) there are large increases in westbound traffic flows from the M23 in the 2032 with Project scenarios compared to the equivalent future baseline scenarios. Flows out of South Terminal also increase in the with Project scenarios compared to the future baseline scenarios.

4.3.36   In the post-Covid sensitivity tests there is little difference between the flows out of South Terminal compared to the core scenarios. However, the post-Covid scenarios show generally lower traffic flows in the eastbound and westbound directions compared to the core scenarios.

PM peak period – average speed comparisons

4.3.37   Figure 24 shows the operational PM peak speed plots (17:30-18:00) at the South Terminal Roundabout and on the M23 Spur, for the core scenarios. Figure 25 shows the same information for the same time period from the post-Covid sensitivity test scenarios.

Figure 24: Speed Plots PM peak – 17:30-18:00 - South Terminal Roundabout and M23 Spur operation (core)
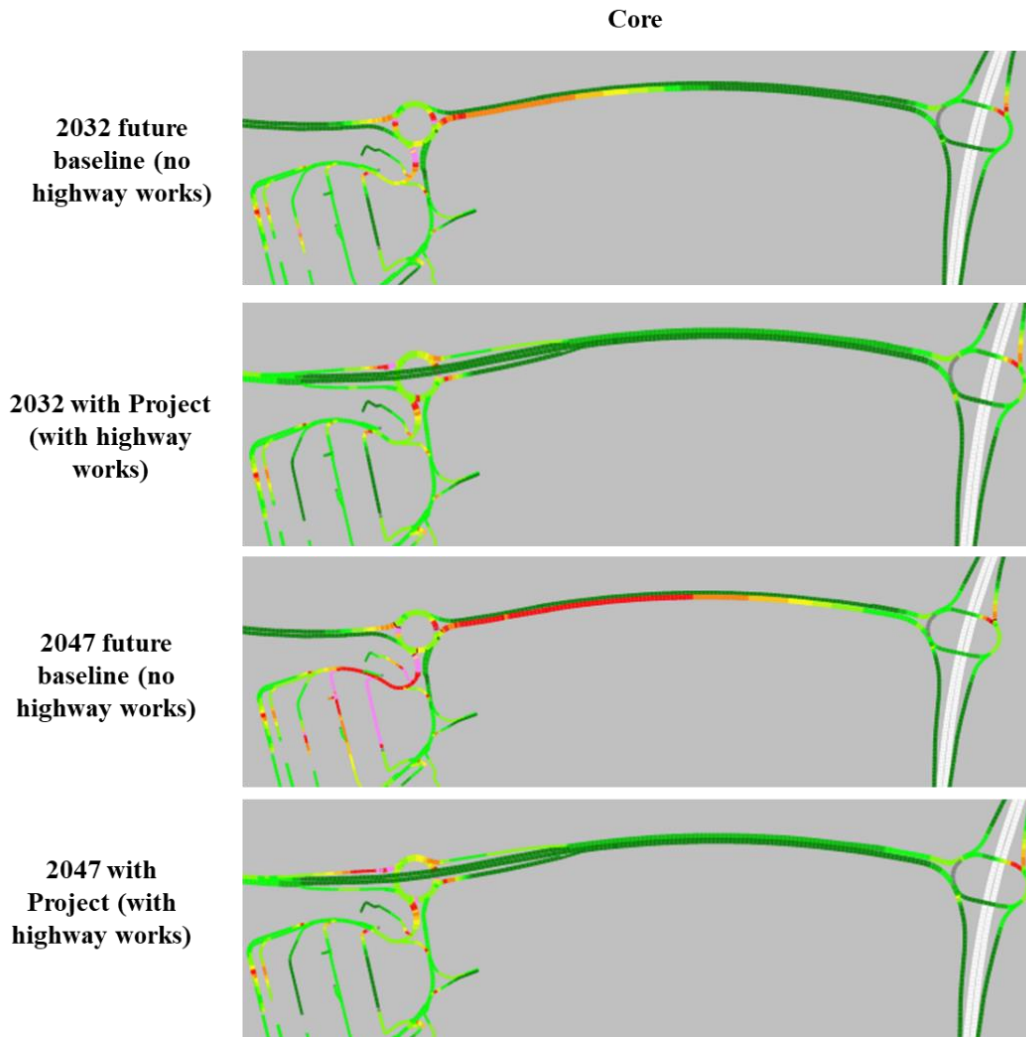
Figure 25: Speed Plots PM peak – 17:30-18:00 - South Terminal Roundabout and M23 Spur operation (post-Covid)

Post-Covid Sensitivities

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)
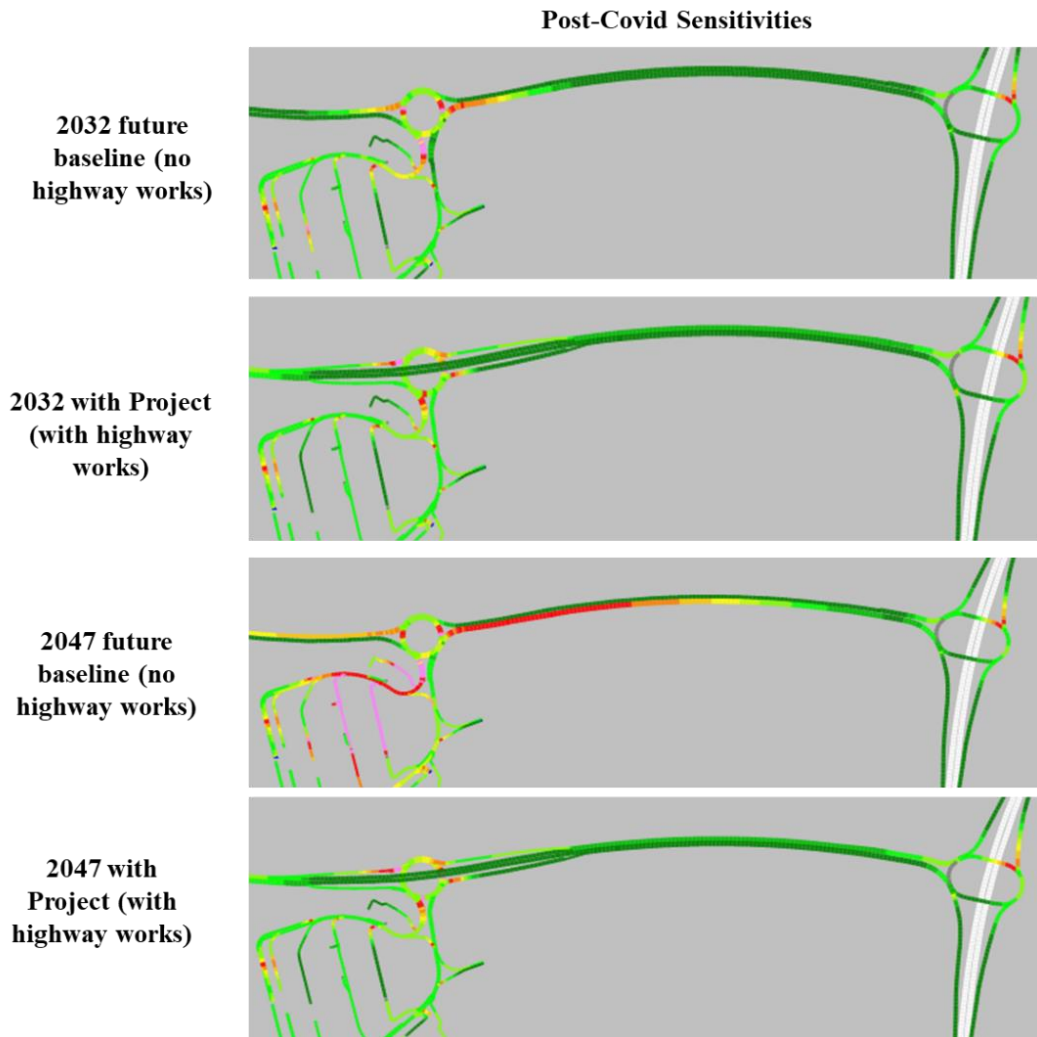
4.3.38   In the core scenarios for the PM peak (Figure 24) the 2047 future baseline shows queues extending from South Terminal Roundabout back into the South Terminal forecourt area. Queueing is shown on the M23 Spur in the 2032 future baseline, worsening in the 2047 future baseline scenario, although not reaching M23 Junction 9.

4.3.39   The core with Project scenarios operate significantly better than the equivalent future baseline scenarios, with significantly less queueing both in the South Terminal forecourt and on the M23 Spur westbound, due to the introduction of the grade separated roundabout and flyover that allows eastbound and westbound through traffic to bypass the roundabout.

4.3.40   The post-Covid sensitivity tests (Figure 25) show significant queueing in the South Terminal forecourt area in the 2047 future baseline scenario and queues on the westbound approach to South Terminal Roundabout, with rolling queues

approaching South Terminal Roundabout in the eastbound direction. The with Project scenarios show significant improvements over the equivalent future baseline scenario.

4.3.41   The post-Covid sensitivity tests generally show a reduced extent of queuing on compared to the core scenarios, although they do show slightly longer eastbound queues approaching South Terminal Roundabout in the 2047 future baseline, compared to the core scenario. This is likely to be due to more eastbound traffic approaching from the direction of Longbridge Roundabout, where reduced overall demand in the post-Covid sensitivity tests would change the balance of operation allowing more traffic to enter from the A217 and A23 Brighton Road during the modelled time period.

4.3.42   The post-Covid sensitivity tests show the with Project scenarios operating similarly to the core scenarios, with short queues at South Terminal Roundabout and no queuing on the M23 Spur.

PM peak period – flow comparisons

4.3.43   Figure 26 shows the PM peak flow comparisons for the period 17:00 to 18:00 in the core scenarios. Figure 27 shows the same information for the post-Covid sensitivity test scenarios.

Figure 26: Flow Comparison PM peak – 17:00-18:00 - South Terminal Roundabout and M23 Spur operation (core)

2032 future baseline (no highway works)   2032 with Project (with highway works)   2047 future baseline (no highway works)   2047 with Project (with highway works)
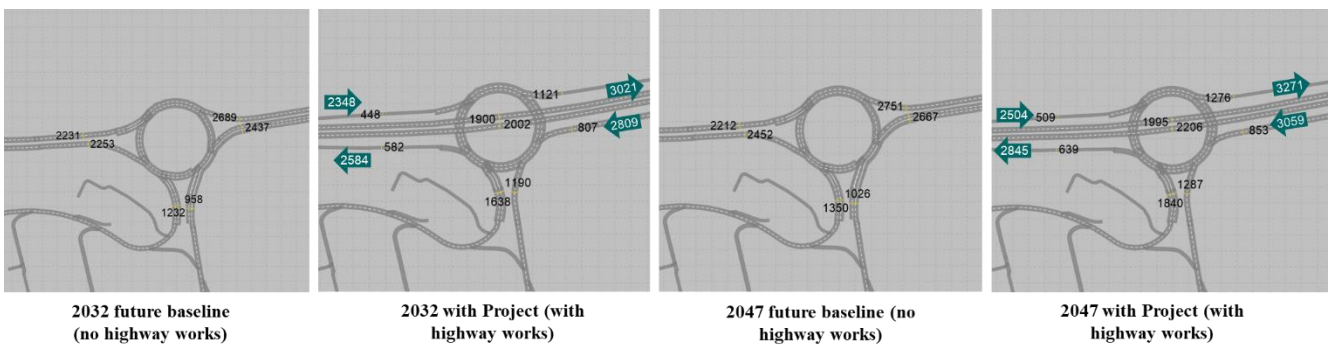
Figure 27: Flow Comparison PM peak – 17:00-18:00 - South Terminal Roundabout and M23 Spur operation (post-Covid)
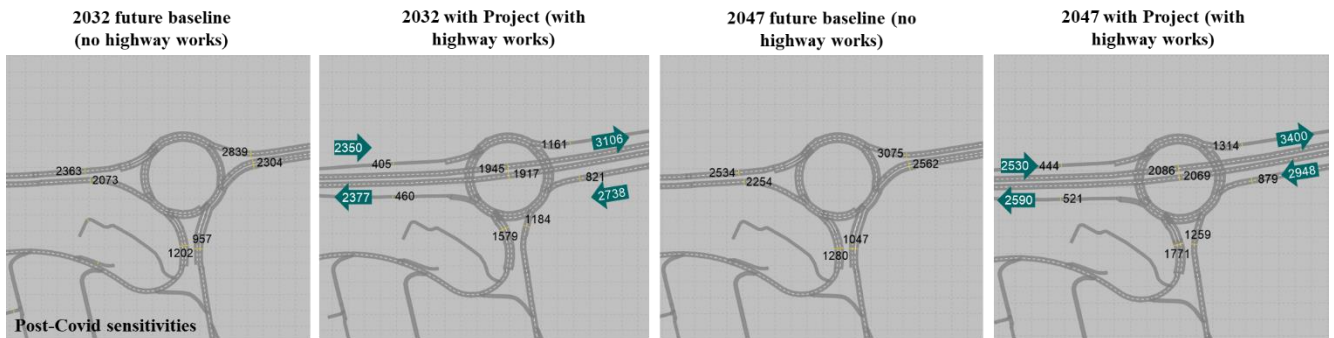
4.3.44   In the PM peak core scenarios (Figure 26) there are higher flows approaching and leaving South Terminal Roundabout in the with Project scenarios compared to the equivalent future baseline scenarios. This results from the introduction of the grade separated junction at South Terminal, reducing queuing on the approaches, as eastbound and westbound traffic can bypass the South Terminal Roundabout, and thus increasing capacity.

4.3.45   Similar to the core scenarios, the post-Covid sensitivity tests for the PM peak (Figure 27) show higher flows out of South Terminal in the 2032 with Project and 2047 with Project compared to the future baseline scenarios. There is also an increase in westbound and eastbound flows in the with highway works scenarios as traffic can bypass the South Terminal Roundabout.

4.3.46   There is little difference between the flows out of South Terminal between the post-Covid sensitivity test and core scenarios across all the PM peak scenarios. However, in the post-Covid sensitivity test scenarios, there are lower westbound traffic flows from the M23 due to a general reduction in background traffic compared to the core scenarios. Eastbound flows into South Terminal Roundabout are slightly higher in the post-Covid scenarios; this is because more traffic is able to enter the network from the A217 to the northwest, as a result of lower volumes of traffic circulating around Longbridge Roundabout.

Longbridge Roundabout

4.3.47   This section looks at the operational comparison of the four future year scenarios for the Longbridge Roundabout across the AM peak and PM peaks, and differences between core and post-Covid sensitivities scenarios.

4.3.48   The 2032 with Project and 2047 with Project scenarios include the new highway works proposed, including the enlargement of the circulatory carriageway at Longbridge Roundabout and signalisation of the A217 approach.

4.3.49   Figure 28 shows the operational AM peak speed plots for the period 08:00 -08:30 at Longbridge Roundabout for the core scenarios. Figure 29 shows the same information for the same time period from the post-Covid sensitivity test scenarios.

Figure 28: Speed Plots – AM Peak – 08:00-08:30 Longbridge Roundabout operation (core)
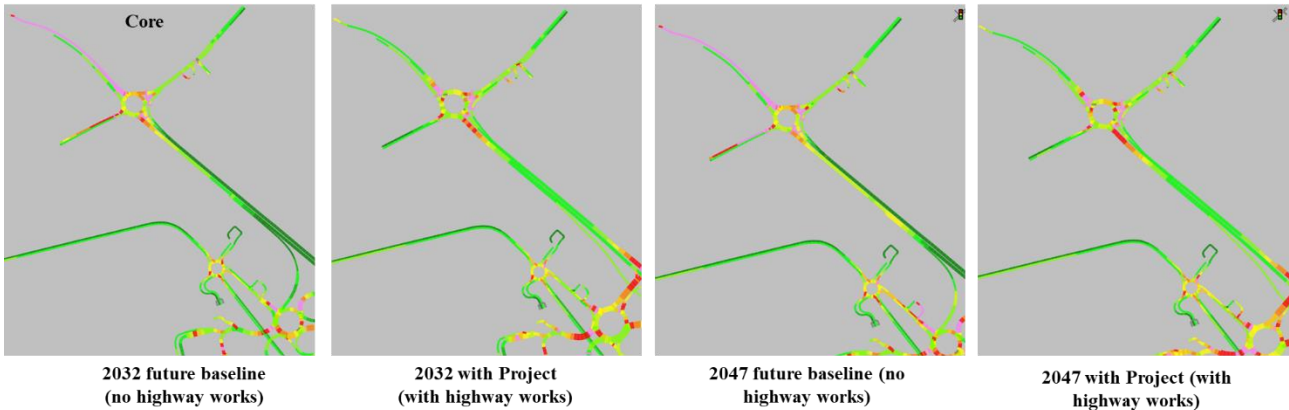
Figure 29: Speed Plots –AM Peak – 08:00-08:30 Longbridge Roundabout operation (post-Covid)
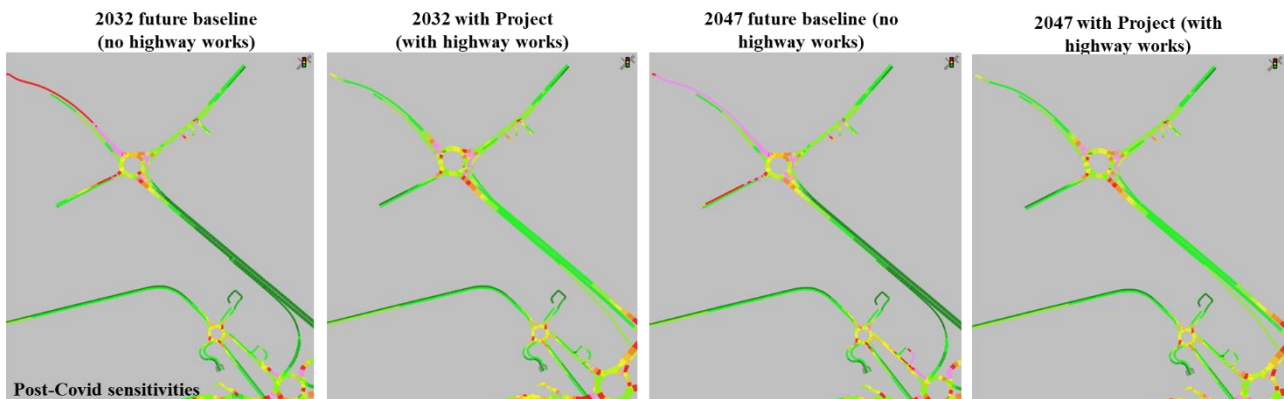
4.3.50   In the AM peak core scenarios (Figure 28) there are longer queues of slower moving traffic on the A217 approach in the 2032 future baseline and the 2047 future baseline scenarios. In the future baseline road layout, the A217 approach is priority controlled and vehicles experience delay entering the roundabout due to the volume of traffic on the circulatory carriageway, particularly traffic from the A23 London Road northbound travelling towards A23 Brighton Road or U-turning to return southbound on A23 London Road. Queues are also present on Povey Cross Road (also priority controlled) in the 2032 future baseline and 2047 future baseline scenarios.

4.3.51   In the 2032 with Project and 2047 with Project core scenarios, the A217 approach is signalised and the roundabout is enlarged. Vehicles approaching on

the A217 would therefore not need to give way to traffic on the circulatory carriageway and queues are shown to be short on all approaches, as expected. Queueing on the A23 London Road northbound approach would also reduce as a result of the introduction of the North Terminal / A23 signalised junction which removes the need for traffic leaving North Terminal and bound for the A23 southbound to make U-turns at Longbridge Roundabout. There would also be a general reduction in speed (shown by the lighter green colours) along the A23 London Road due to implementation of reduced speed limits as part of the highway works.

4.3.52   In the post-Covid 2032 and 2047 future baseline sensitivity scenarios (Figure 29) queuing is again shown on the A217 approach but average speeds are slightly faster than shown in the equivalent core scenario. In both the post-Covid 2032 and 2047 future baseline sensitivity scenarios, the extent of queuing on the A23 London road northbound approach is reduced compared to the equivalent core scenario.

4.3.53   The 2032 with Project and 2047 with Project post-Covid sensitivity scenarios operate similarly to the core scenarios, with short queues on the approaches to Longbridge Roundabout.

AM peak period – flow comparisons

4.3.54   Figure 30 shows the AM peak flow comparisons for the period 08:00 to 09:00 in the core scenarios. Figure 31 shows the same information for the post-Covid sensitivity test scenarios.

Figure 30: Flow Comparisons AM peak – 08:00-09:00 – Longbridge Roundabout (core)

2032 future baseline (no highway works)   2032 with Project (with highway works)   2047 future baseline (no highway works)   2047 with Project (with highway works)
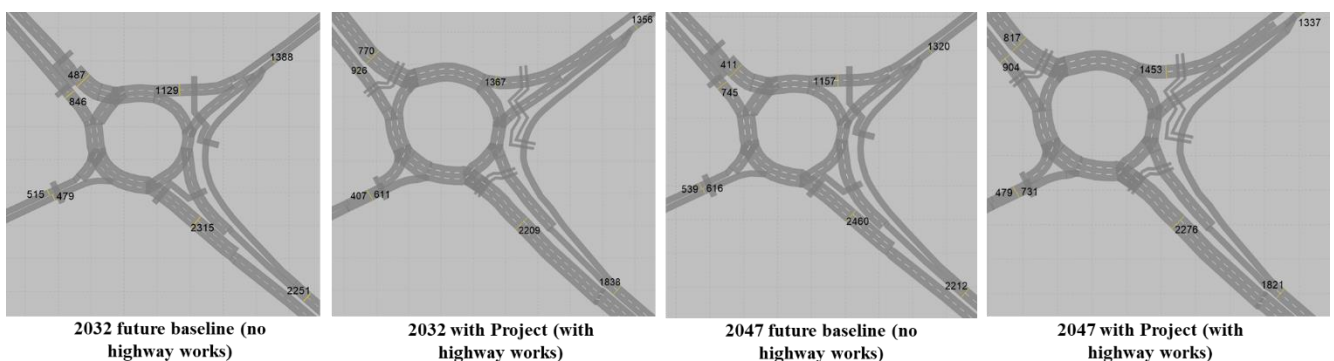
Figure 31: Flow Comparisons AM peak – 08:00-09:00 – Longbridge Roundabout (post-Covid)
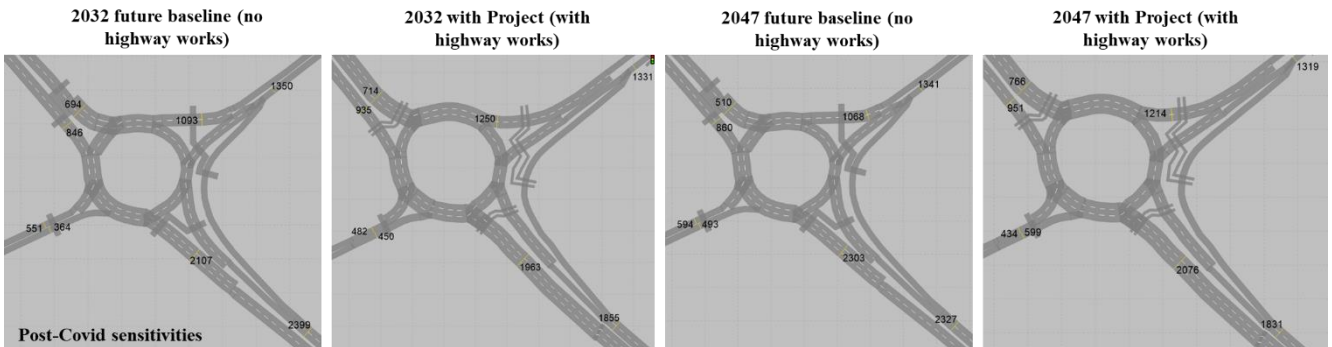
4.3.55   In the core 2032 future baseline and 2047 future baseline scenarios (Figure 30) there are fewer vehicles entering the network on the A217 approach, as a result of the queueing on this arm of the roundabout, compared to the with Project scenario. In the 2032 and 2047 with Project scenarios, flows entering from the A217 increase significantly as a result of the signalisation of the roundabout.

4.3.56   There are slightly lower traffic volumes on the A23 London Road northbound in the core 2032 with Project and 2047 with Project scenarios compared to the future baseline scenarios. This is because the introduction of the new signalised junction on A23 London Road at North Terminal reduces the need for traffic leaving North Terminal to make U-turn movements at Longbridge Roundabout, which in turn reduces traffic volumes passing through the roundabout and increases capacity.

4.3.57   In the post-Covid sensitivity test scenarios (Figure 31) traffic flows on the A23 London Road northbound approach are lower than in the equivalent core scenario. This reflects the reduction in background traffic generally seen in the post-Covid sensitivity tests, which also leads to wider redistribution of traffic in the strategic model.

4.3.58   In the post-Covid sensitivity tests for the 2032 future baseline and 2047 future baseline scenarios, there is an increase in traffic entering the roundabout from the A217 compared to the flows in the core scenarios. This reflects lower flows circulating around the roundabout, which mean that more traffic can enter from the A217. The with Project scenarios confirm the same pattern as the core scenarios, namely that entry flows from the A217 increase, and flows on the A23 London Road northbound decrease slightly, with the introduction of the Project.

PM peak period – average speed comparisons

4.3.59   Figure 32 shows the operational PM peak speed plots (17:30-18:00) at Longbridge Roundabout for the core scenarios. Figure 33 shows the same

information for the same time period from the post-Covid sensitivity test scenarios.

Figure 32: Speed Plots – PM Peak – 17:30-18:00 Longbridge Roundabout operation (core)

2032 future baseline (no highway works)   2032 with Project (with highway works)   2047 future baseline (no highway works)   2047 with Project (with highway works)
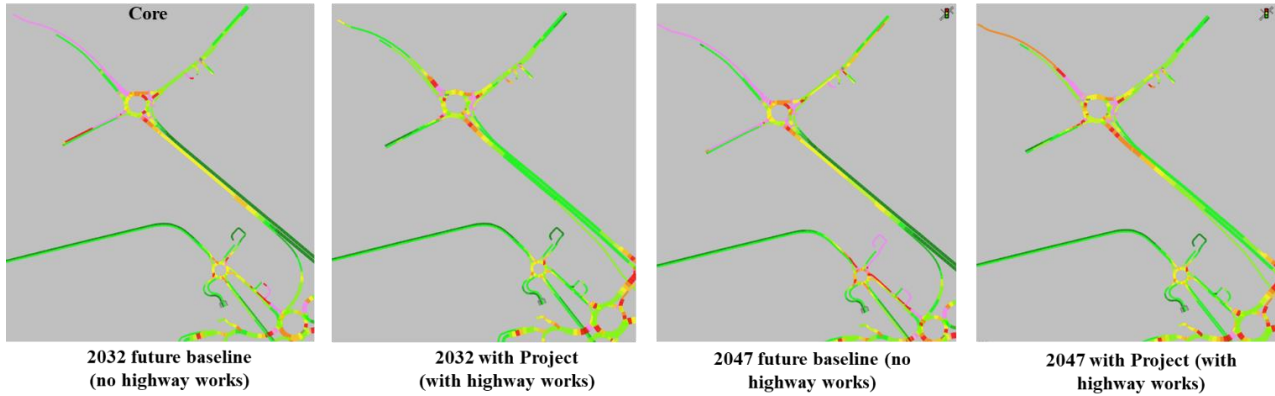
Figure 33: Speed Plots – PM Peak – 17:30-18:00 Longbridge Roundabout operation (post-Covid)

2032 future baseline (no highway works)   2032 with Project (with highway works)   2047 future baseline (no highway works)   2047 with Project (with highway works)
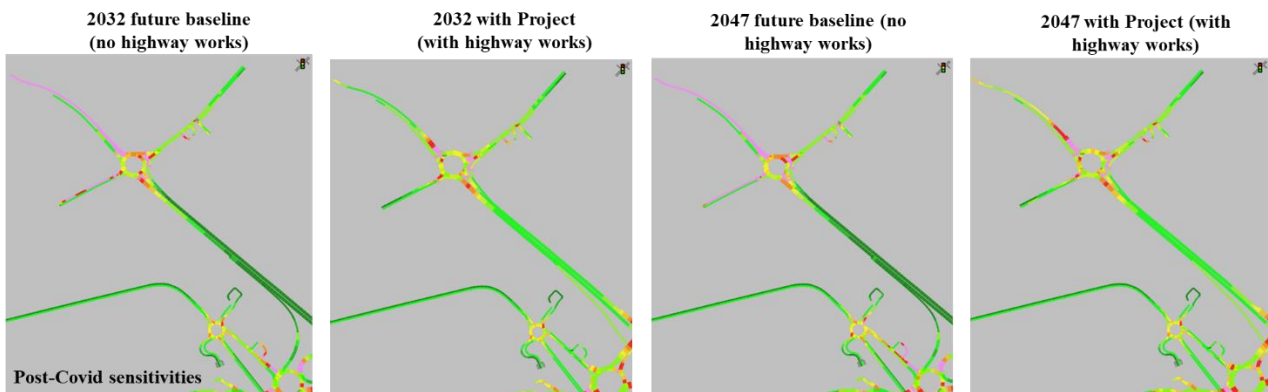
4.3.60   For the core scenarios (Figure 32) for the 2032 future baseline, 2047 future baseline and 2047 with Project, queues are shown on the A217 as a result of circulating traffic causing delays to traffic entering the roundabout from the A217. This is a similar situation to that seen in the AM peak period.

4.3.61   In the core 2032 future baseline and 2047 future baseline scenarios, rolling queues on the A23 London Road northbound approach are shown extending back to the north terminal merge. There are also queues on the Povey Cross Road approach in these scenarios. The A217 and Povey Cross road approaches are both priority controlled, and therefore the queues are slower moving than on the A23 London Road northbound approach.

4.3.62   In the core 2032 and 2047 with Project scenarios, the network is operating significantly better than in the equivalent future baseline scenarios. Some queueing is shown on the A217 approach at this time although this is primarily a rolling queue.

4.3.63 The post-Covid sensitivity test speed plots (Figure 33) show that the extent of queueing in the post-Covid scenarios on the A23 London Road northbound approach at Longbridge Roundabout is reduced compared to the core scenarios. This reflects the lower levels of background traffic seen in the post-Covid sensitivity scenarios..

4.3.64 The post-Covid 2032 future baseline and 2047 future baseline scenarios show queuing on the A217 approach, as seen in the core scenarios, although queues on Povey Cross Road and the A23 London Road northbound approaches are shorter than in the core scenarios.

4.3.65 The post-Covid 2032 with Project scenario operates similarly to the core scenario on all approaches to Longbridge Roundabout with relatively short queues. The post-Covid 2047 with Project scenario shows a noticeable reduction in queuing on both the A217 and A23 London Road northbound approaches compared to the core scenario.

PM peak period – flow comparisons

4.3.66 Figure 34 shows the PM peak flow comparisons for the period 17:00 to 18:00 in the core scenarios. Figure 35 shows the same information for the post-Covid sensitivity test scenarios.

Figure 34: Flow Comparisons PM peak – 17:00-18:00 – Longbridge Roundabout (core)

2032 future baseline (no highway works)   2032 with Project (with highway works)   2047 future baseline (no highway works)   2047 with Project (with highway works)
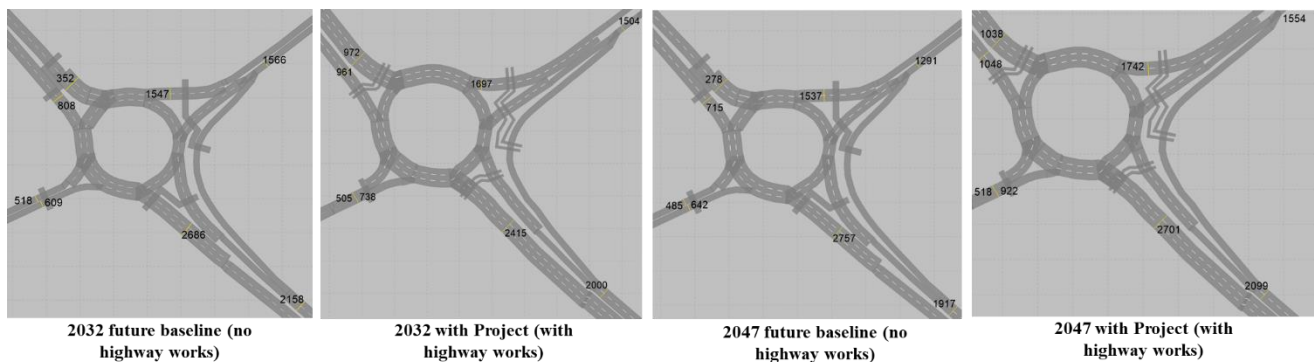
Figure 35: Flow Comparisons PM peak – 17:00-:00 – Longbridge Roundabout (post-Covid)

4.3.67   In the core 2032 future baseline and 2047 future baseline (Figure 34) there are fewer vehicles entering the network from the A217 than in the with Project scenarios, which is a result of traffic being held in the queue on the A217 approach to the roundabout. In comparison, the 2302 and 2047 with Project scenarios show an increased number of vehicles entering the roundabout from the A217 because the improved roundabout arrangement reduces congestion and queues on that approach.

4.3.68   There are slightly lower traffic volumes on the A23 northbound in the core 2032 with Project and 2047 with Project scenarios compared to the future baseline scenarios. The introduction of the new signalised junction on A23 London Road at North Terminal reduces the need for traffic leaving North Terminal to make U-turn movements at Longbridge Roundabout.

4.3.69   All the post-Covid sensitivity test scenarios (Figure 35) show fewer vehicles on the A23 London Road northbound approach than in the equivalent core scenarios. This is due to wider redistribution of traffic in the strategic model as a consequence of lower levels of background traffic in the post-Covid sensitivity tests.

4.3.70   In the post-Covid sensitivity tests for the 2032 with Project and 2047 with Project scenarios, there is a similar level of flows entering the network from A217 in the post-Covid scenarios compared to the core scenarios. However, the post-Covid future baseline scenarios show more traffic entering the roundabout from the A217 approach than seen in the core scenarios. This is the result of lower flows approaching on A23 London Road and circulating past the A217 approach, which means that more gaps are present for A217 traffic to enter the roundabout.

A23 London Road (Gatwick Road)

4.3.71   This section looks at the operational comparison of the four future year scenarios for the area of A23 London Road in the vicinity of the Gatwick Road and Lowfield Heath Roundabouts to the south of the Airport. It considers both AM peak and PM peaks and the differences between core and post-Covid sensitivities scenarios.

4.3.72   The Project does not include highway works on this part of the network, but conditions are influenced by the additional traffic demand produced by the Project and this area of the VISSIM model is therefore reported here for completeness.

AM peak period – average speed comparison

4.3.73   Figure 36 shows the operational AM peak speed plots for the period 08:00 -08:30 in the vicinity of the Gatwick Road Roundabout for the core scenarios. Figure 37 shows the same information for the same time period from the post-Covid sensitivity test scenarios.

4.3.74   For the core scenarios (Figure 36) in the busiest part of the AM peak period, between 08:30 and 09:00, there is very little difference in model operation between the future baseline and with Project core scenarios and the plots indicate that queue lengths would be very short and localised to junctions. The with Project scenarios indicate that additional demand arising from the Project can be adequately accommodated on this part of the network.

4.3.75   As expected, the post-Covid sensitivity test scenarios (Figure 37) show a similar pattern to the core scenarios, with very limited queuing at any point in this part of the network.

Figure 36: Speed Plots - AM peak – 08:30 – 09:00 London Road (Gatwick Road) operation (core)

Core

2032 future baseline

2032 with Project

2047 future baseline

2047 with Project
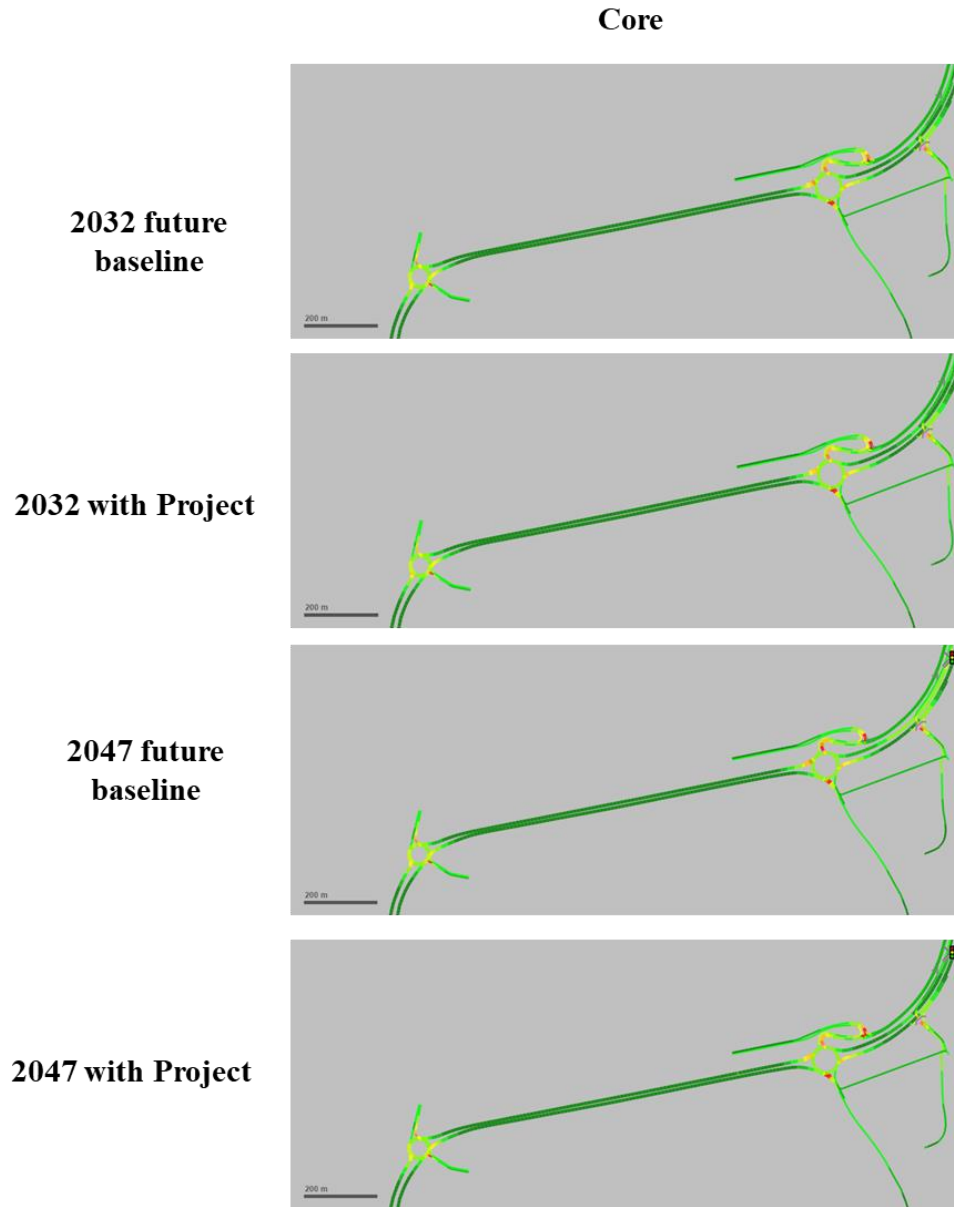
Figure 37: Speed Plots - AM peak – 08:30 – 09:00 London Road (Gatwick Road) operation (Post-Covid)

Post-Covid Sensitivities

2032 future baseline

2032 with Project

2047 future baseline

2047 with Project
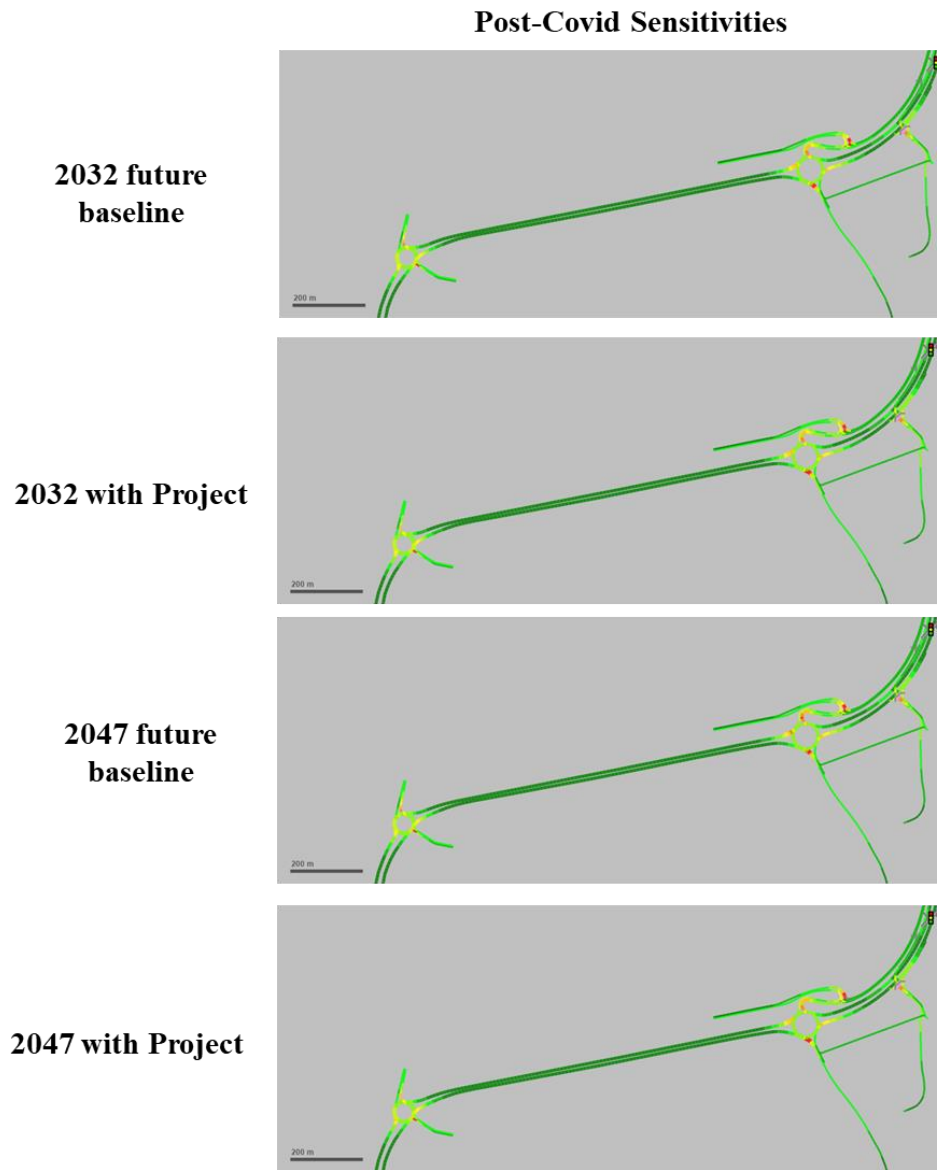
PM peak period – average speed comparisons

4.3.76   Figure 38 shows the operational PM peak speed plots for the period 17:30-18:00 on the A23 London Road to the south of the Airport for the core scenarios. Figure 39 shows the same information for the same time period from the post-Covid sensitivity test scenarios.

Figure 38: Speed Plots - PM peak – 17:30 – 18:00 London Road (Gatwick Road) operation (core)

Core

2032 future baseline

2032 with Project

2047 future baseline

2047 with Project

Figure 39: Speed Plots - PM peak – 17:30 – 18:00 London Road (Gatwick Road) operation (post-Covid)
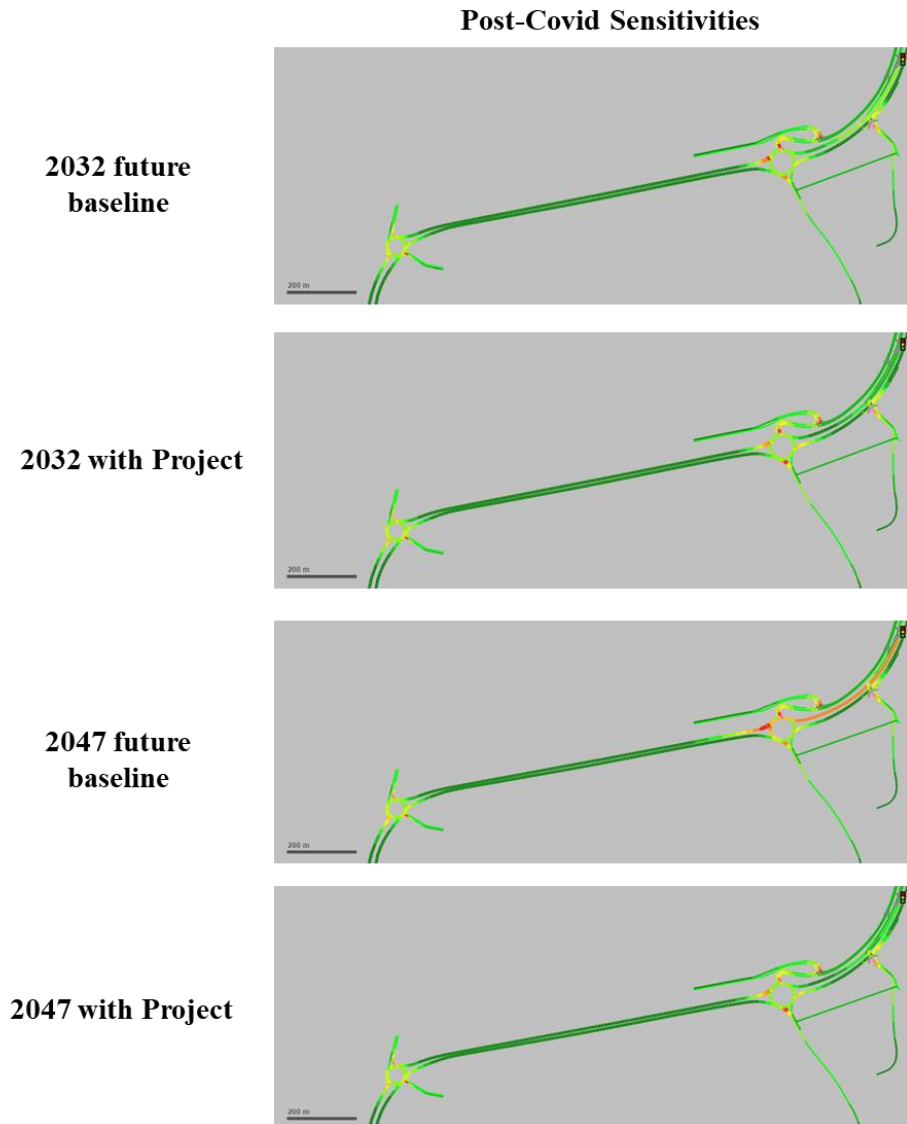
4.3.77   For the core scenarios (Figure 38) the 2032 future baseline scenario shows pronounced queuing from the northbound merge on the A23 London Road, north of Gatwick Road Roundabout, back towards Lowfield Heath Roundabout. In the 2047 future baseline scenario, this queuing extends past Lowfield Heath Roundabout.

4.3.78   In the core 2032 and 2047 with Project scenarios the level of queuing at this point of the network is reduced compared to the future baseline scenarios. This is due to wider redistribution of traffic in the strategic model as result of the highway works improvement. Northbound queues are no longer shown on the approach to Gatwick Road Roundabout in the 2032 with Project scenario. In the 2047 with Project scenario, queues are seen approaching Gatwick Road Roundabout but these are significantly shorter than those in the 2047 future baseline scenario.

4.3.79   The post-Covid sensitivity scenarios (Figure 39) show considerably less queuing in this part of the network than is shown in the core scenarios, due to the lower levels of background traffic and redistribution of traffic within the strategic model as a consequence. Short queues are shown from the A23 London Road northbound merge by 2047 in the future baseline scenario, but no significant queueing is present in either of the with Project scenarios.

4.4.   Network performance results

4.4.1   The following statistics were used to assess comparative network operation of the 2032 future baseline, 2032 with Project, 2047 future baseline and 2047 with Project scenarios for the core scenarios and post-Covid sensitivities.

- Vehicle kilometres travelled (VKT) per vehicle;
- Time travelled in network per vehicle (minutes);
- Average network speed (kph);
- Average network delay per vehicle (seconds); and
- Unreleased trips at the end of the modelled evaluation period (i.e. trips which could not be released into the modelled network due to congestion).

Network performance comparison – AM peak period

4.4.2   Table 1 provides a comparison of network performance statistics across the four core scenarios in the AM peak.

4.4.3   The number of vehicle kilometres travelled per vehicle is similar in all four scenarios. The average network delay per vehicle and number of unreleased trips increases between the 2032 future baseline and 2047 future baseline as would be expected as a result of increased demand. Time travelled in-network per vehicle also increases.

4.4.4   The introduction of the Project highway works in both 2032 and 2047 results in increases in average network speed and reductions in average network delay per vehicle and unreleased trips compared to the equivalent future baseline scenario.

4.4.5   Table 2 provides the same comparison of network performance for the four post-Covid sensitivity scenarios in the AM peak. The pattern between scenarios is consistent with that seen in the core scenarios as the introduction of the Project highway works results in increases in average speed and reduces the average network delay per vehicle and number of unreleased trips.

4.4.6   Compared to the core scenarios, there are fewer vehicles in the network in the post-Covid scenarios. This leads to a general reduction in network delay per vehicle and unreleased trips and an increase in average speeds.

Table 1: Core scenarios AM peak – network performance comparison

Network statistic	2032 future baseline	2032 with Project	2032 with Project vs 2032 future baseline	2047 future baseline	2047 with Project	2047 future baseline vs 2032 future baseline	2047 with Project vs 2047 future baseline
Arrived Vehicles	18707	20145	1438	19244	20854	537	1610
Vehicle kilometres travelled per vehicle	3.70	3.72	0.02	3.70	3.72	0.00	0.03
Time travelled in network per vehicle (minutes)	1297.6	1349.4	51.8	1516.5	1505.9	218.9	-10.5
Average network speed (kph)	53.4	55.5	2.1	47.1	51.6	-6.3	4.5
Average network delay per vehicle (s)	79.3	57.6	-21.7	113.4	75.5	34.1	-37.9
Unreleased Trips	165.5	3.1	-162.4	315.2	13.4	149.7	-301.8

Table 2: Post-covid sensitivity AM peak – network performance comparison

Network statistic	2032 future baseline	2032 with Project	2032 with Project vs 2032 future baseline	2047 future baseline	2047 with Project	2047 future baseline vs 2032 future baseline	2047 with Project vs 2047 future baseline
Arrived Vehicles	18040	19552	1512	18853	20433	814	1580
Vehicle kilometres travelled per vehicle	3.64	3.67	0.02	3.63	3.67	-0.01	0.03
Time travelled in network per vehicle (minutes)	1126.5	1271.4	144.9	1369.5	1381.4	243.0	11.9
Average network speed (kph)	58.3	56.4	-1.9	50.4	54.2	-7.9	3.8
Average network delay per vehicle (s)	56.3	52.6	-3.7	93.4	61.9	37.0	-31.4
Unreleased Trips	148.1	3.5	-144.7	293.2	5.8	145.1	-287.4

Network performance comparison – PM peak period

4.4.7   Table 3 provides a comparison of network performance statistics across the core scenarios in the PM peak.

4.4.8   The number of vehicle kilometres travelled per vehicle do not differ significantly across the scenarios. The average network delay per vehicle and number of unreleased trips increase between 2032 future baseline and 2047 future baseline as would be expected as a result of background growth and growth in Airport activity in the absence of the Project.

4.4.9   The introduction of the Project highway works in both 2032 and 2047 results in an increase in average network speed and a reduction in average network delay per vehicle and in the number of unreleased trips.

4.4.10   Table 4 provides the comparison of network performance for the four post-Covid sensitivity scenarios in the PM peak.

4.4.11   Compared to the core scenario runs, the overall number of vehicles in the network is less in the post-Covid scenarios and the statistics therefore show fewer unreleased trips, reduced average network delay per vehicle and an increase in average speeds across all scenarios.

Table 3: Core PM peak – network performance comparison

Network statistic	2032 future baseline	2032 with Project	2032 with Project vs 2032 future baseline	2047 future baseline	2047 with Project	2047 future baseline vs 2032 future baseline	2047 with Project vs 2047 future baseline
Arrived Vehicles	18933	20678	1746	19728	22074	796	2346
Vehicle kilometres travelled per vehicle	3.68	3.59	-0.09	3.71	3.60	0.03	-0.11
Time travelled in network per vehicle (minutes)	1407.8	1299.2	-108.6	1721.9	1590.1	314.1	-131.8
Average network speed (kph)	50.1	57.2	7.1	43.4	50.1	-6.7	6.7
Average network delay per vehicle (s)	101.1	51.4	-49.7	148.4	84.0	47.3	-64.4
Unreleased Trips	679.3	3.1	-676.2	1514.5	41.8	835.2	-1472.8

Table 4: Post-covid sensitivity PM peak – network performance comparison

Network statistic	2032 future baseline	2032 with Project	2032 with Project vs 2032 future baseline	2047 future baseline	2047 with Project	2047 future baseline vs 2032 future baseline	2047 with Project vs 2047 future baseline
Arrived Vehicles	18133	19754	1622	19141	21223	1008	2082
Vehicle kilometres travelled per vehicle	3.65	3.55	-0.10	3.72	3.56	0.07	-0.16
Time travelled in network per vehicle (minutes)	1164.2	1208.0	43.8	1481.7	1333.2	317.5	-148.5
Average network speed (kph)	56.9	58.0	1.1	48.5	56.6	-8.4	8.1
Average network delay per vehicle (s)	64.4	46.3	-18.0	110.1	52.7	45.7	-57.4
Unreleased Trips	635.6	2.2	-633.4	885.2	4.9	249.7	-880.3

4.5. Journey time results

4.5.1 Fourteen journey time routes were assessed, to provide a good level of coverage across the model network. The routes are listed below and are bi-directional.

- M23 North to South Terminal Roundabout (1-3 & 3-1)
- Junction 9 to M23 South (7-2 & 2-7)
- South Terminal Roundabout to Longbridge Roundabout (3-5 & 5-3)
- North Terminal Roundabout to Lowfield Heath Roundabout (4-6 & 6-4)
- North Terminal Roundabout to Junction 9 (4-7 & 7-4)
- Lowfield Heath Roundabout to Longbridge Roundabout (6-5 & 5-6)
- Junction 9 to Longbridge Roundabout (7-5 & 5-7)

4.5.2 The location of these journey time routes is presented in Figure 40. Lowfield Heath Roundabout is located at point 6b within this figure.

Figure 40: Modelled journey time routes
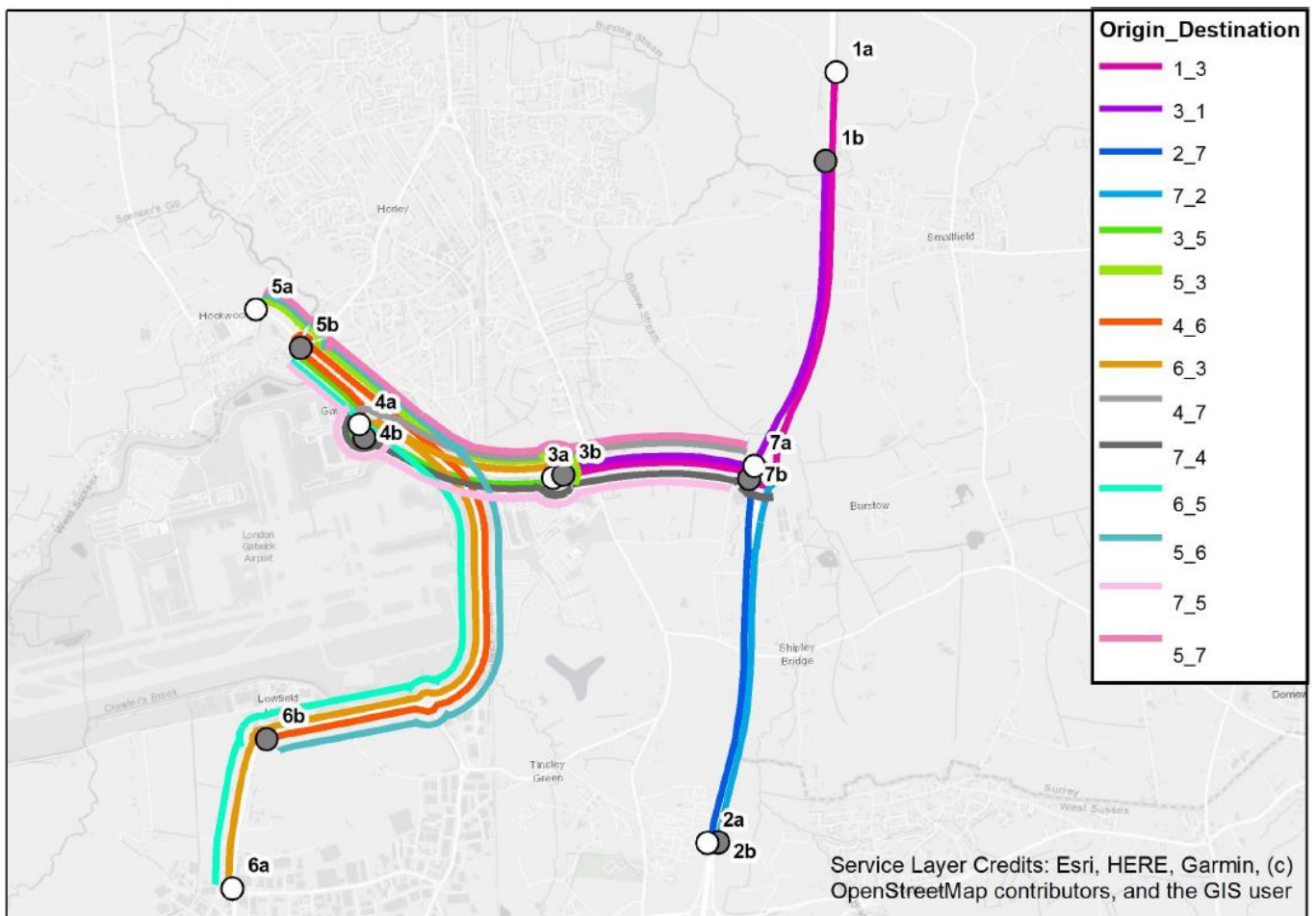
4.5.3   The average journey times for the 2032 future baseline, 2032 with Project, 2047 future baseline and 2047 with Project core and post-Covid sensitivity scenarios have been compared across each of the above journey time routes for AM and PM peak hours.

4.5.4   A full set of journey time results graphs and comparisons are provided in Appendix 4. A selection of the journey time routes modelled is presented below to understand and highlight patterns, differences and similarities between model scenario results.

4.5.5   Confidence intervals are included on each bar of each graph. For each graph the confidence intervals are small, suggesting there is little difference in each individual model runs results across the 20 random seed runs completed for each scenario.

4.5.6   Core scenarios are shown in lighter shade bars on the graphs. The post-Covid sensitivity scenarios are shown in the darker shade bars.

4.5.7   The journey time results generally follow a similar pattern to the other results presented within this note. As expected, journey times show some variation in performance the scenarios. Journey times are generally longer in the 2047 future baseline scenario compared to the other scenarios, reflecting the future situation with growth in background traffic demand, and growth at the Airport without the Project. The post-Covid sensitivity scenarios generally show shorter journey times compared to the equivalent core scenarios.

M23 North to South Terminal Roundabout

4.5.8   Figure 41 and Figure 42 show journey times between the M23 north of Junction 9 and South Terminal Roundabout in the AM and PM peaks respectively.

Figure 41: Journey times from M23 North to South Terminal Roundabout – AM peak
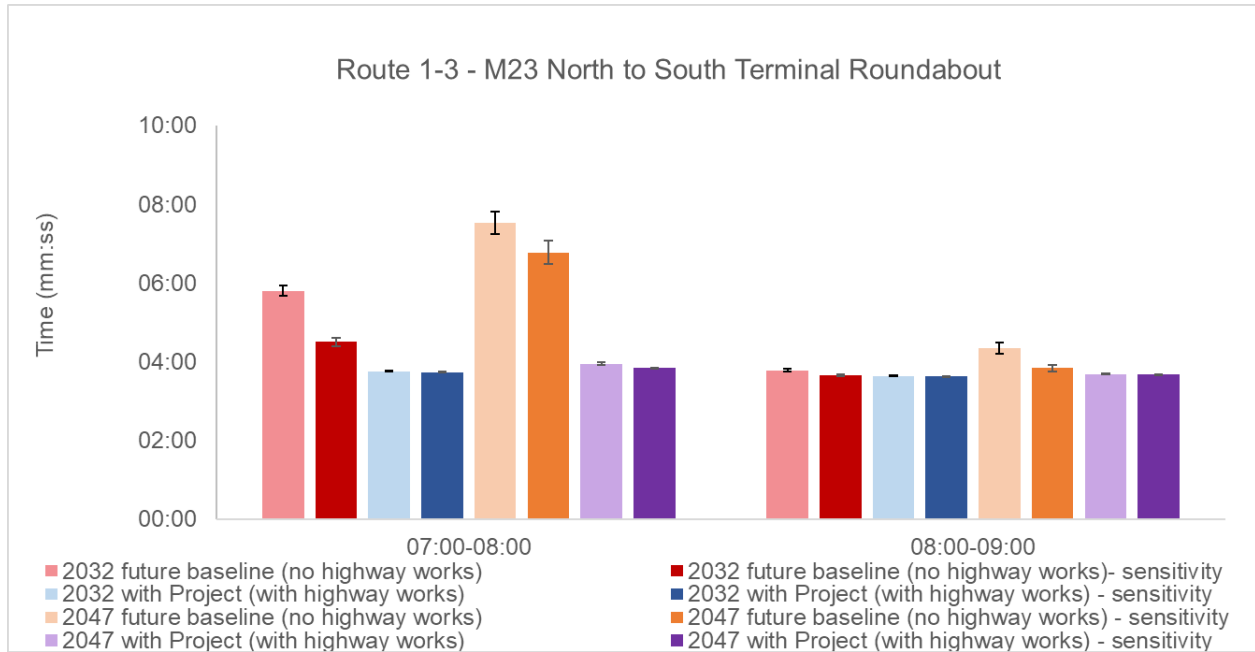
4.5.9 In the AM peak period, longer journey times are shown in the 2047 future baseline core scenario compared to the 2032 future baseline. The introduction of the Project and associated highway works in the 2032 and 2047 with Project scenarios leads to a reduction in journey time.

4.5.10 The post-Covid sensitivity scenarios show a decrease in journey times along this route compared to those in the core scenarios, particularly in the 2032 future baseline and 2047 future baseline cases, as background traffic along the M23 Spur westbound is lower in the post-Covid sensitivity scenarios. In particular, compared to the core scenarios there is a significant reduction in queueing on the M23 Spur approach in the post-Covid 2032 with Project and 2047 with Project scenarios, as shown in the average speed plots, and these scenarios have the largest reduction in journey times.

Figure 42: Journey times from M23 North to South Terminal Roundabout – PM peak
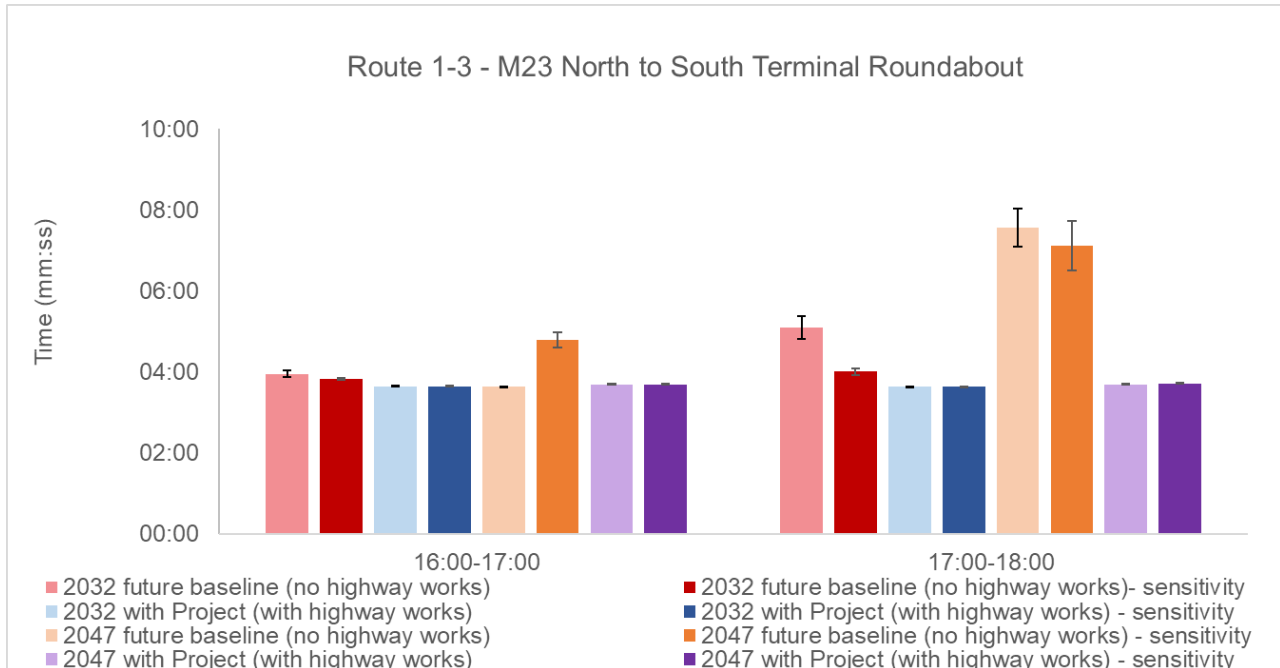
4.5.11   In the PM peak period, the introduction of the Project leads to reductions in journey time compared to the core scenarios, with significant reductions being seen between 17:00 and 18:00 in 2047.

4.5.12   There is less variation in PM journey times between the post-Covid sensitivity and core runs than seen in the AM peak period. In the 2047 future baseline post-Covid sensitivity scenario, journey times between 16:00 and 17:00 are shown to be longer than in the equivalent core scenario. This is likely to be the result of local traffic signal optimisation in the model at South Terminal Roundabout which balances queues at approaches. Signal timings in the post-Covid sensitivity test therefore differ from those in the equivalent core test, because there are lower traffic volumes on westbound approach but increased traffic volumes on the eastbound approach. The average speed plots also show longer queues on the M23 Spur approach in the 2047 future baseline post-Covid sensitivity scenario compared to the core scenario.

Lowfield Heath Roundabout to Longbridge Roundabout

4.5.13   Figure 43 and Figure 44 show the journey times between Lowfield Heath Roundabout and Longbridge Roundabout for the AM and PM peak periods respectively.

Figure 43: Journey times from Lowfield Heath Roundabout to Longbridge Roundabout – AM peak
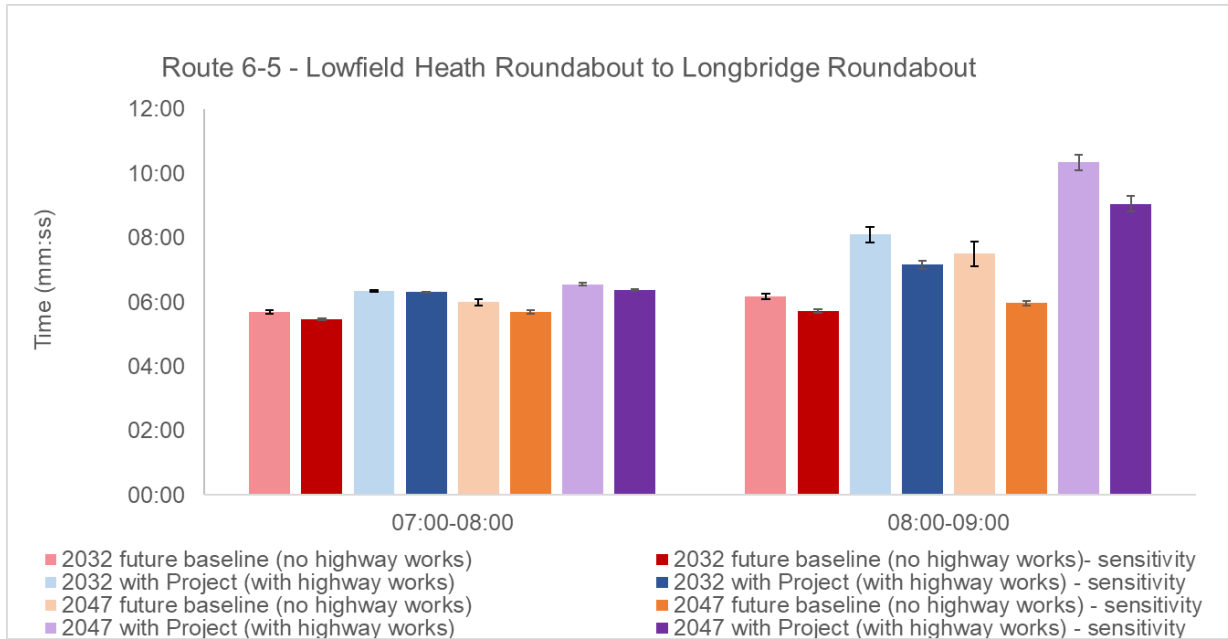
4.5.14   Between 07:00 and 08:00, journey times are similar across the eight scenarios.

4.5.15   Between 08:00 and 09:00, there are slightly longer journey times in the 2032 and 2047 with Project core scenarios compared to the equivalent future baseline scenarios. This is the result of the introduction of the new signalised junction on the A23 London Road, which introduces additional delay for some traffic travelling northbound and southbound, as well as reduced speed limits on the A23 London Road as part of the Project highway works.

4.5.16   The post-Covid sensitivity scenarios show slightly shorter journey times than the core scenarios, due to lower levels of background traffic within the model.

Figure 44: Journey times from Lowfield Heath Roundabout to Longbridge Roundabout – PM peak
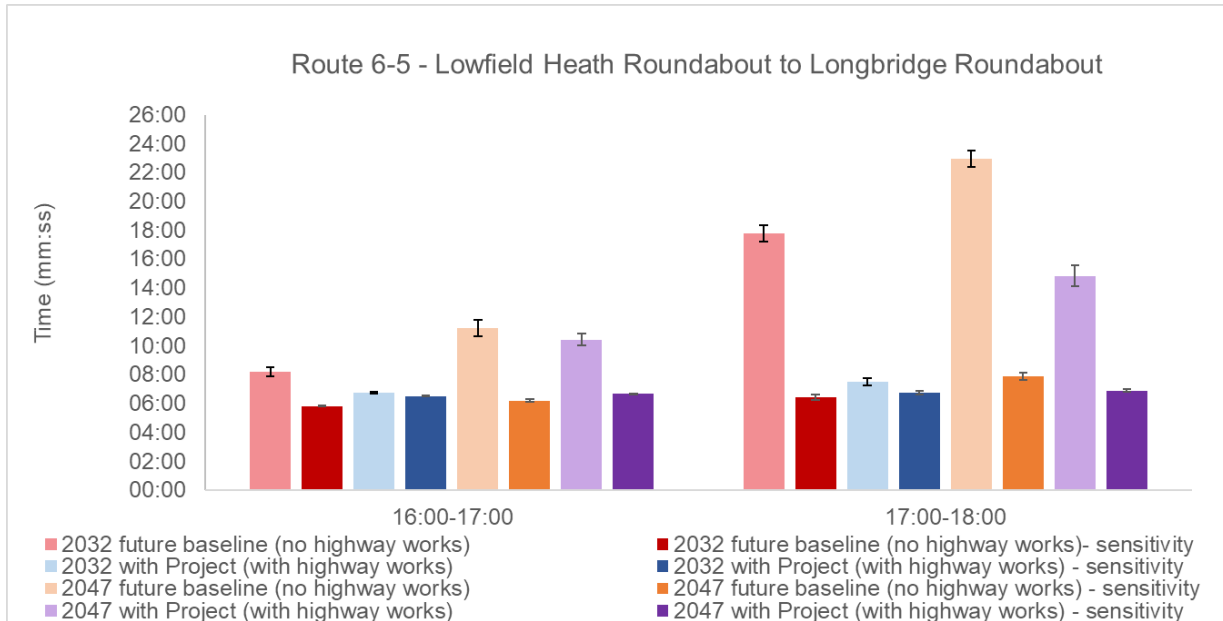
4.5.17   In the PM peak period, the average speed plots showed that there would be pronounced queueing in the 2032 future baseline and 2047 future baseline core scenarios at the A23 London Road northbound merge north of Gatwick Road Roundabout. This leads to longer journey times along this route. This is reflected in the journey times, particularly between 17:00 and 18:00. Journey times would reduce significantly as a result of the Project.

4.5.18   In the post-Covid sensitivity scenarios, the extent of queuing is shorter, leading to lower journey times than shown for the core scenarios. This leads to similar journey times across the four post-Covid sensitivity scenarios.

Longbridge Roundabout to Junction 9

4.5.19   Figure 45 and Figure 46 show the journey times between Longbridge Roundabout to Junction 9 in the AM and PM peaks respectively.

Figure 45: Journey times from Longbridge Roundabout to Junction 9 – AM peak
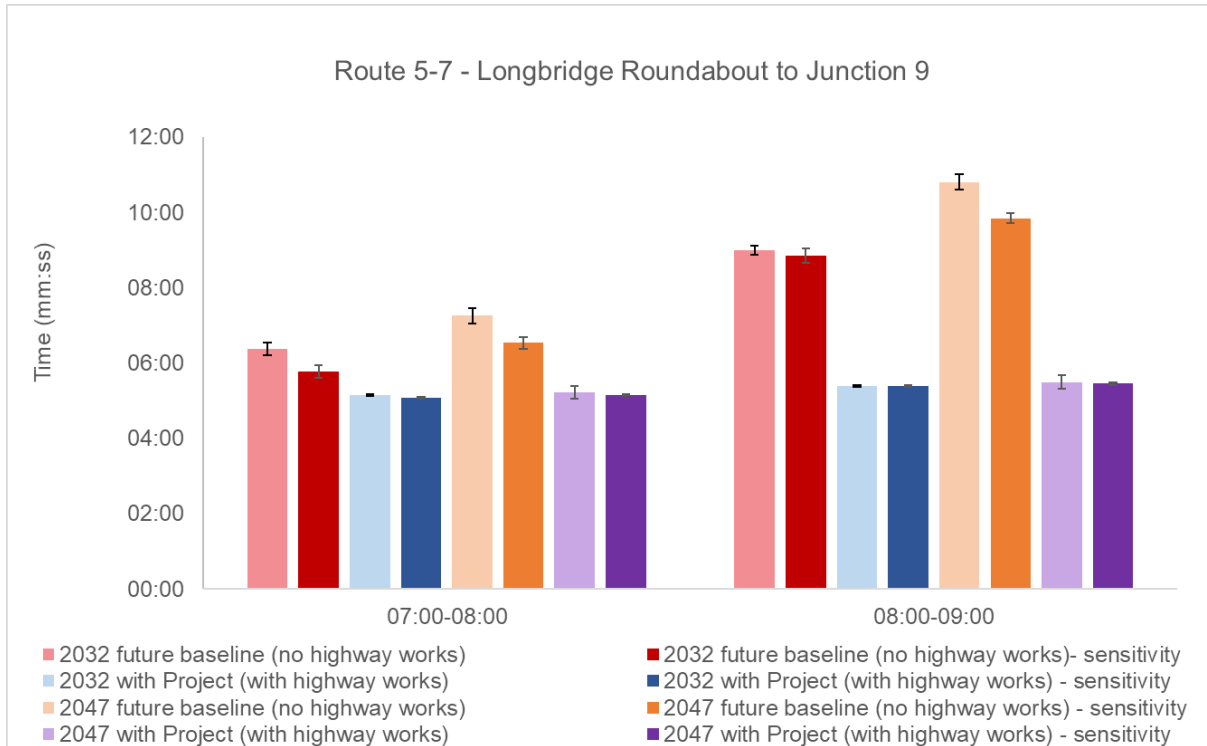
4.5.20   In the AM peak period, there are longer journey times in the 2032 future baseline and 2047 future baseline scenarios compared to the 2032 and 2047 with Project core scenarios. The introduction of the Project highway works reduces journey times along this route in both 2032 and 2047.

4.5.21   With the post-Covid sensitivity scenarios, there are decreases in journey times in the 2032 future baseline and 2047 future baseline compared to those in the core scenarios, whilst in the 2032 with Project and 2047 with Project, journey times remain consistent between the core and the post-Covid sensitivity scenarios.

Figure 46: Journey times from Longbridge Roundabout to Junction 9 – PM peak
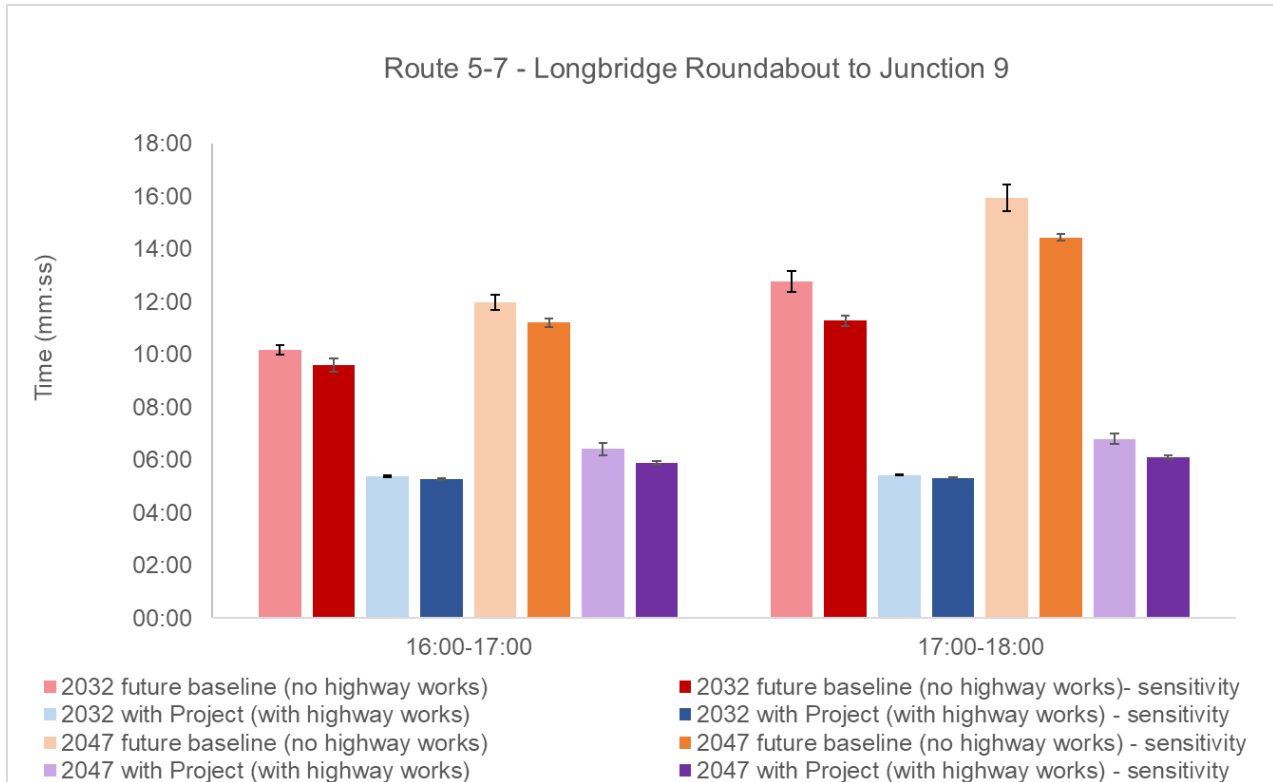
4.5.22   In the PM peak period, there are longer journey times in 2032 future baseline and 2047 future baseline core scenarios compared to the 2032 and 2047 with Project core scenarios. Journey times on this route are reduced in the with Project scenarios.

4.5.23   In the post-Covid scenarios, there is slight decreases in journey times along the route across the future baseline scenarios and 2047 with Project compared to the core scenarios. in the 2032 with Project, journey times are very similar in the core and post-Covid sensitivity scenarios.

4.5.24   Figure 41 to Figure 46 demonstrate that journey times in the post-Covid sensitivities are generally shorter than those in the core scenarios, due to lower levels of background traffic on the network. The statistics also indicate that overall, journey times are expected to decrease with the Project, as a result of the inclusion of the Project highway works to address additional demand generated by the Project.

5　Summary and conclusions

5.1.1　A comparison of model performance in the AM and PM peaks has been conducted across the following four future year scenarios using the VISSIM model:

- 2032 future baseline core;
- 2032 with Project core;
- 2047 future baseline core;
- 2047 with Project core;
- 2032 future baseline post-Covid sensitivity;
- 2032 with Project post-Covid sensitivity;
- 2047 future baseline post-Covid sensitivity; and
- 2047 with Project post-Covid sensitivity.

5.1.2　Four post-Covid sensitivity test scenarios have been prepared, drawing on the post-Covid sensitivity testing undertaken in the strategic transport model (reported in **Accounting for Covid-19 in Transport Modelling** [AS-121]).

5.1.3　This technical note analyses the overall performance, network performance and journey time results across the core and post-Covid sensitivity scenarios.

5.1.4　The strategic modelling indicates a reduction in background highway demand in the post-Covid sensitivity scenarios compared to the core scenarios. The post-Covid future baseline sensitivity scenarios therefore generally contain less road traffic congestion.

5.1.5　The post-Covid sensitivity VISSIM model results comparisons show an improvement in network performance compared to the core VISSIM scenarios, which is in line with the strategic model observations. The pattern of network performance between the post-Covid sensitivity scenarios remains similar to that seen in the core scenarios, in that conditions worsen over time in the future baseline scenarios, and the with Project scenarios show considerably better operation overall than in the future baseline.

5.1.6　In both the AM and PM peaks there would be a reduction in average network delay, along with an increase in average network speed in the 2032 and 2047 with Project scenarios compared to the 2032 and 2047 future baseline respectively in the core and post-Covid sensitivity scenarios.

5.1.7　Consequently, the Project highway works would not only accommodate the additional demand generated by the Project but would do so in a way that reduces congestion and queue lengths compared to those that would exist in the equivalent year without the Project.

5.1.8   Network performance statistics indicate that the implementation of the highway works which form part of the Project in 2032 and 2047 would prevent network performance deteriorating further in those years. Compared to conditions that would otherwise arise in the future without the Project, the Project highway works would reduce average network delays and increase average speeds in this part of the network.

5.1.9   The analysis clearly shows the network operation and performance benefits produced by the introduction of the highway works which are part of the Project, which not only address the additional traffic demand associated with the Project but would also improve conditions for non-airport road users.

Appendix 1 – Vehicle Hours Travelled graphs

Figure 47: AM Peak 2032 future baseline Vehicle Hours Travelled
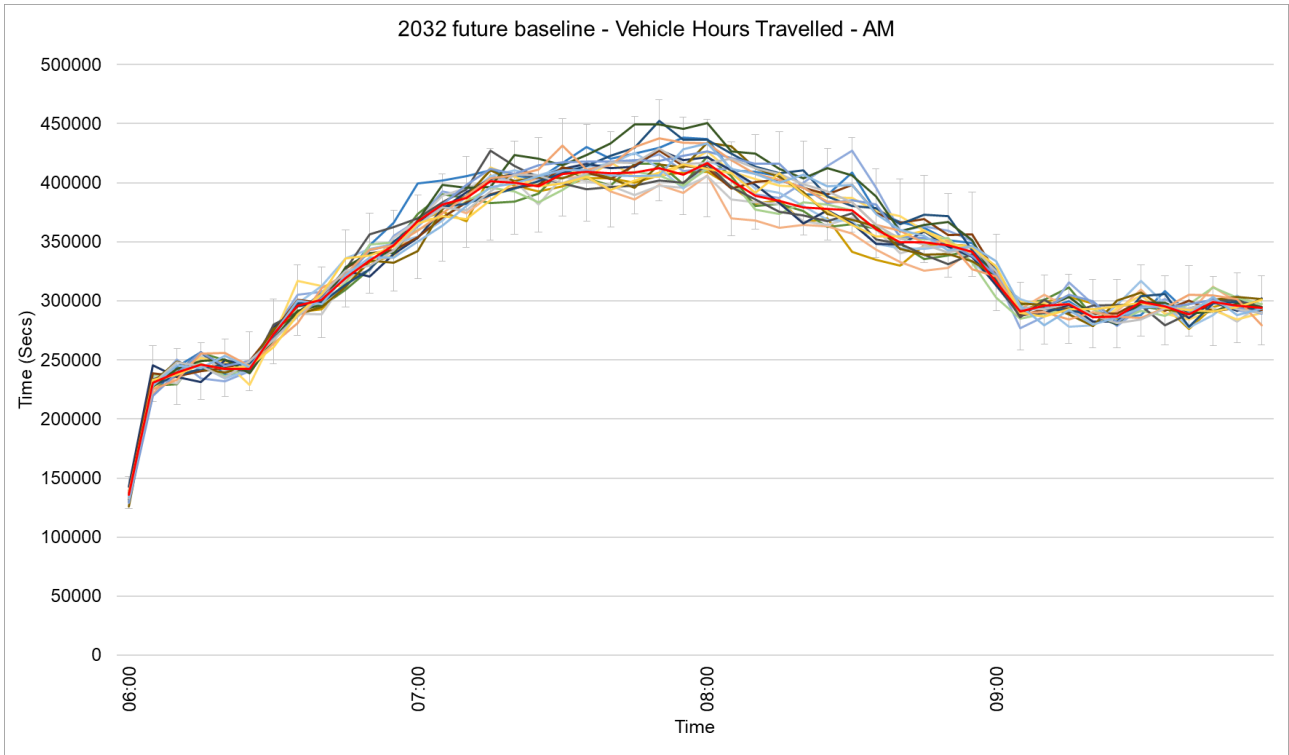
Figure 48: Post-Covid Sensitivity AM Peak 2032 future baseline Vehicle Hours Travelled
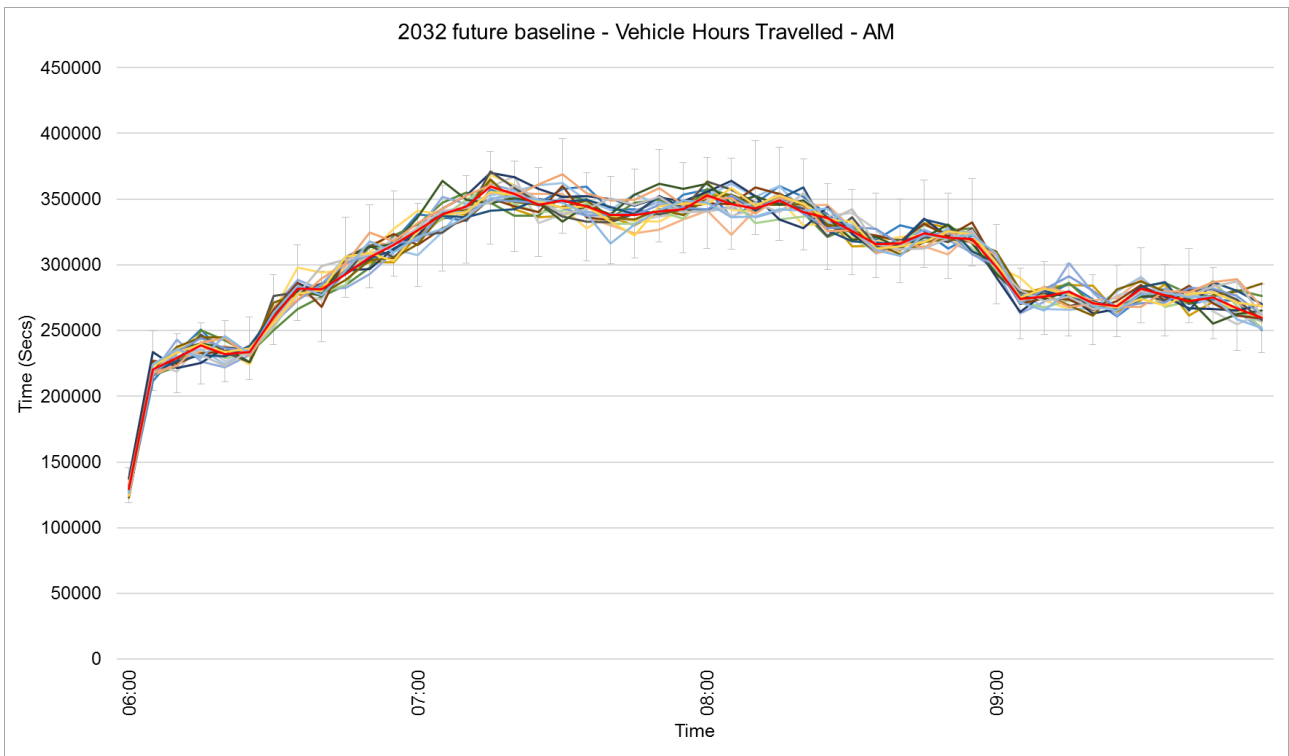
Figure 49: AM Peak 2047 future baseline Vehicle Hours Travelled
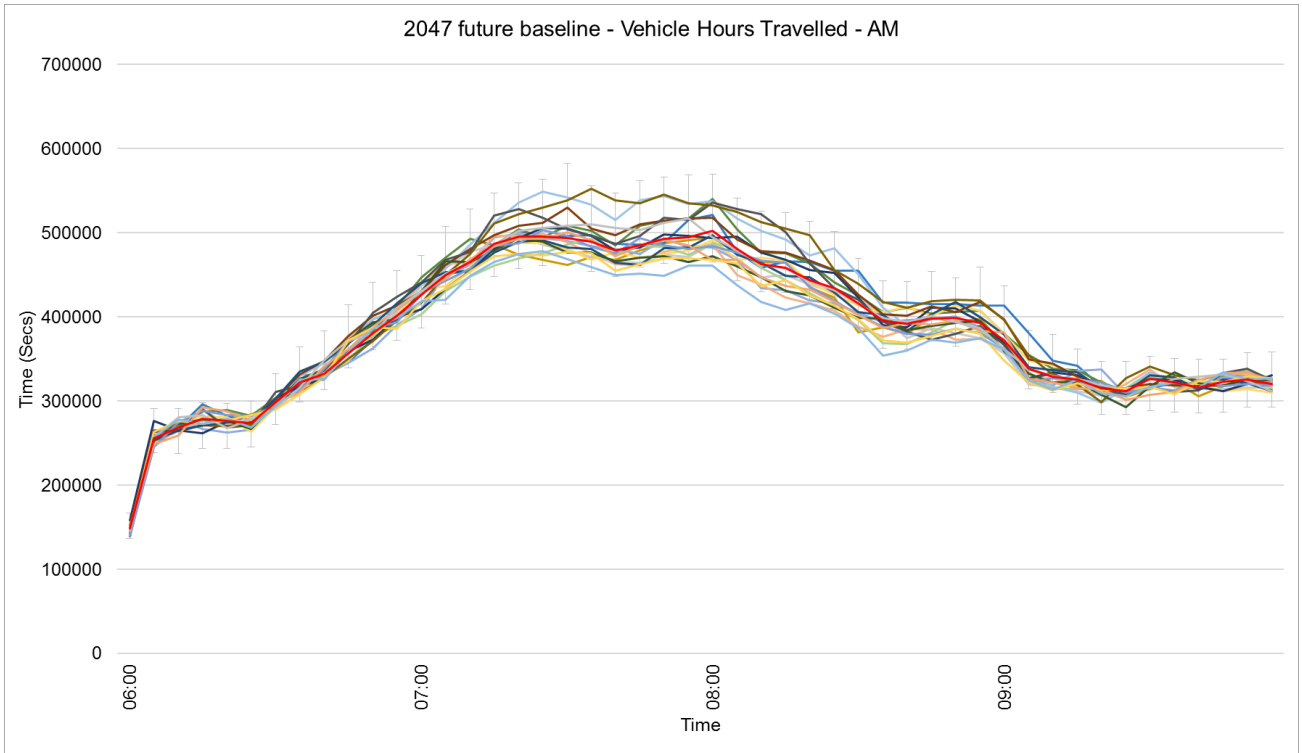
Figure 50: Post-covid sensitivity AM Peak 2047 future baseline Vehicle Hours Travelled
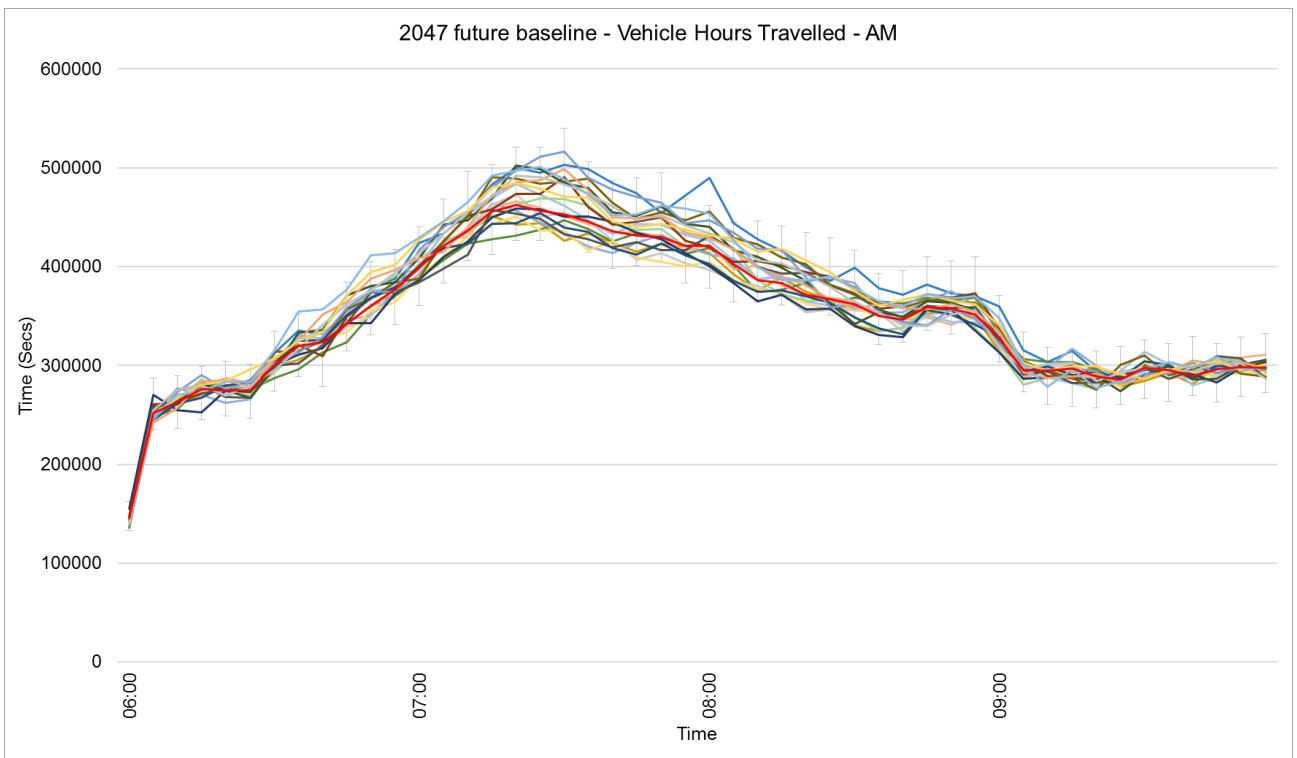
Figure 51: AM Peak 2032 with Project Vehicle Hours Travelled
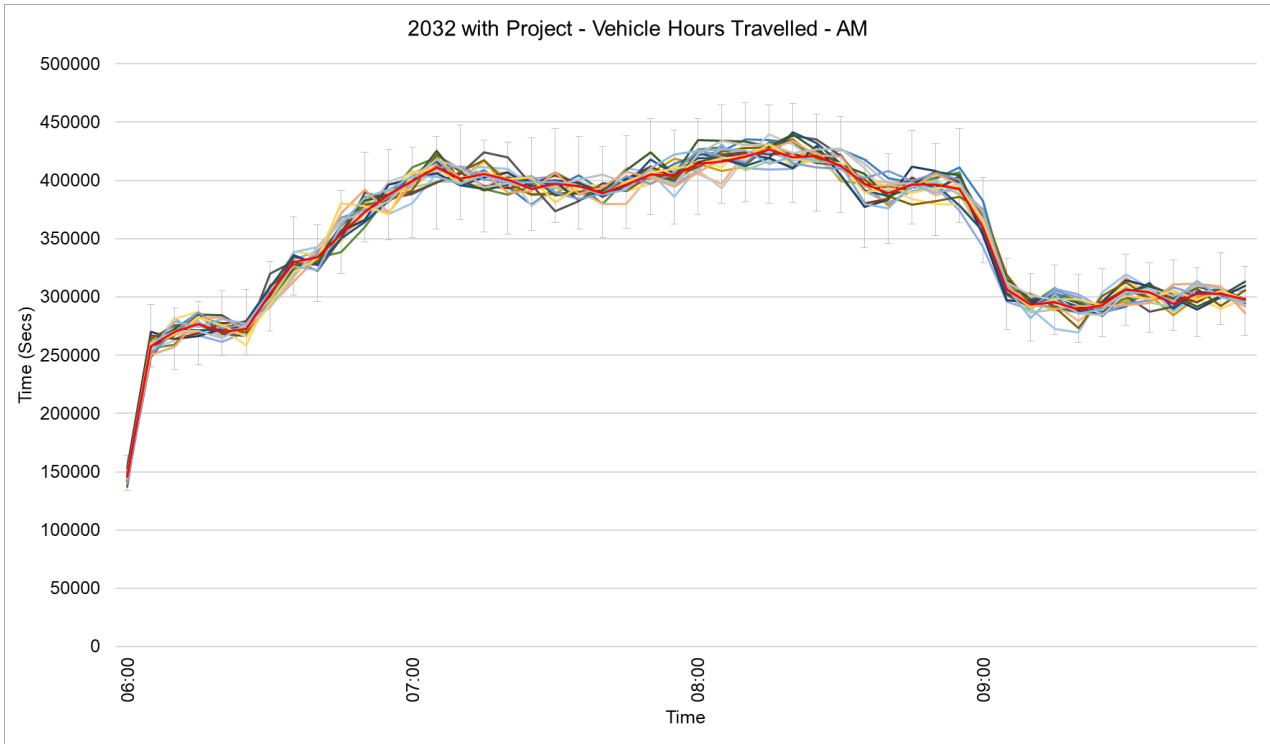
Figure 52: Post-Covid sensitivity AM Peak 2032 with Project Vehicle Hours Travelled
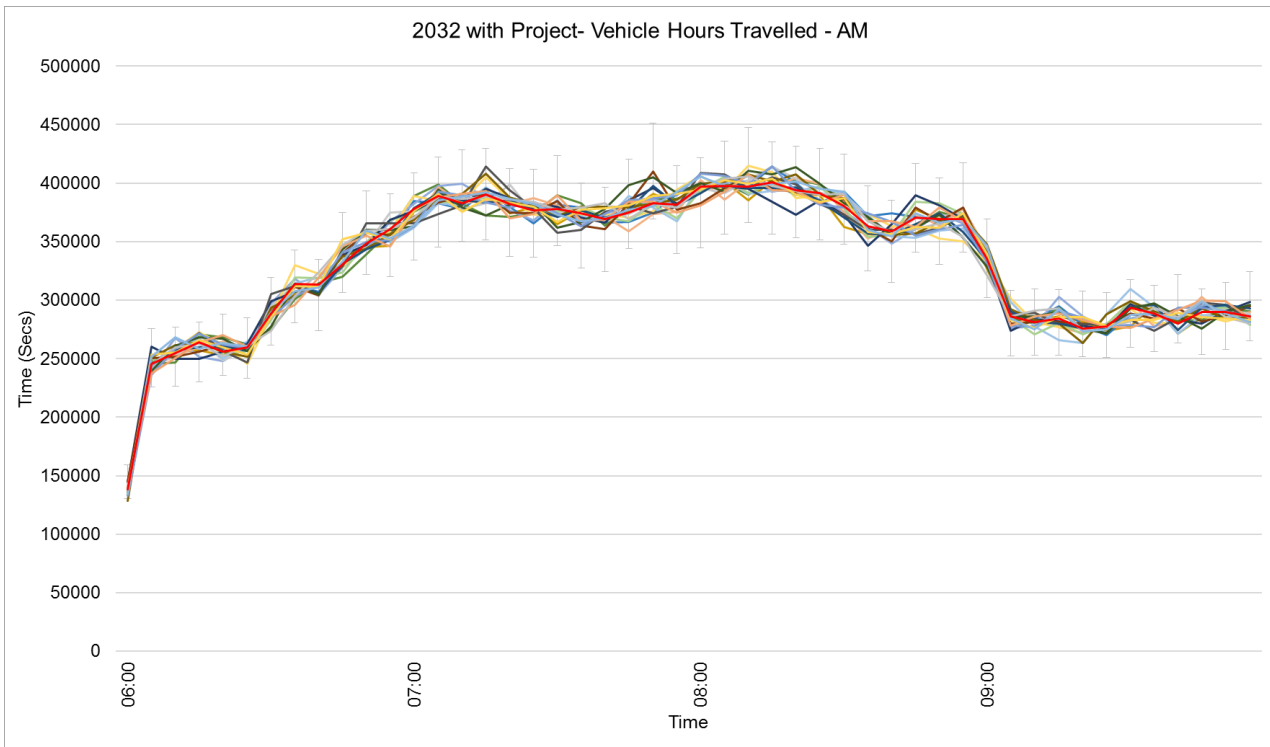
Figure 53: AM Peak 2047 with Project Vehicle Hours Travelled
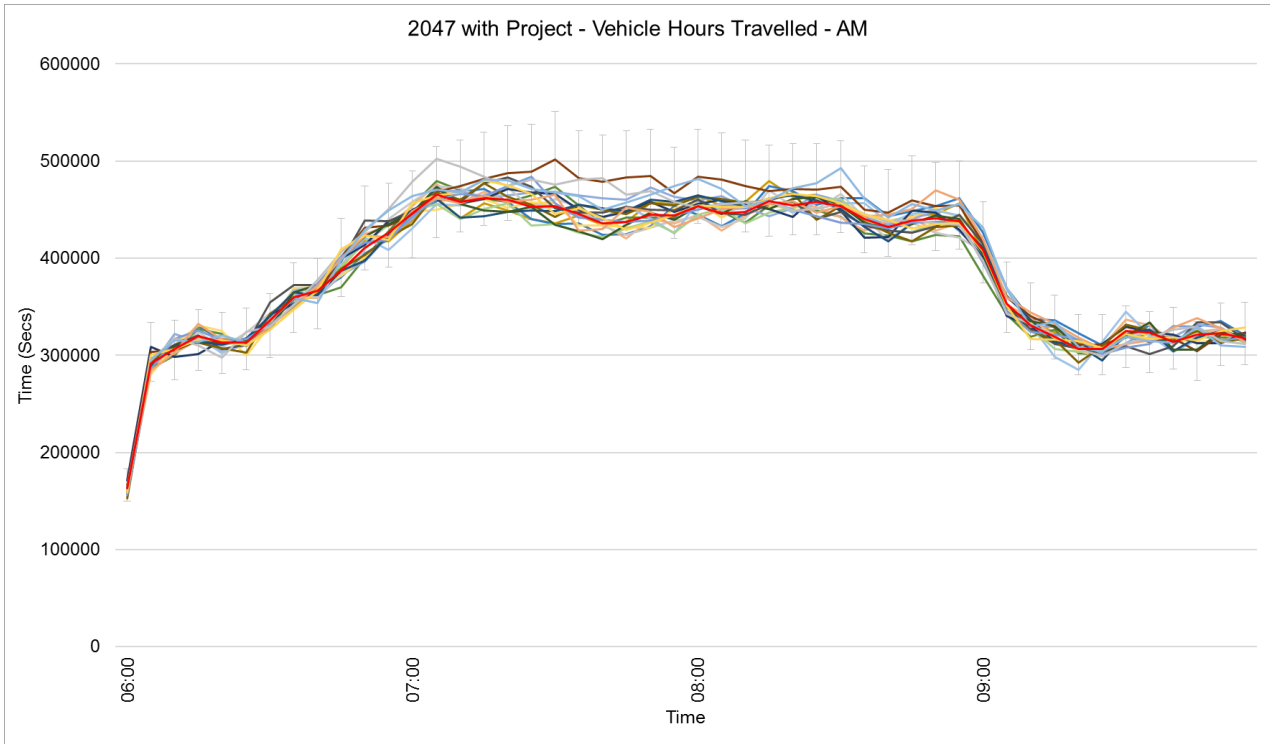
Figure 54: Post-Covid sensitivity AM Peak 2047 with Project Vehicle Hours Travelled
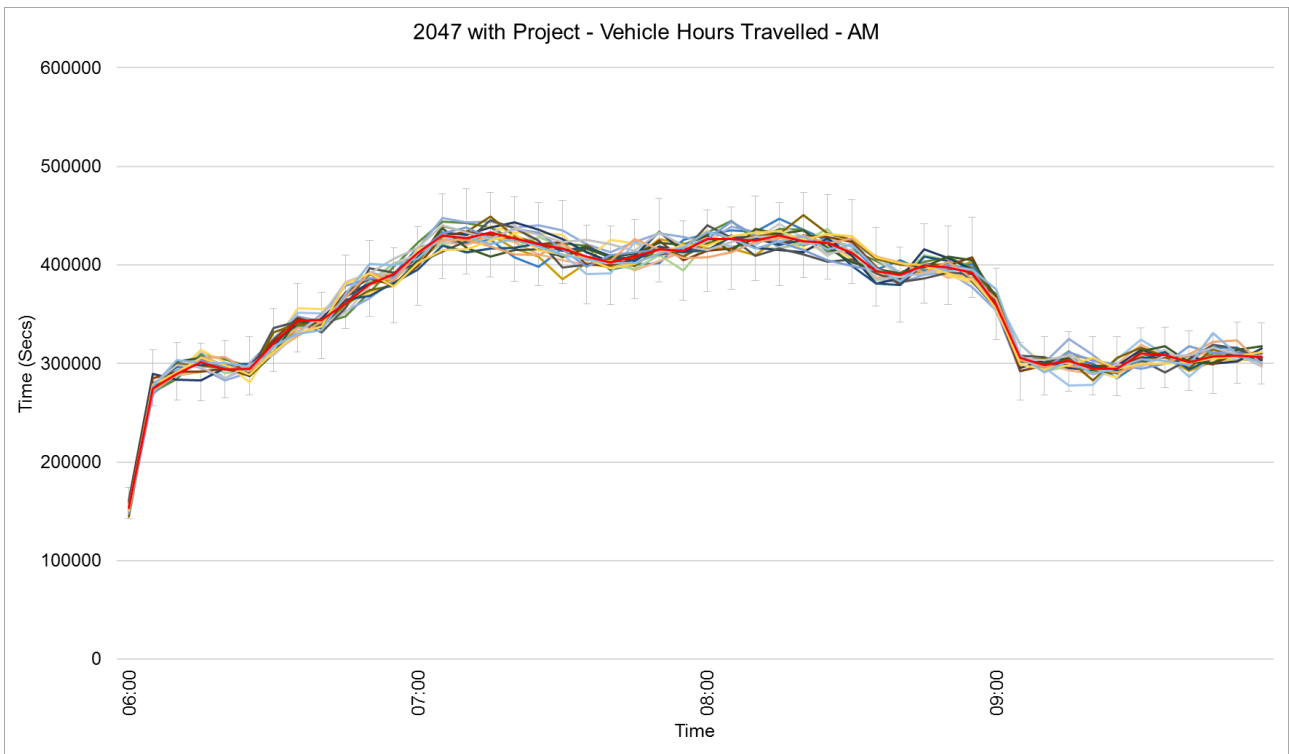
Figure 55: PM Peak 2032 future baseline Vehicle Hours Travelled
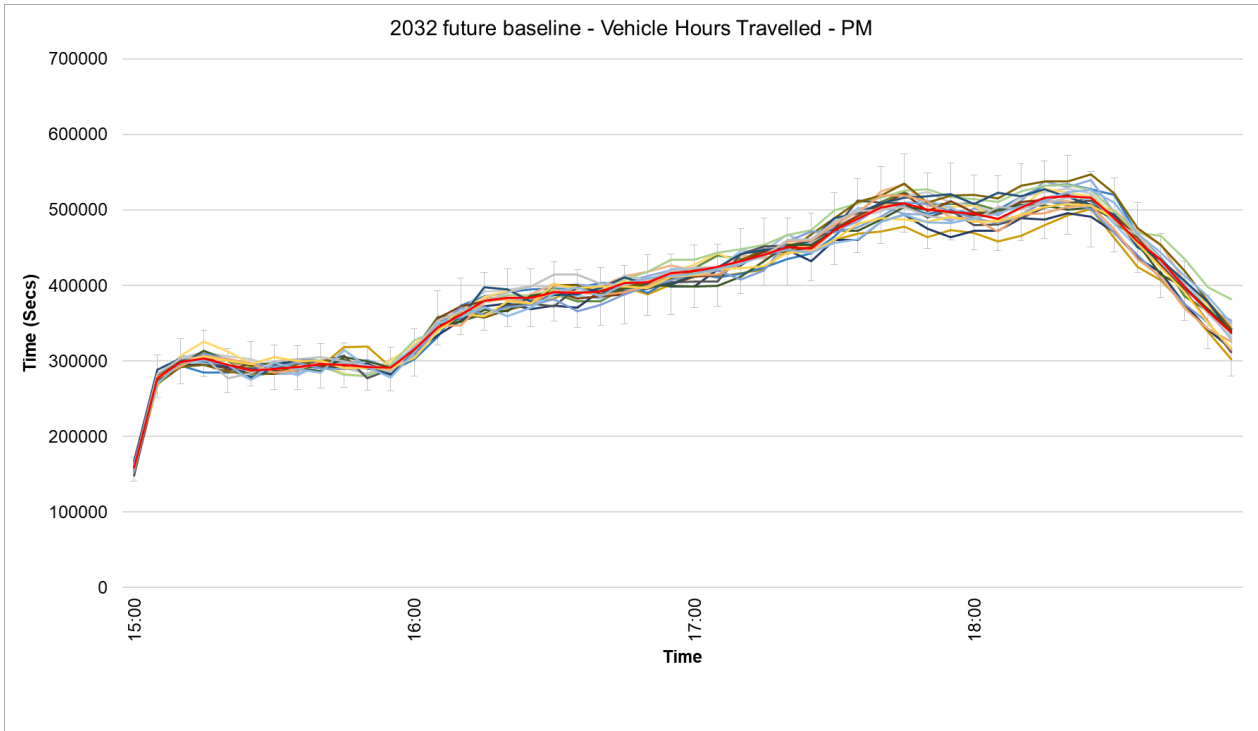
Figure 56: Post-covid sensitivity PM Peak 2032 future baseline Vehicle Hours Travelled
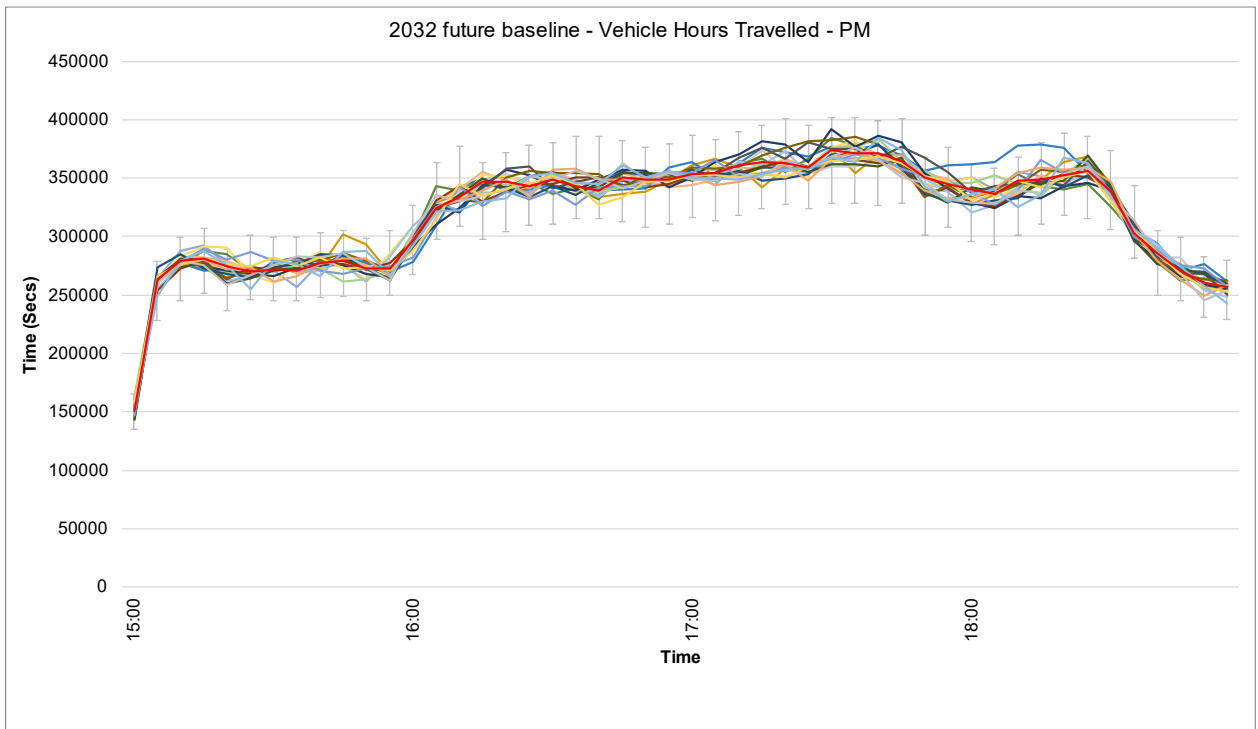
Figure 57: PM Peak 2047 future baseline Vehicle Hours Travelled
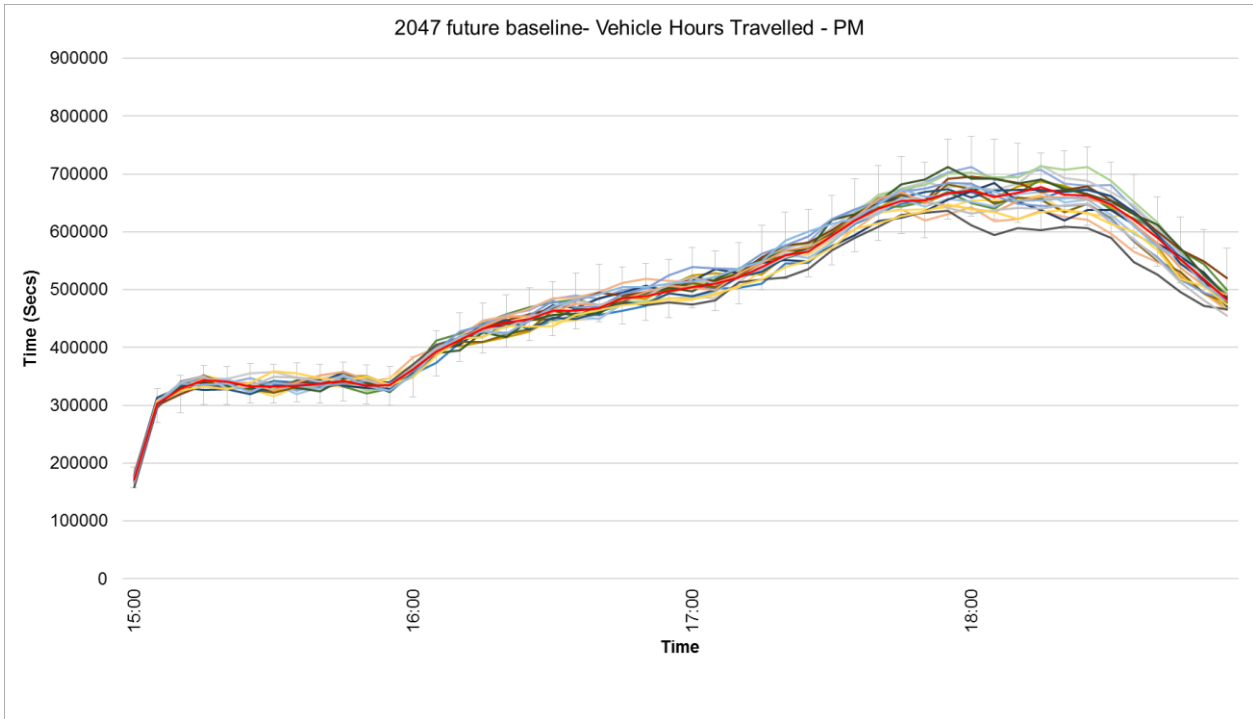
Figure 58: Post-covid sensitivity PM Peak 2047 future baseline Vehicle Hours Travelled
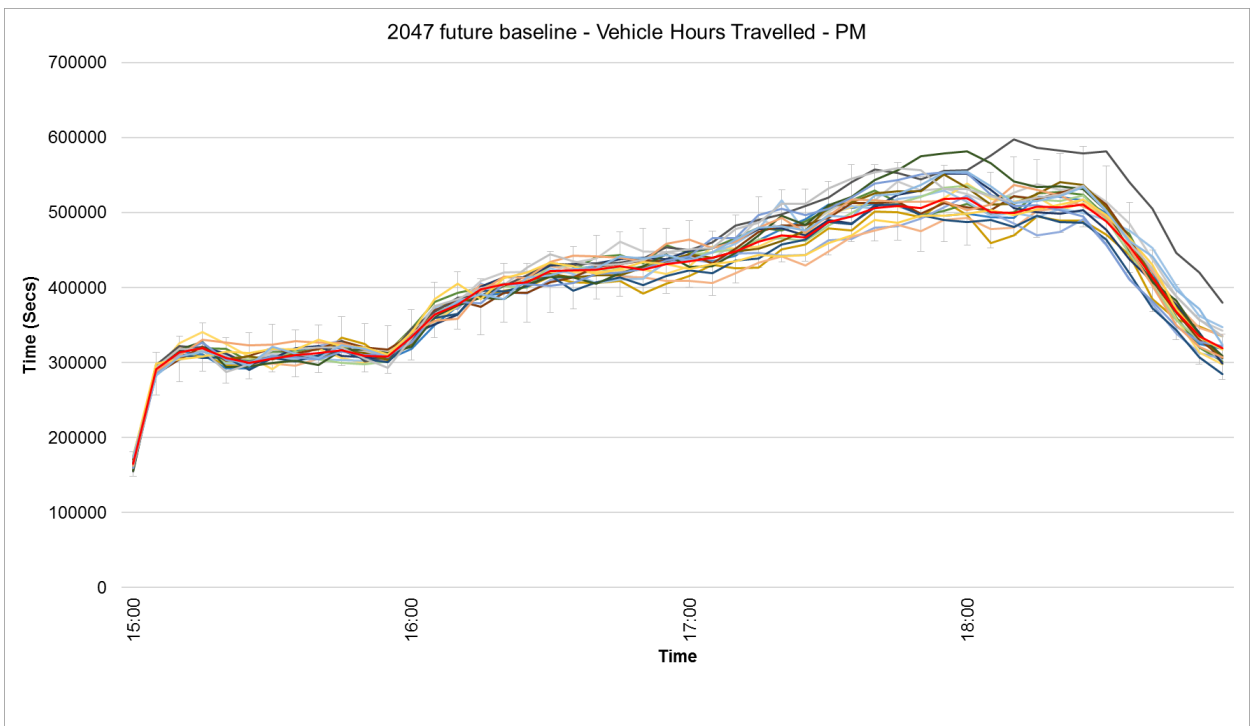
Figure 59: PM Peak 2032 with Project Vehicle Hours Travelled
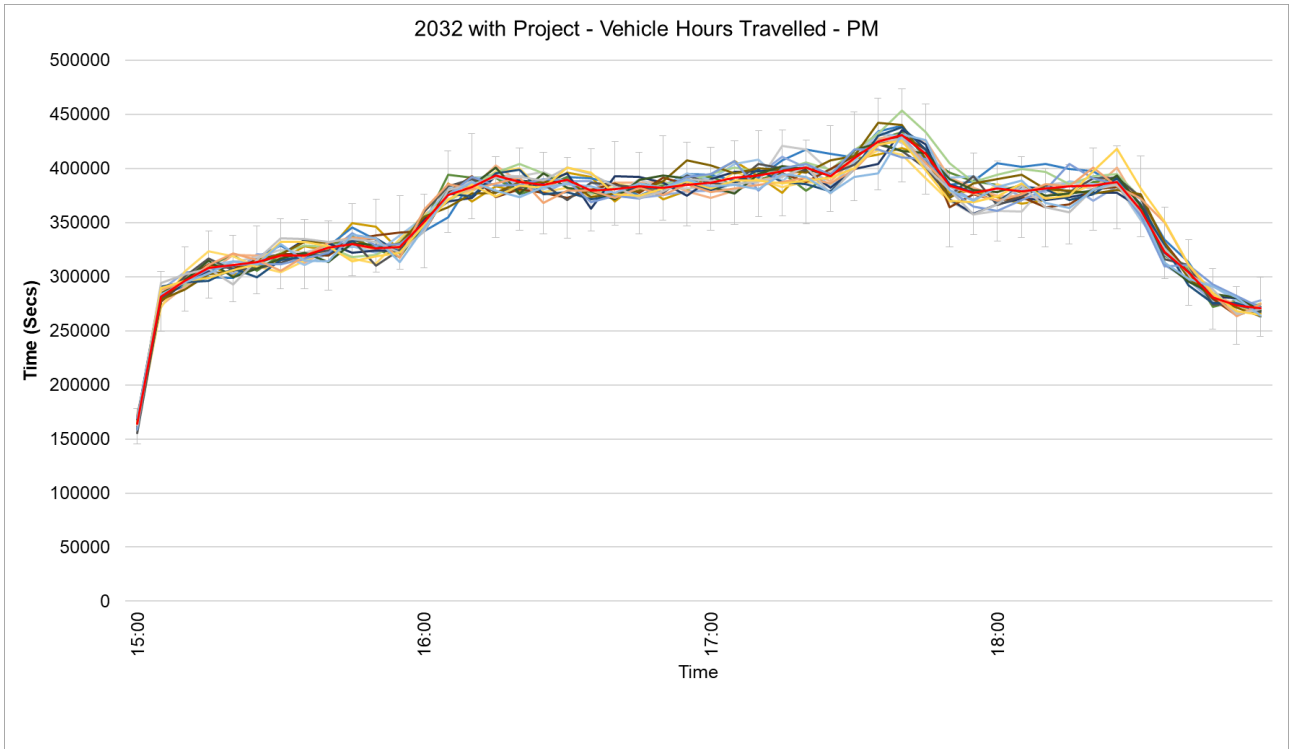
Figure 60: Post-Covid sensitivity PM Peak 2032 with Project Vehicle Hours Travelled
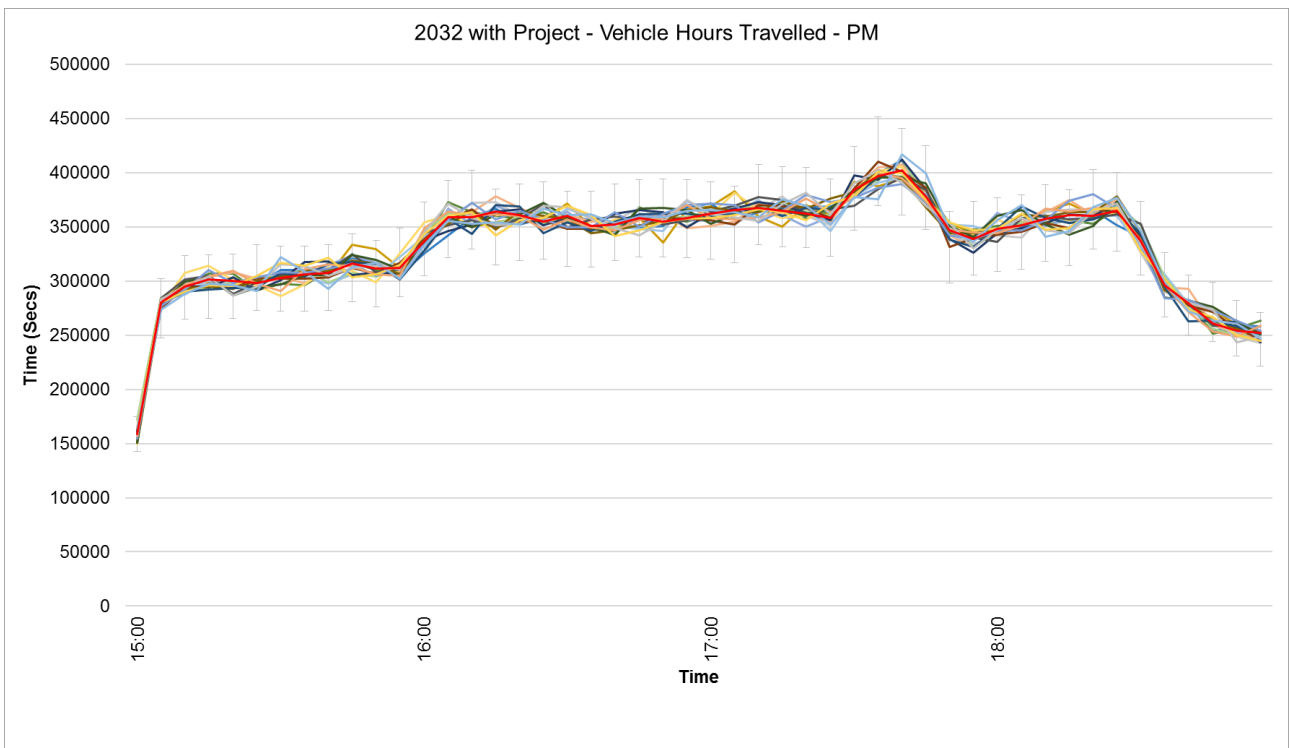
Figure 61: PM Peak 2047 with Project Vehicle Hours Travelled

2047 with Project - Vehicle Hours Travelled - PM
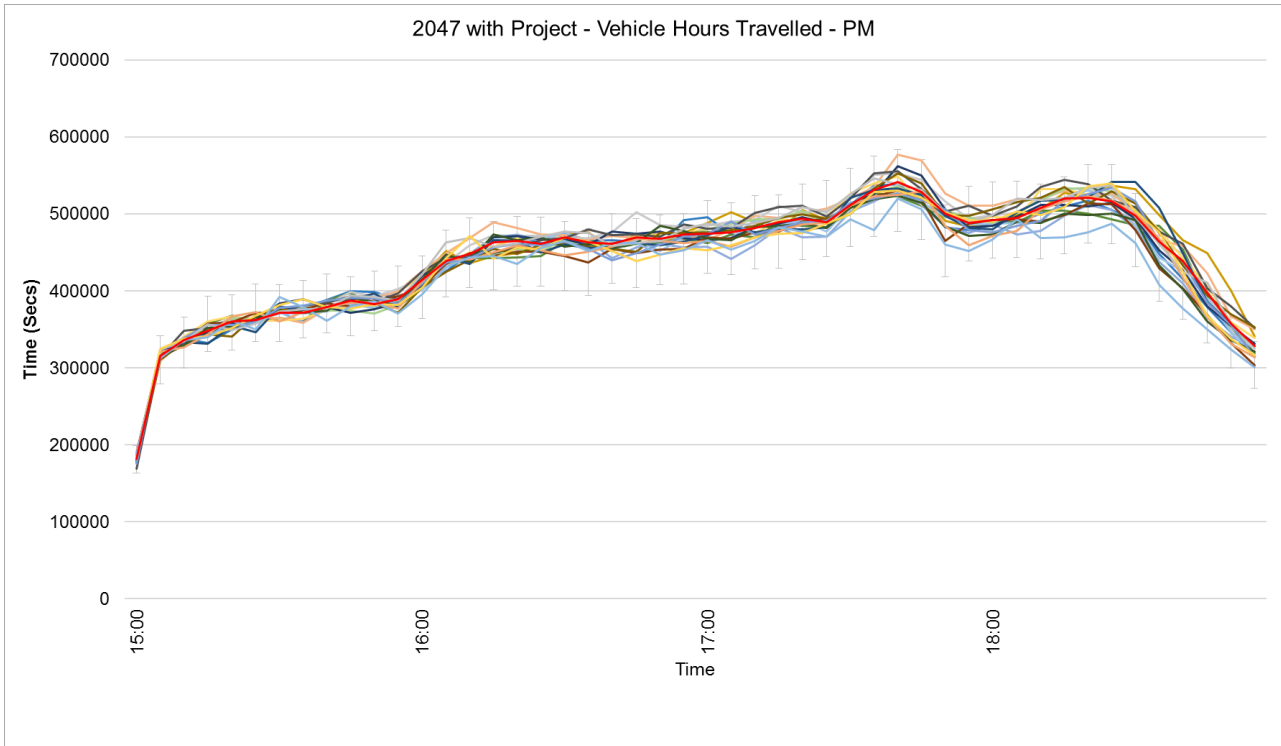
Figure 62: Post-Covid sensitivity PM Peak 2047 with Project Vehicle Hours Travelled

2047 with Project- Vehicle Hours Travelled - PM
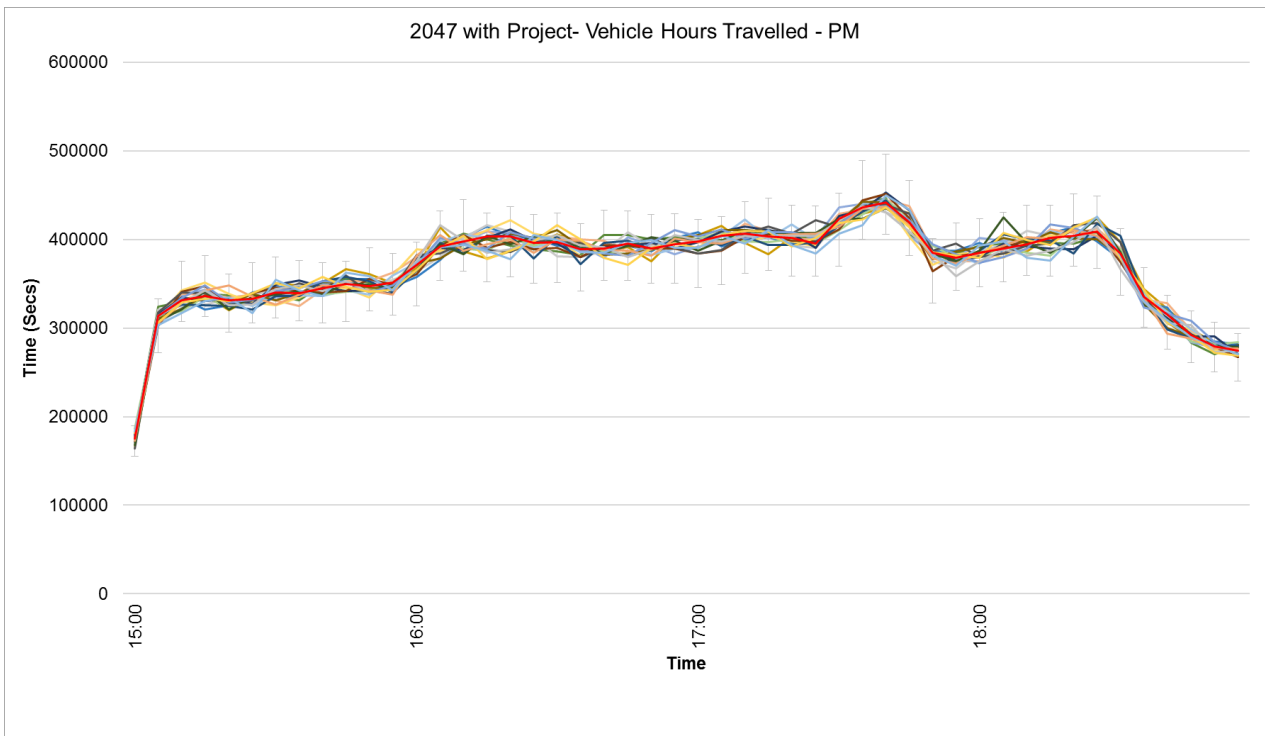
Appendix 2 – Full Flow Comparisons

Figure 63: Flow Comparisons – AM peak 07:00-08:00 – North Terminal Roundabout
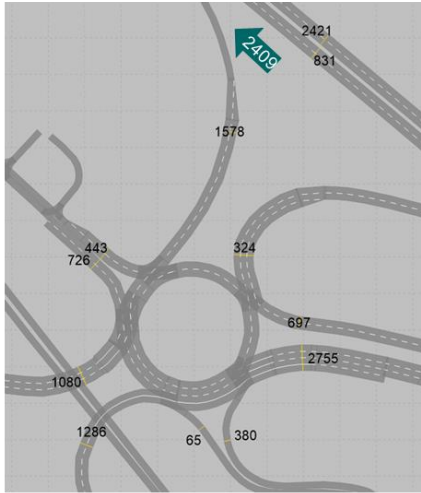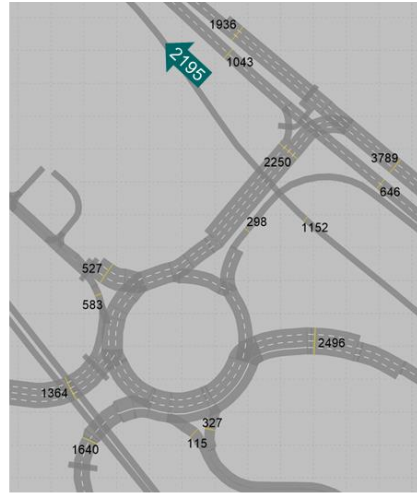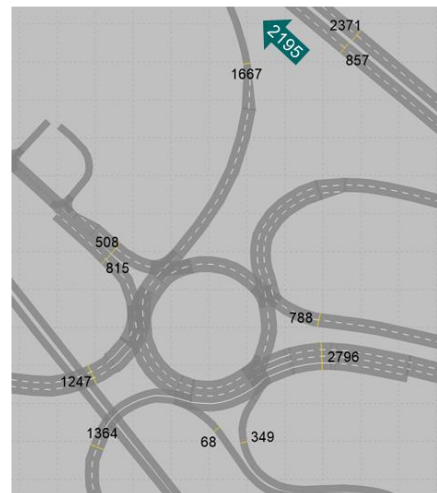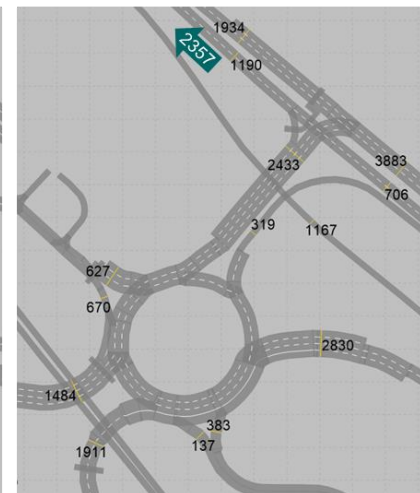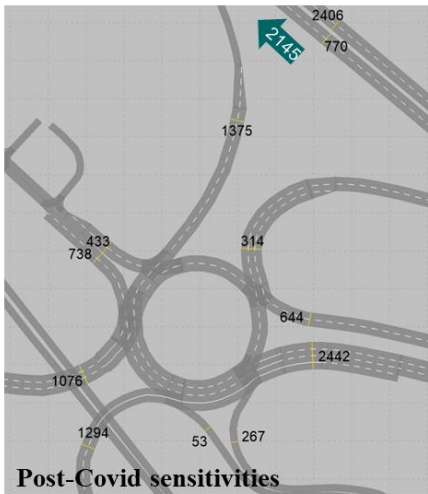
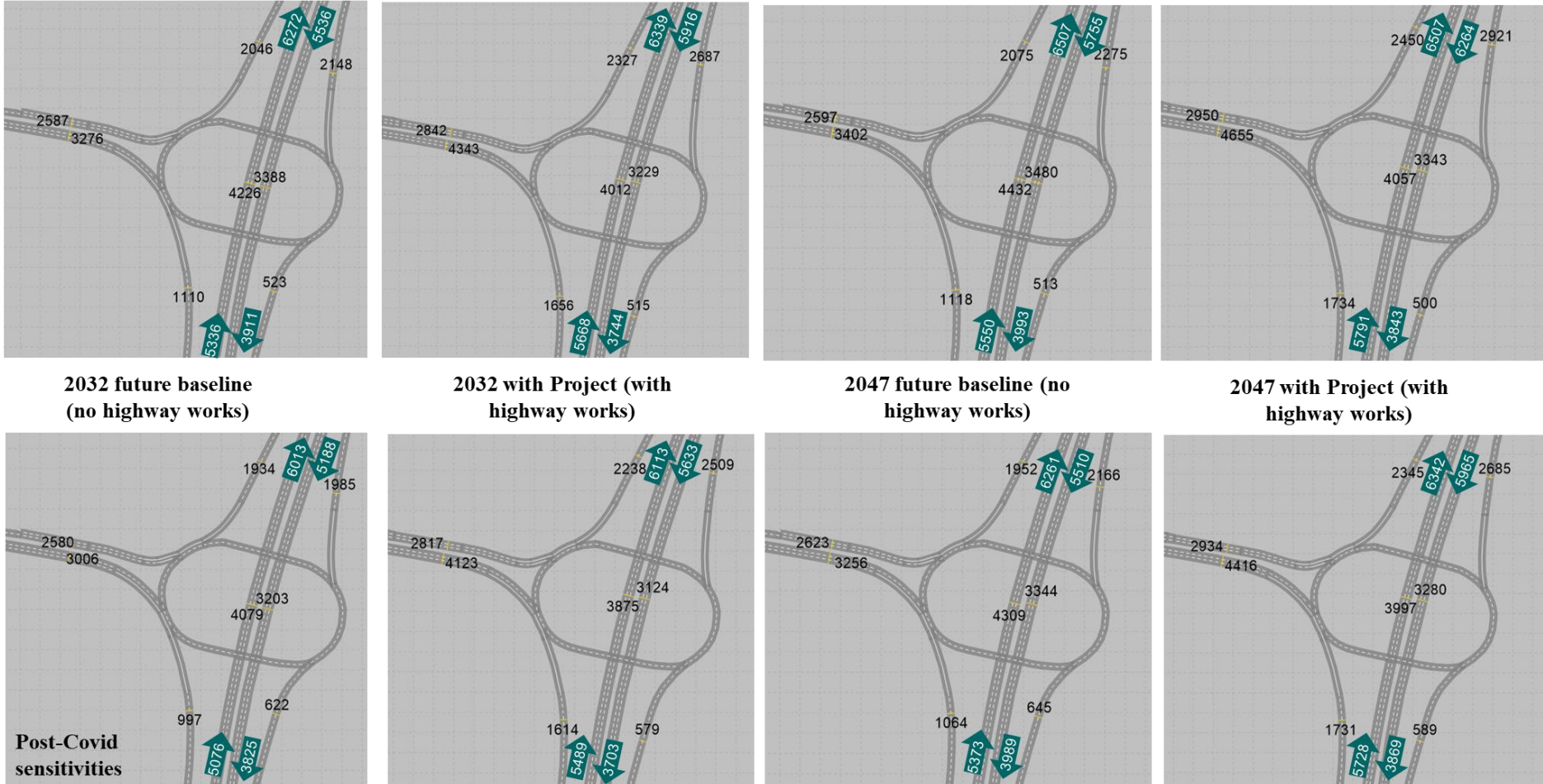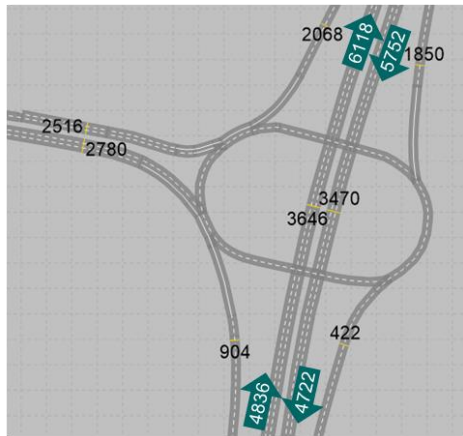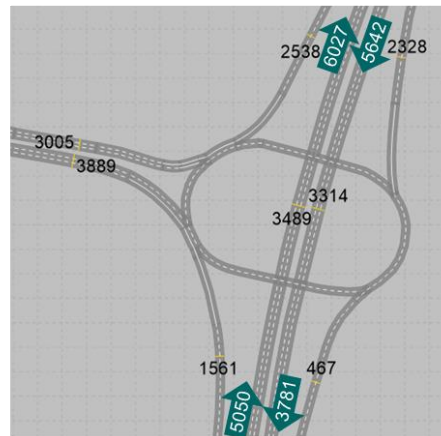| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |
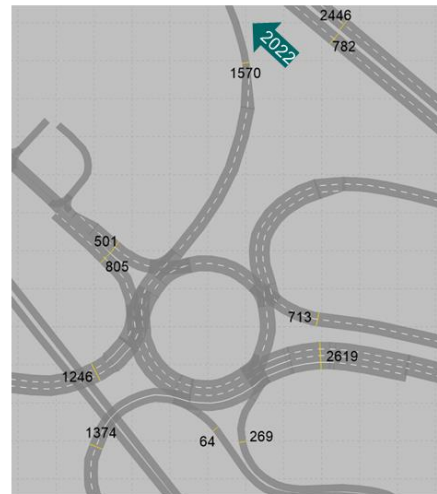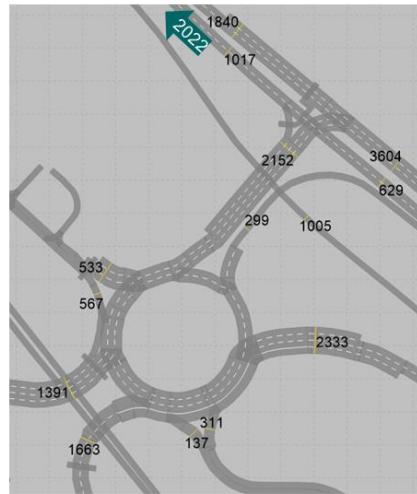
Figure 64: Flow Comparisons – AM peak 08:00-09:00 – North Terminal Roundabout

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities
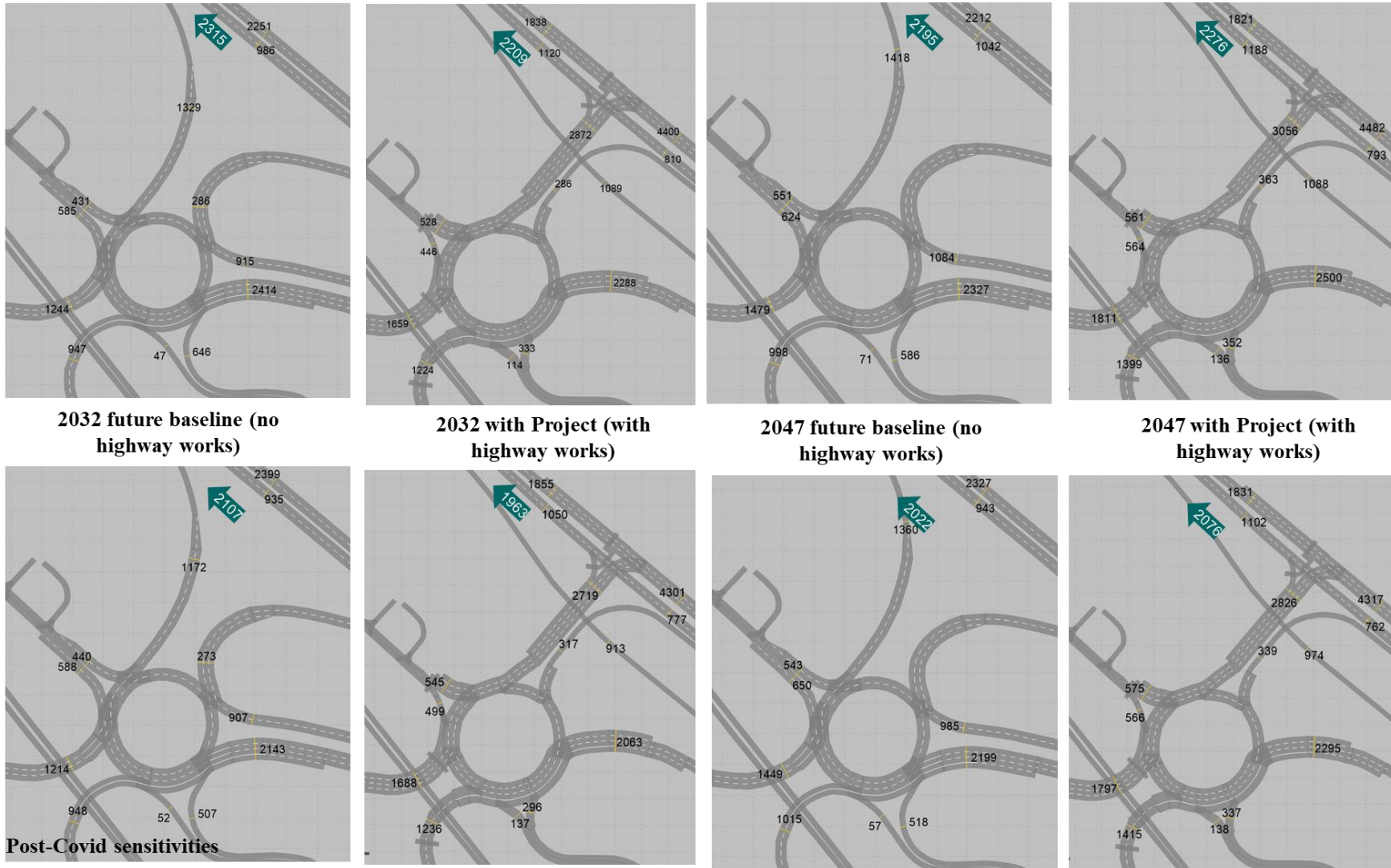
Figure 65: Flow Comparisons – PM peak 16:00-17:00 – North Terminal Roundabout
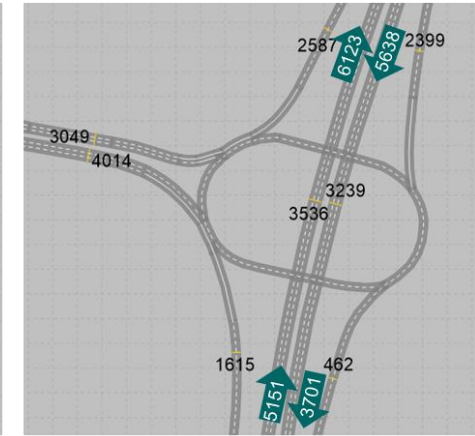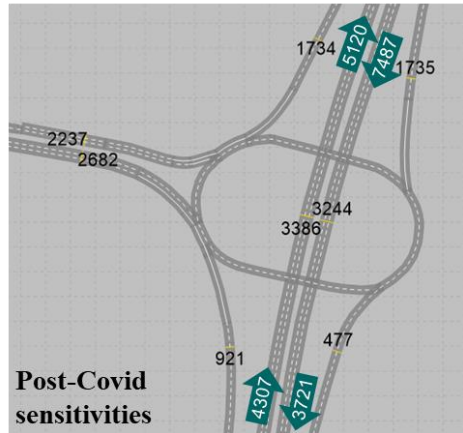

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities
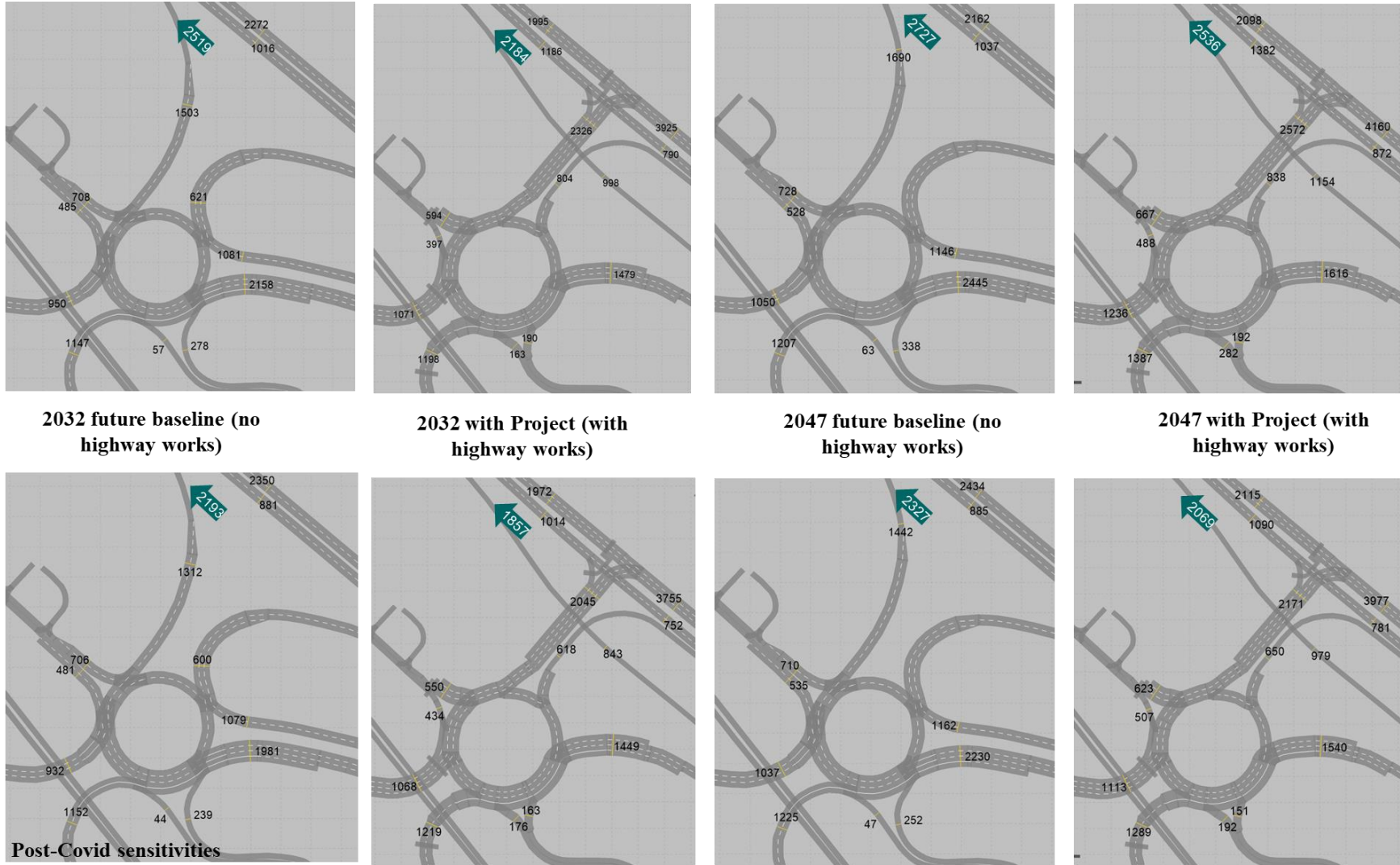
Figure 66: Flow Comparisons – PM peak 17:00-18:00 – North Terminal Roundabout

| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |
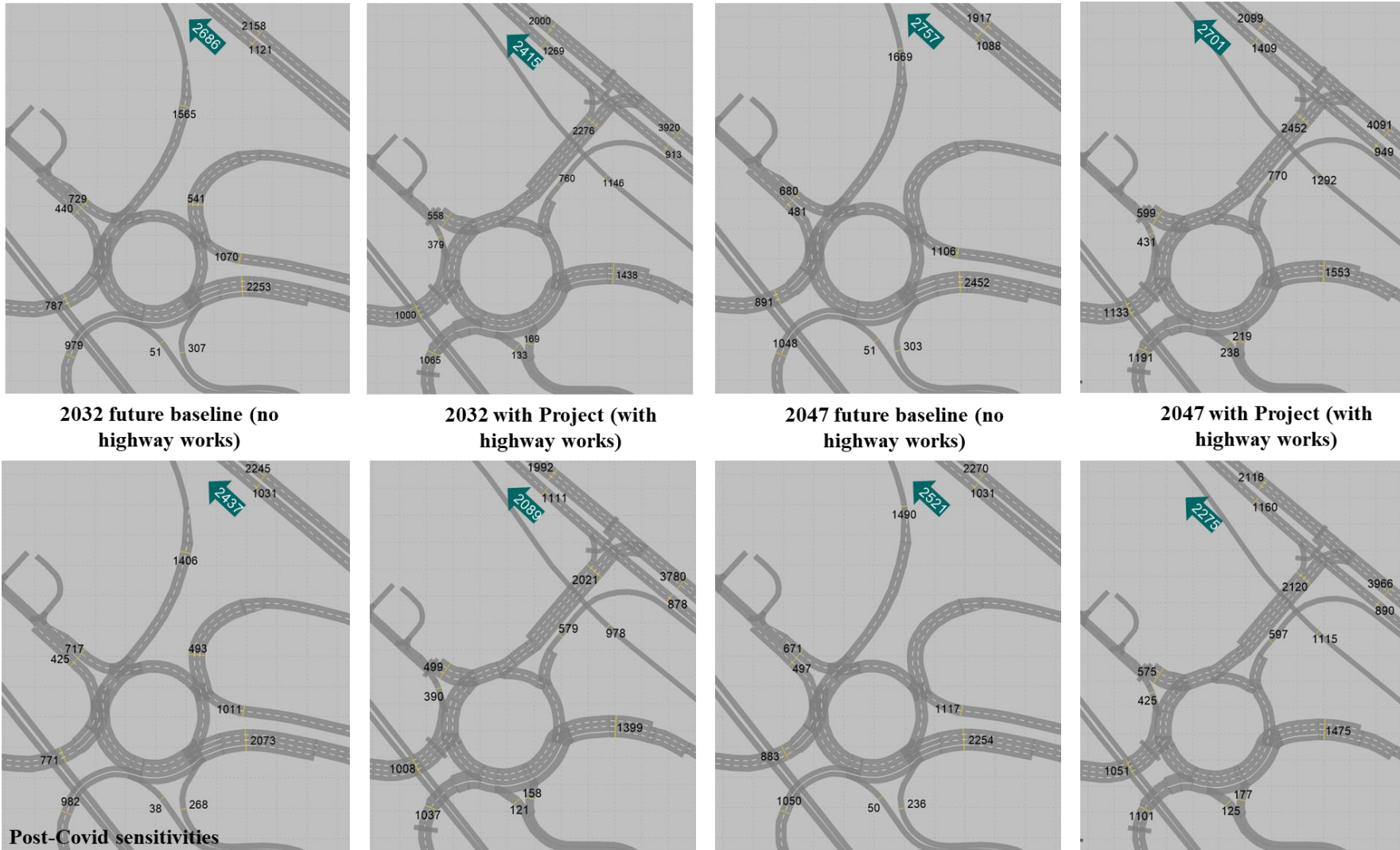
Figure 67: Flow Comparisons – AM peak 07:00-08:00 – South Terminal Roundabout

2032 future baseline
(no highway works)

2032 with Project (with
highway works)

2047 future baseline (no
highway works)

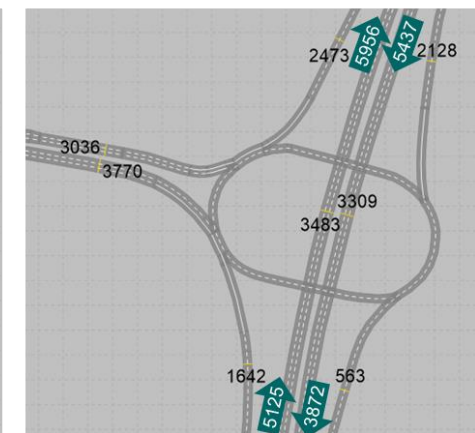2047 with Project (with
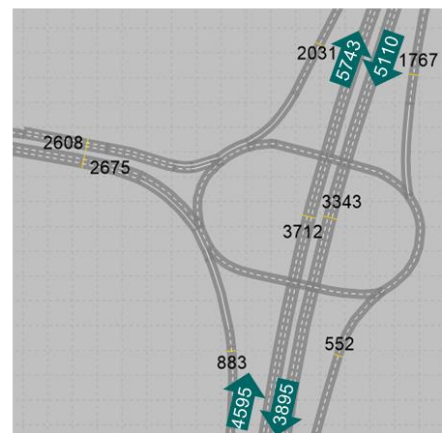highway works)

Post-Covid sensitivities
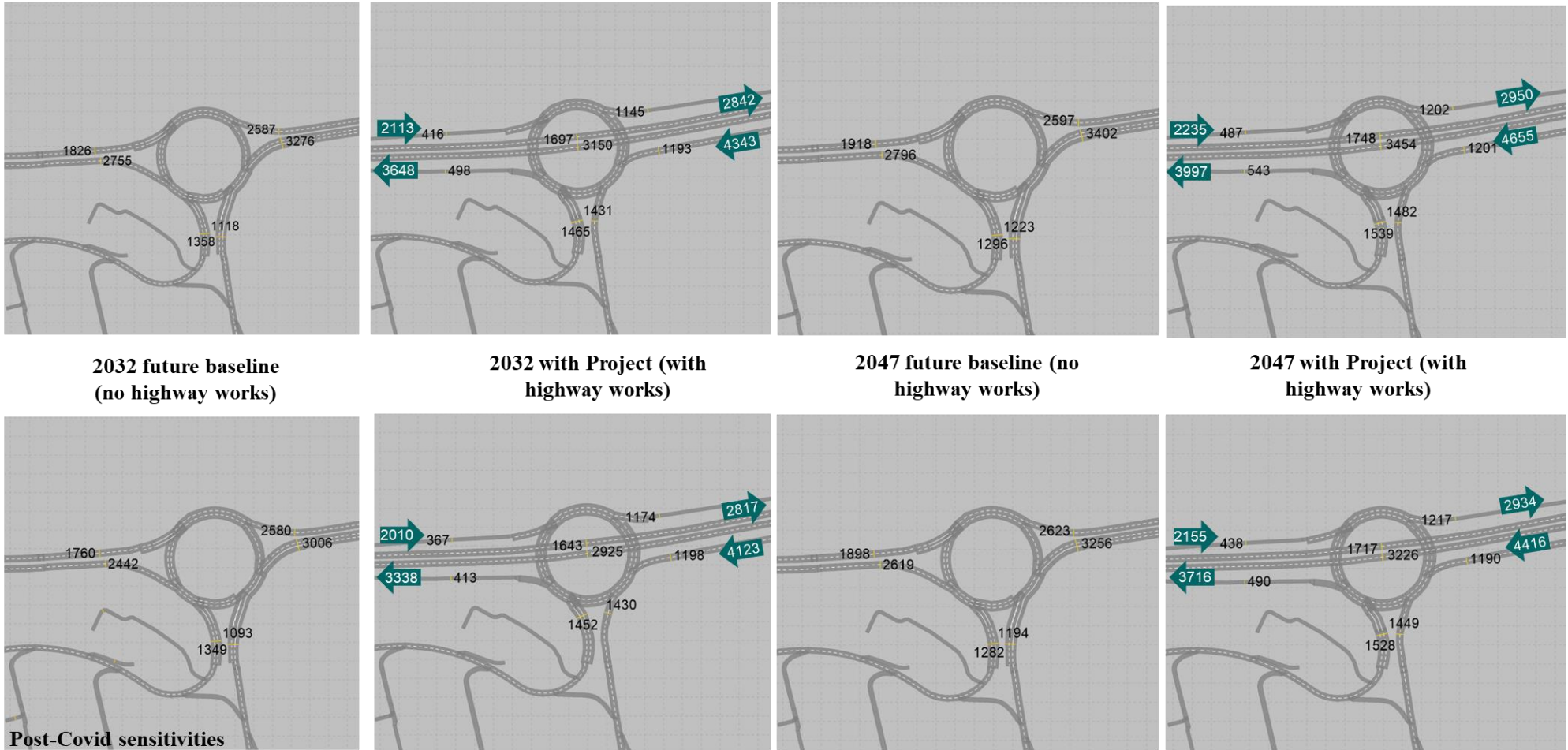
Figure 68: Flow Comparisons – AM peak 08:00-09:00 – South Terminal Roundabout

2032 future baseline
(no highway works)

2032 with Project (with
highway works)

2047 future baseline (no
highway works)

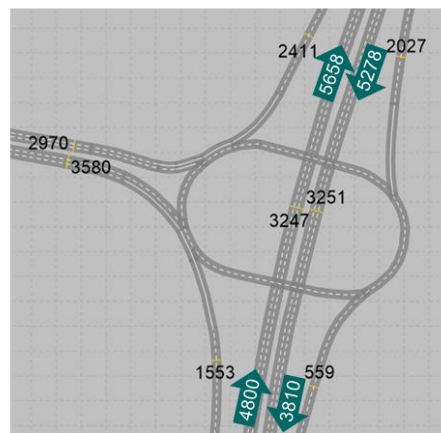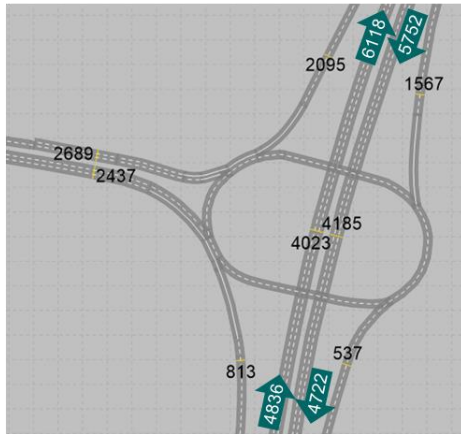2047 with Project (with
highway works)

Post-Covid sensitivities
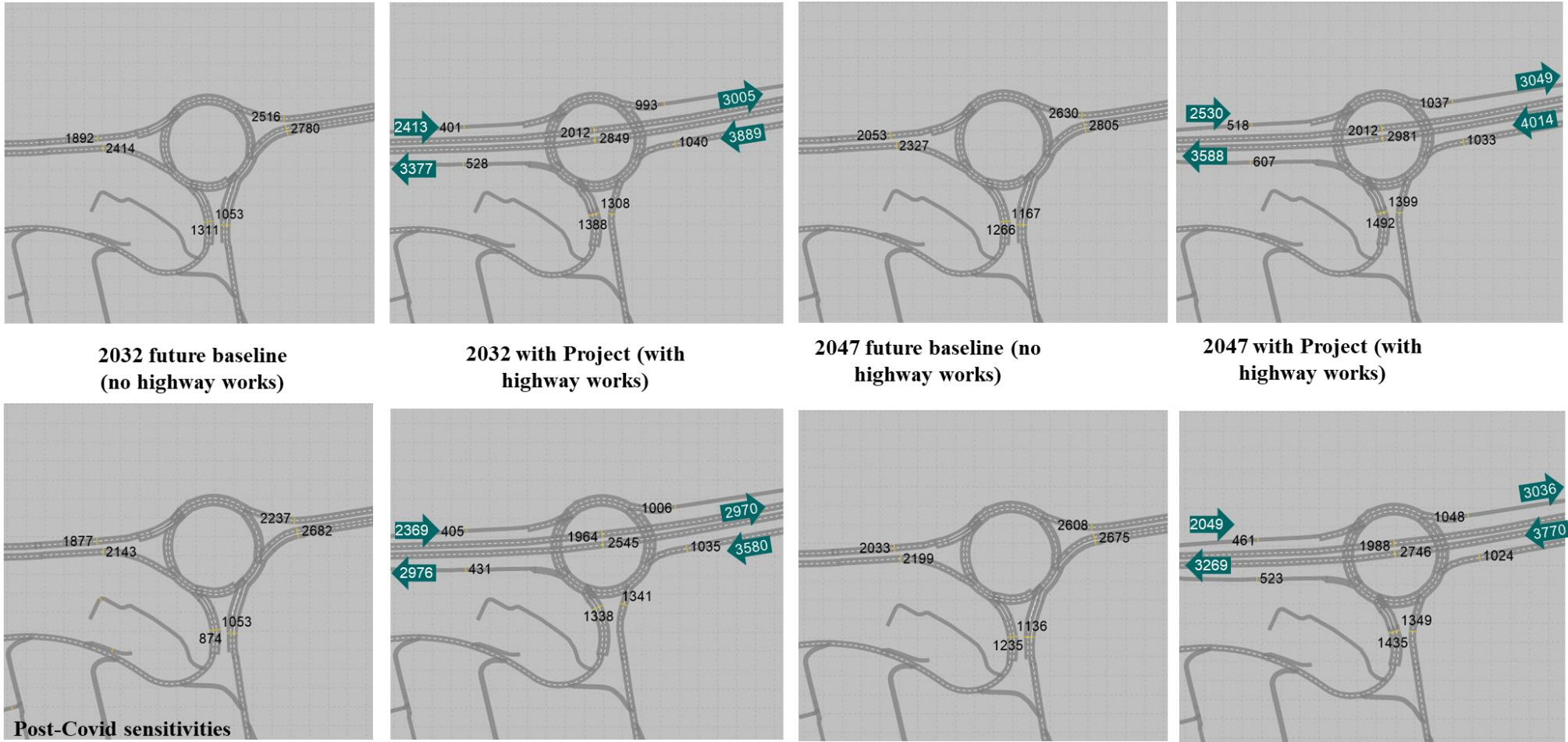
Figure 69: Flow Comparisons – PM peak 16:00-17:00 – South Terminal Roundabout

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities
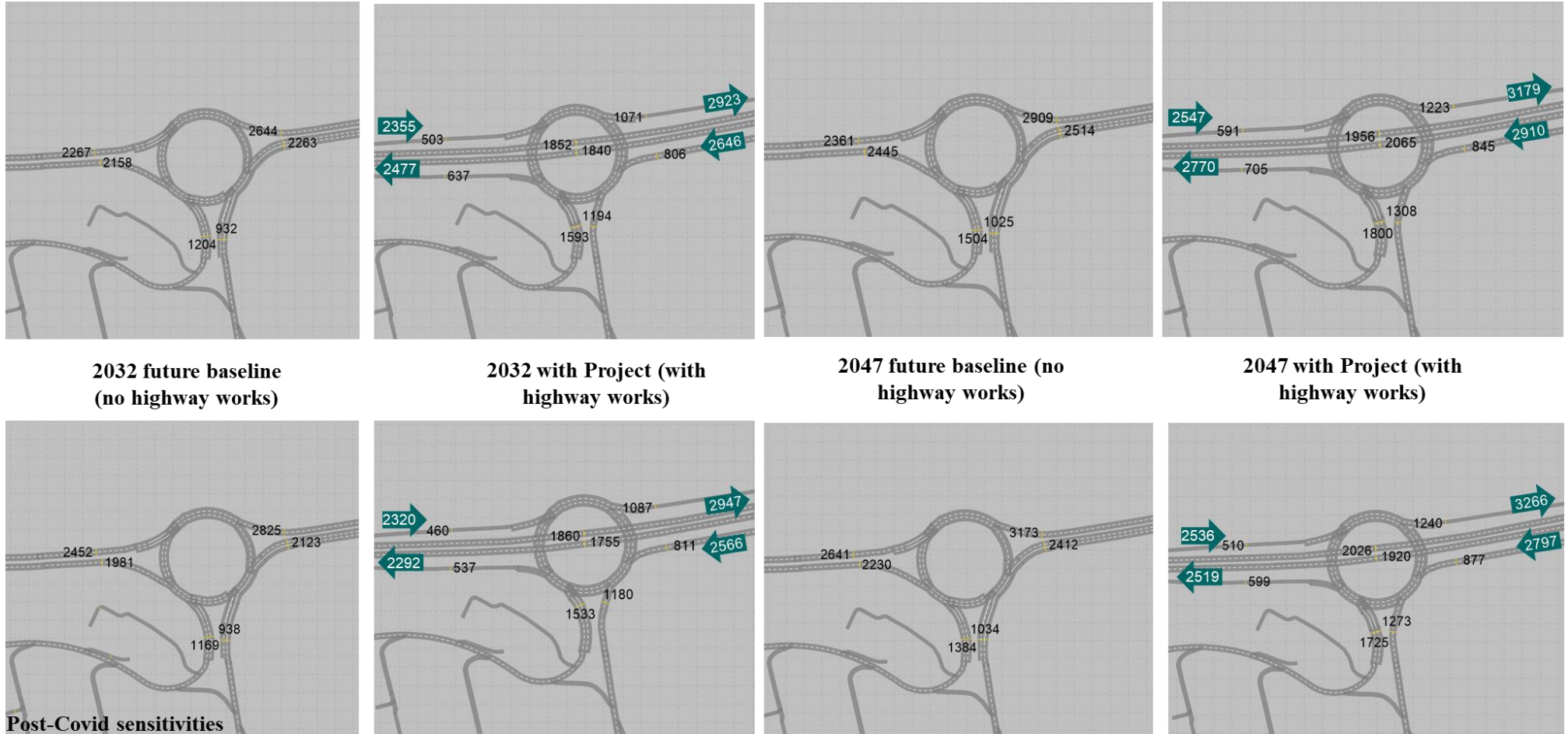
Figure 70: Flow Comparisons – PM peak 17:00-18:00 – South Terminal Roundabout

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities
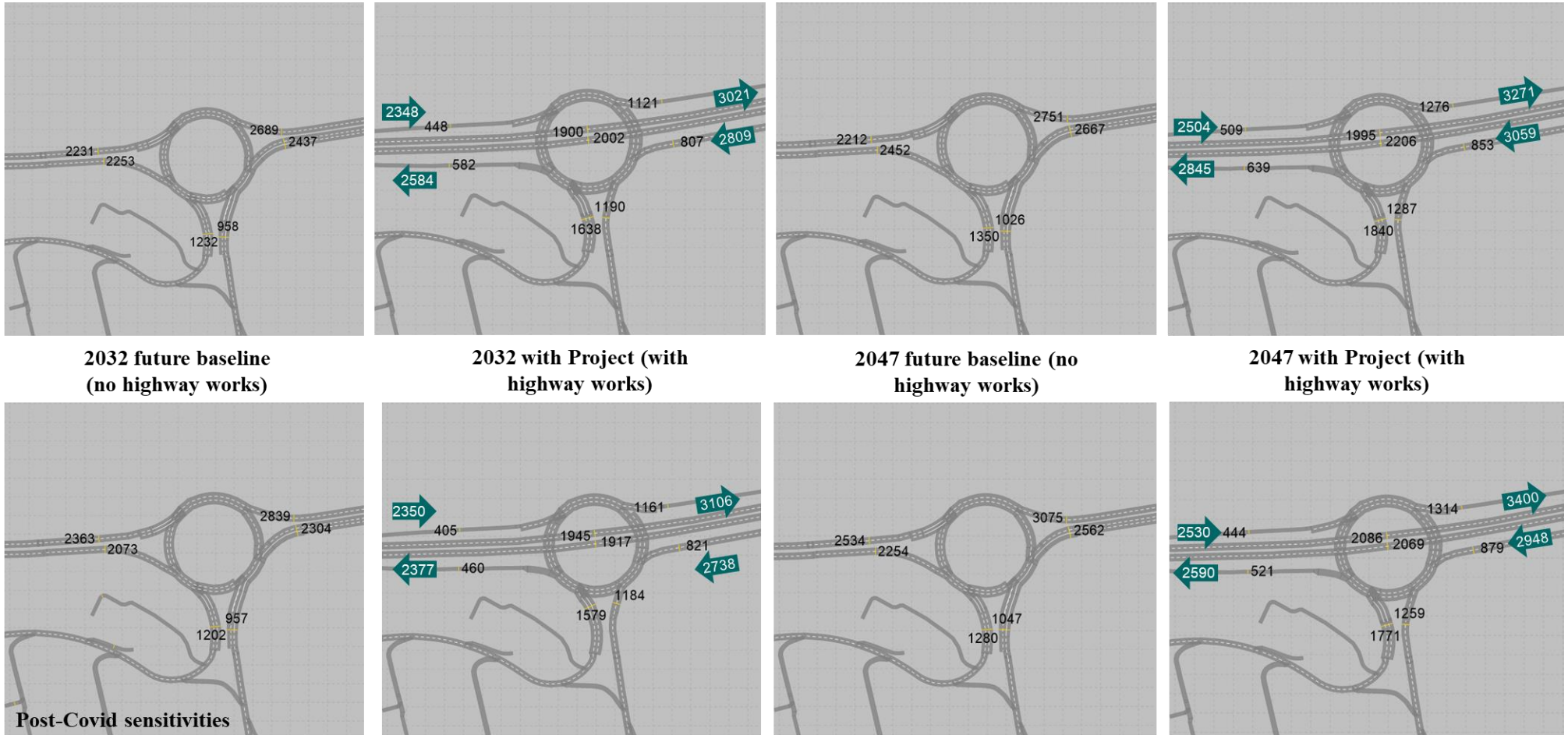
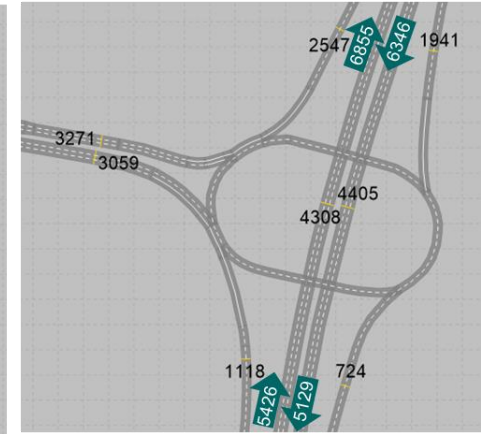**Figure 71: Flow Comparisons – AM peak 07:00-08:00 – Longbridge Roundabout**

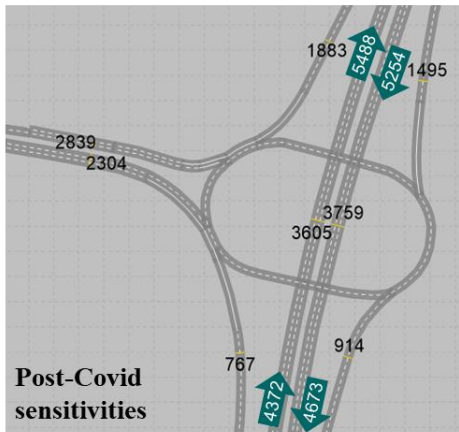| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |
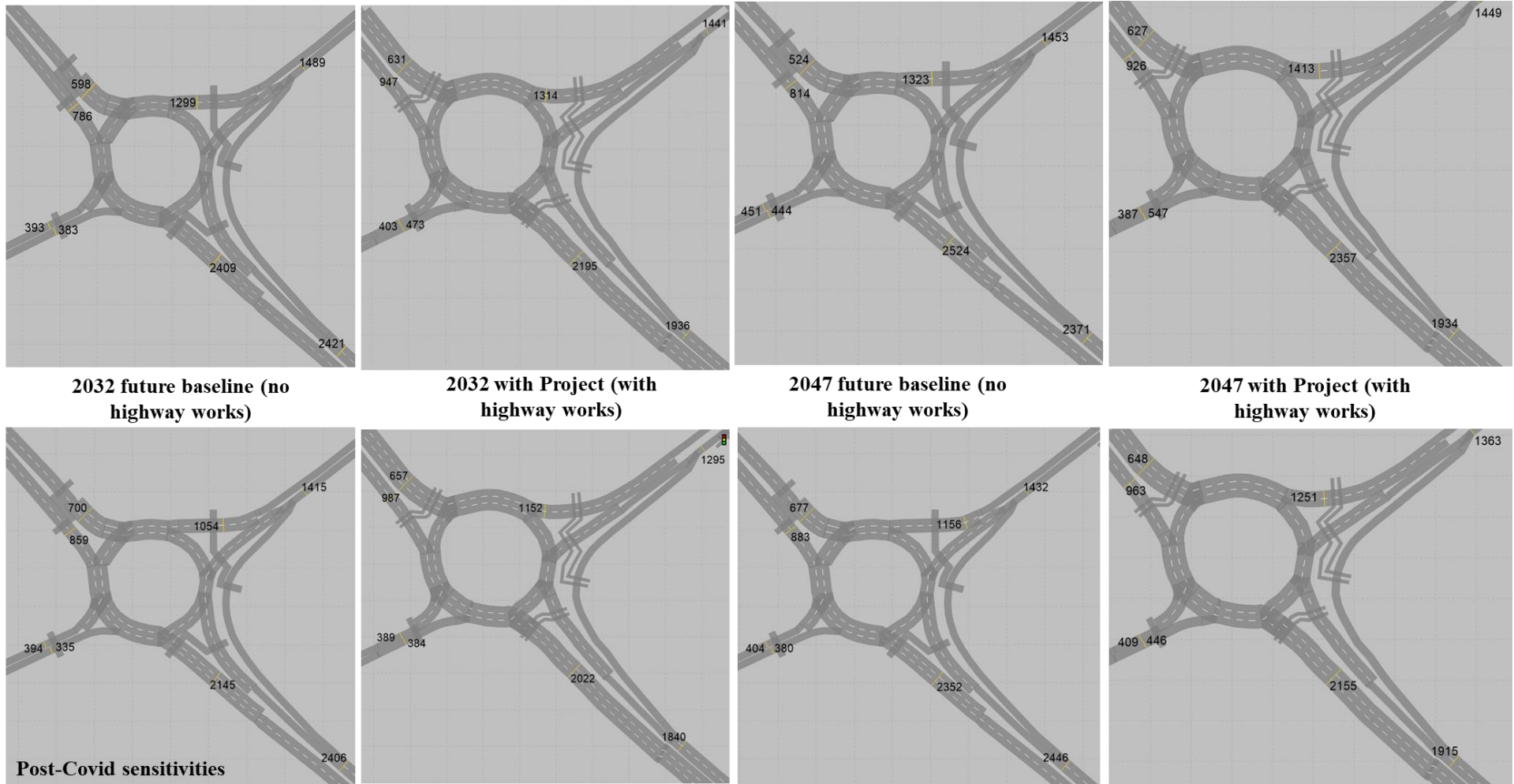
Figure 72: Flow Comparisons – AM peak 08:00-09:00 – Longbridge Roundabout

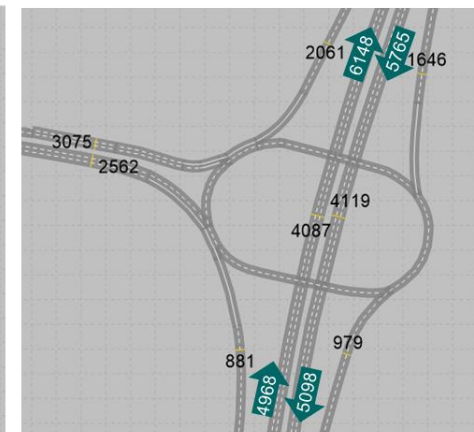| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |
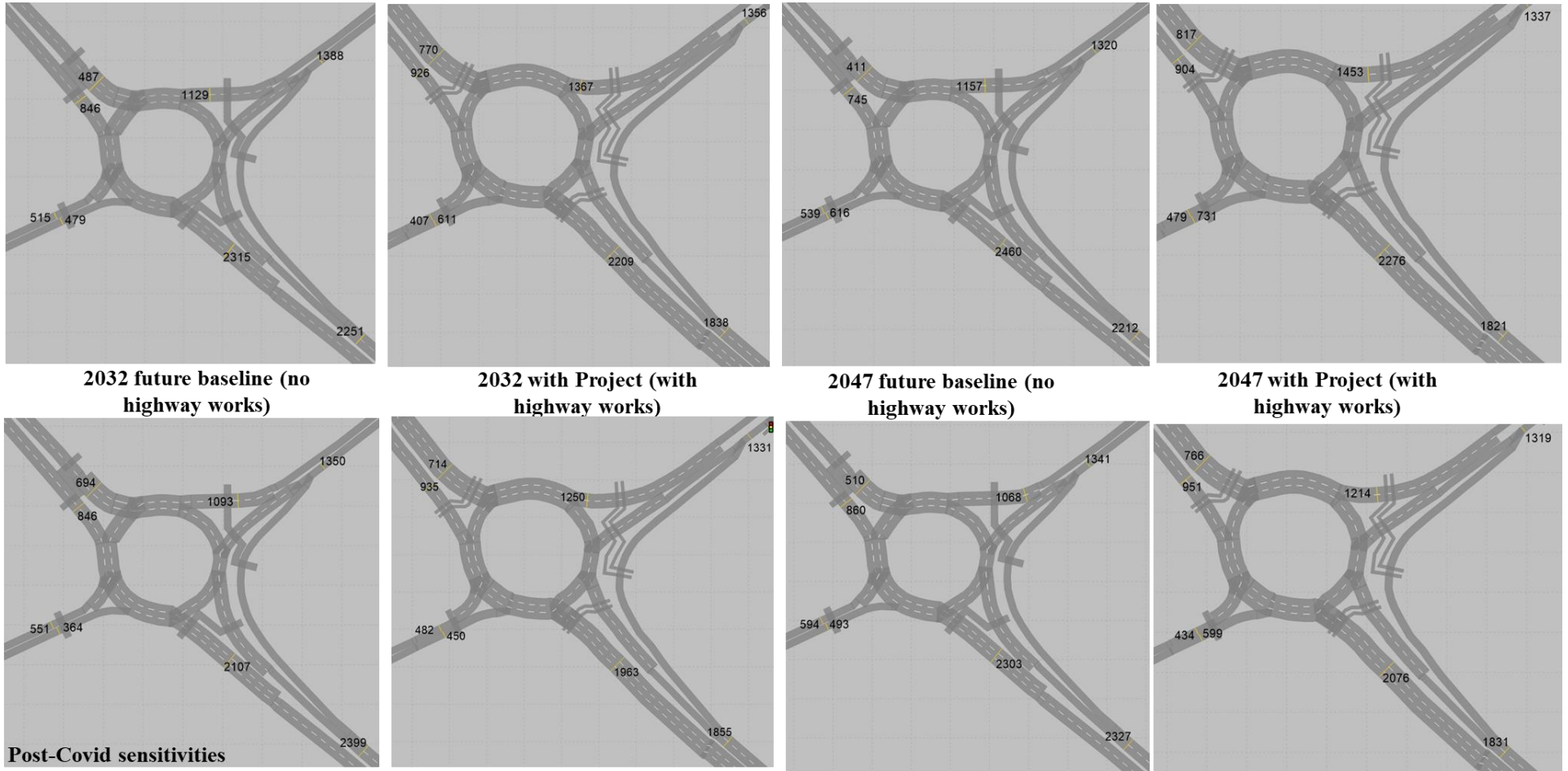
Figure 73: Flow Comparisons – PM peak 16:00-17:00 – Longbridge Roundabout

2032 future baseline (no highway works)
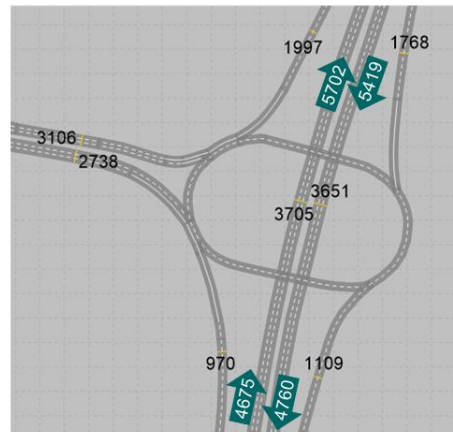
2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities
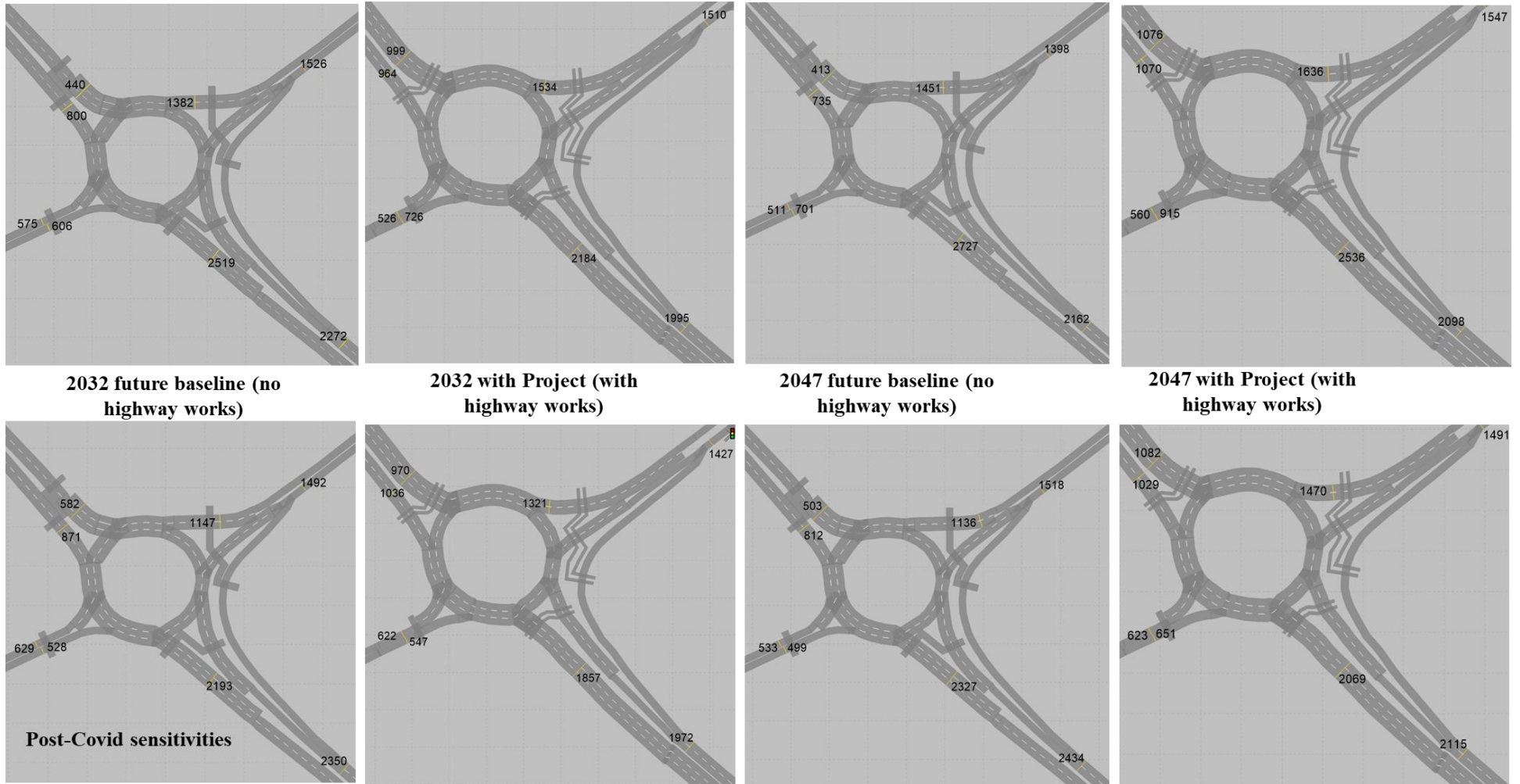
Figure 74: Flow Comparisons – PM peak 17:00-18:00 – Longbridge Roundabout

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities
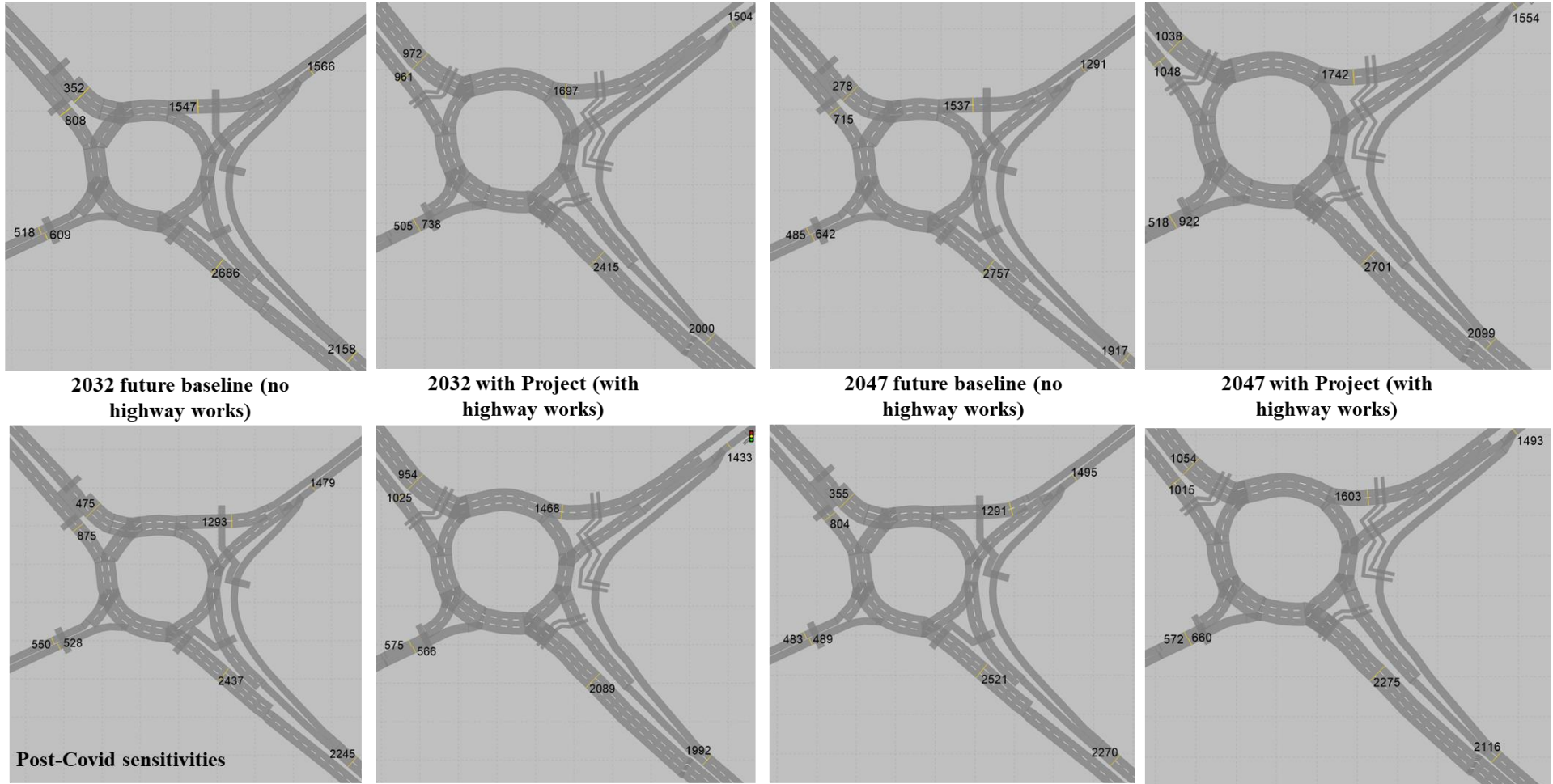
Figure 75: Flow Comparisons – AM peak 07:00-08:00 – M23 J9
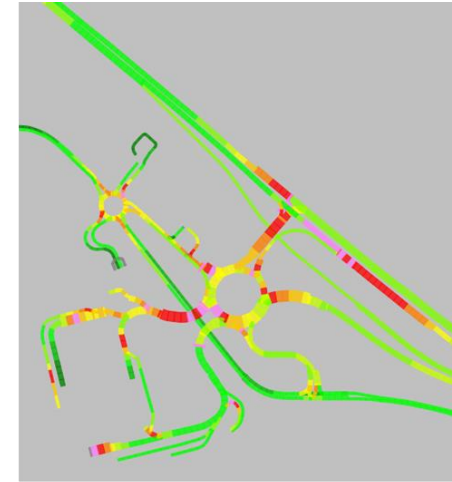

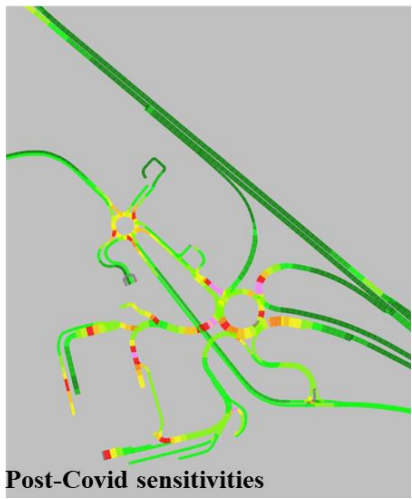
2032 future baseline
(no highway works)

2032 with Project (with
highway works)

2047 future baseline (no
highway works)

2047 with Project (with
highway works)

Post-Covid sensitivities

Figure 76: Flow Comparisons – AM peak 08:00-09:00 – M23 J9

2032 future baseline (no highway works)
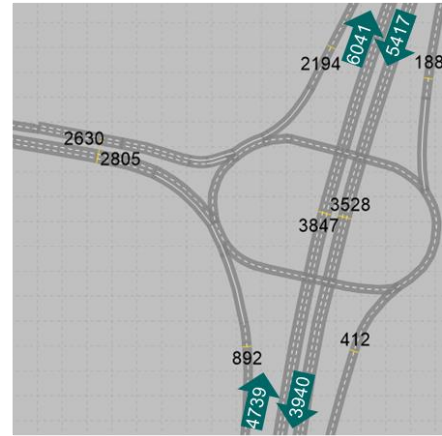
2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities

Figure 77: Flow Comparisons – PM peak 16:00-17:00 – M23 J9

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities

Figure 78: Flow Comparisons – PM peak 17:00-18:00 – M23 J9

2032 future baseline (no highway works)
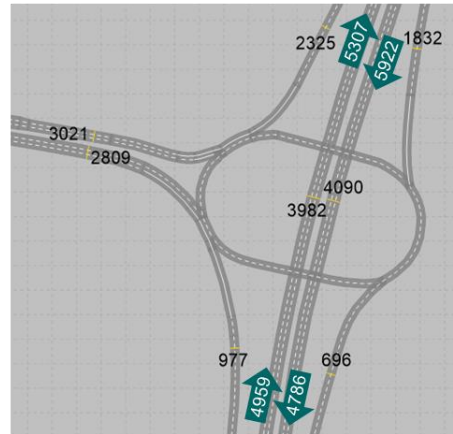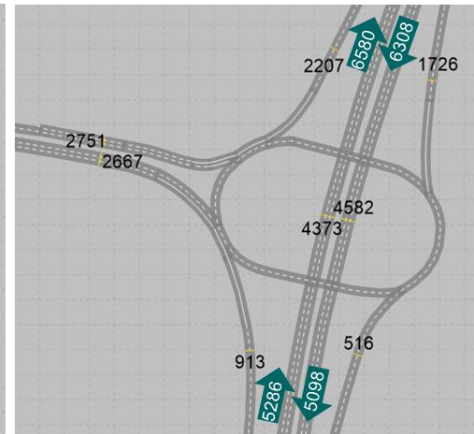
2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)
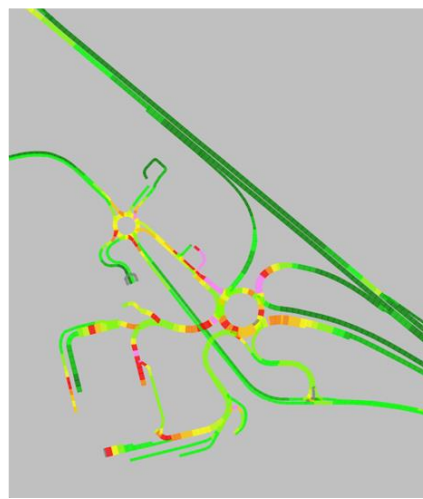
Post-Covid sensitivities
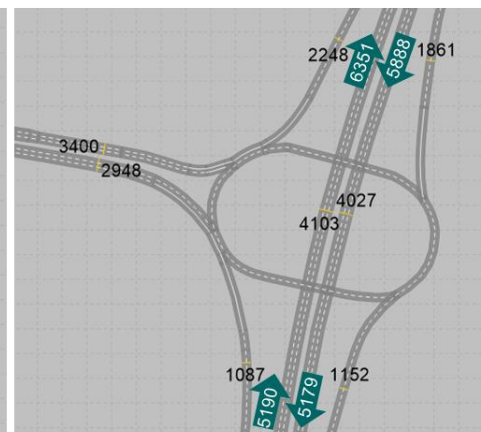
Appendix 3 – Full speed plot set

Figure 79: North Terminal Roundabout – 07:00 – 07:30

2032 future baseline
(no highway works)

2032 with Project
(with highway works)

2047 future baseline (no
highway works)

2047 with Project (with
highway works)

Post-Covid sensitivities
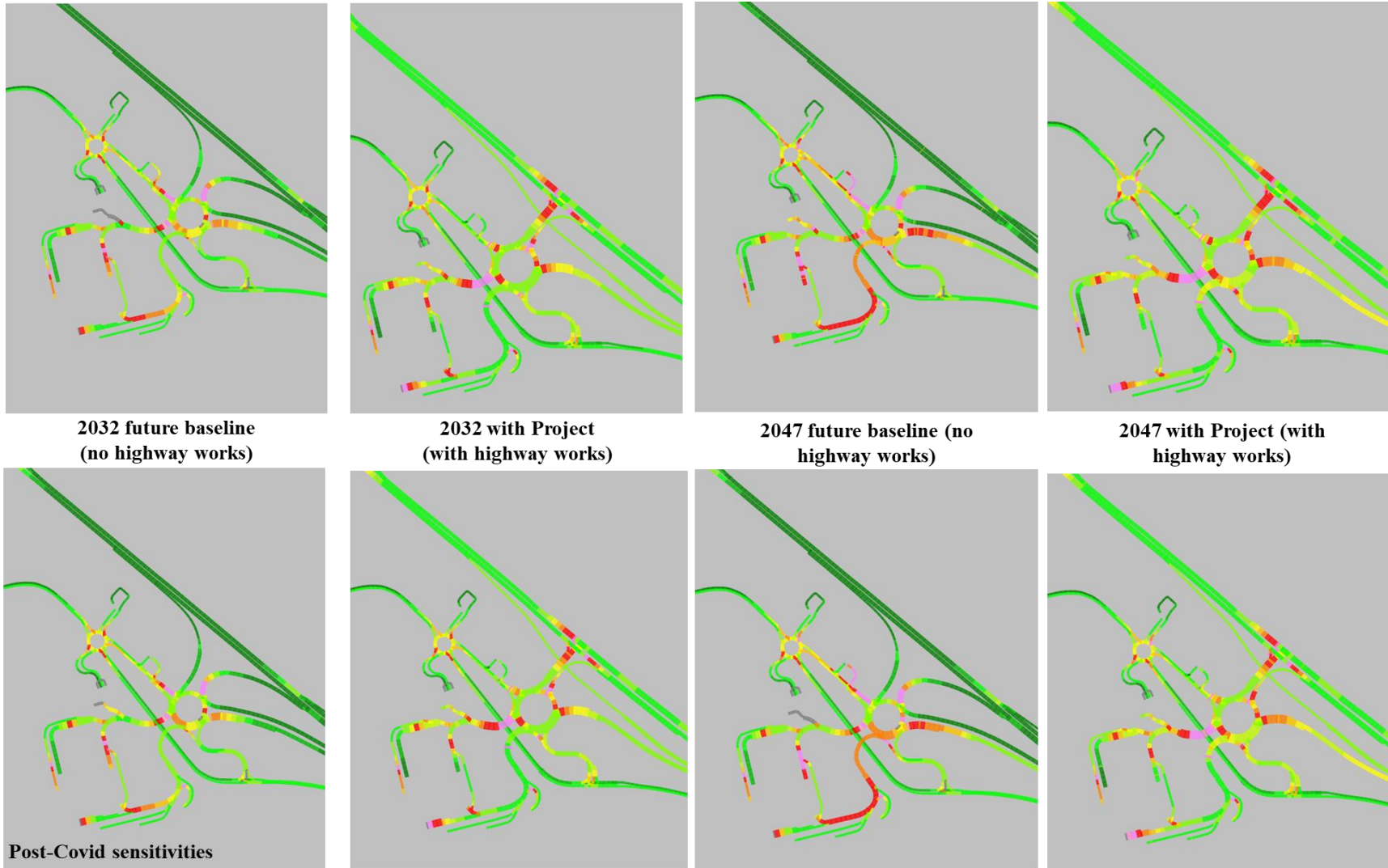
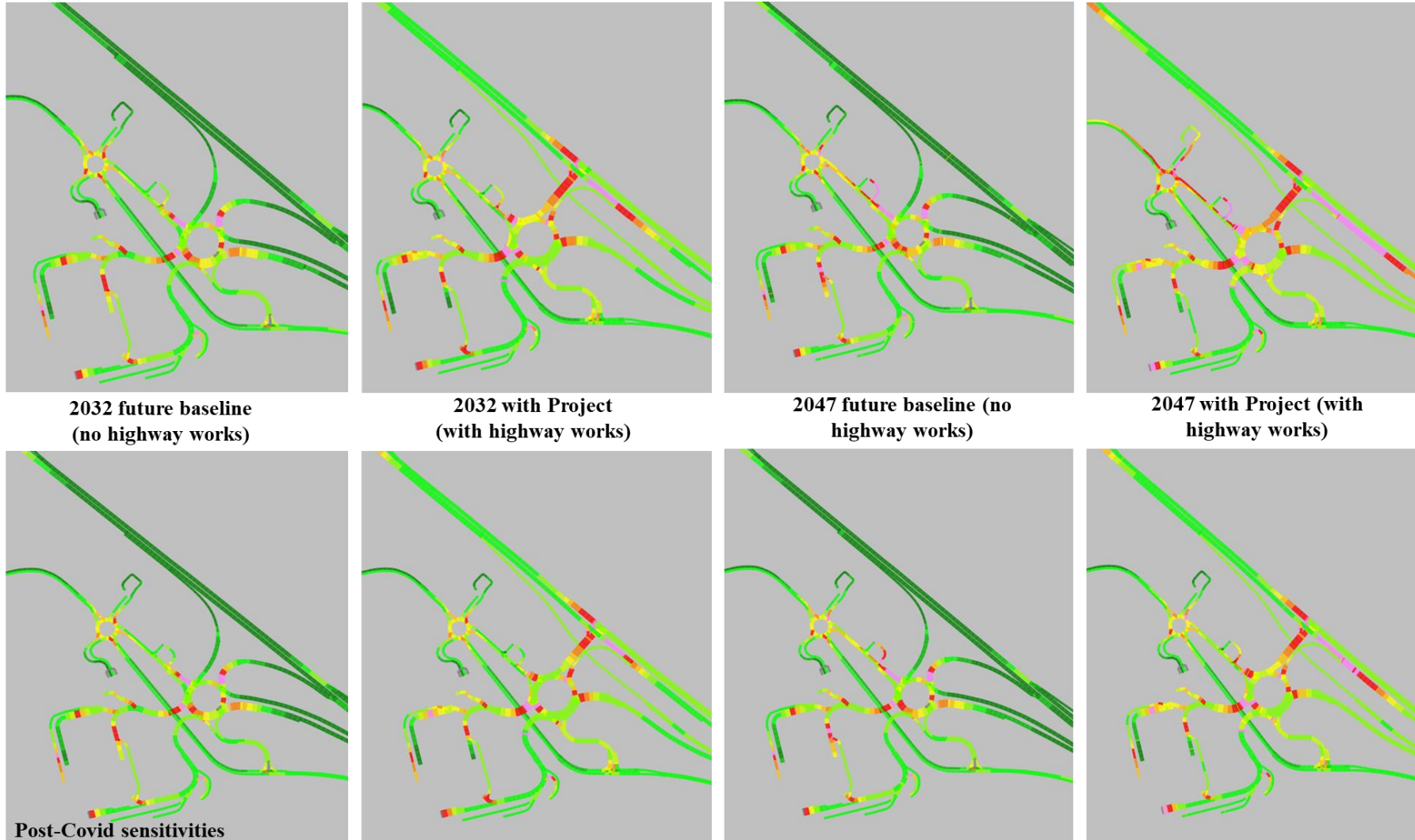**Figure 80: North Terminal Roundabout – 07:30 – 08:00**

2032 future baseline (no highway works)

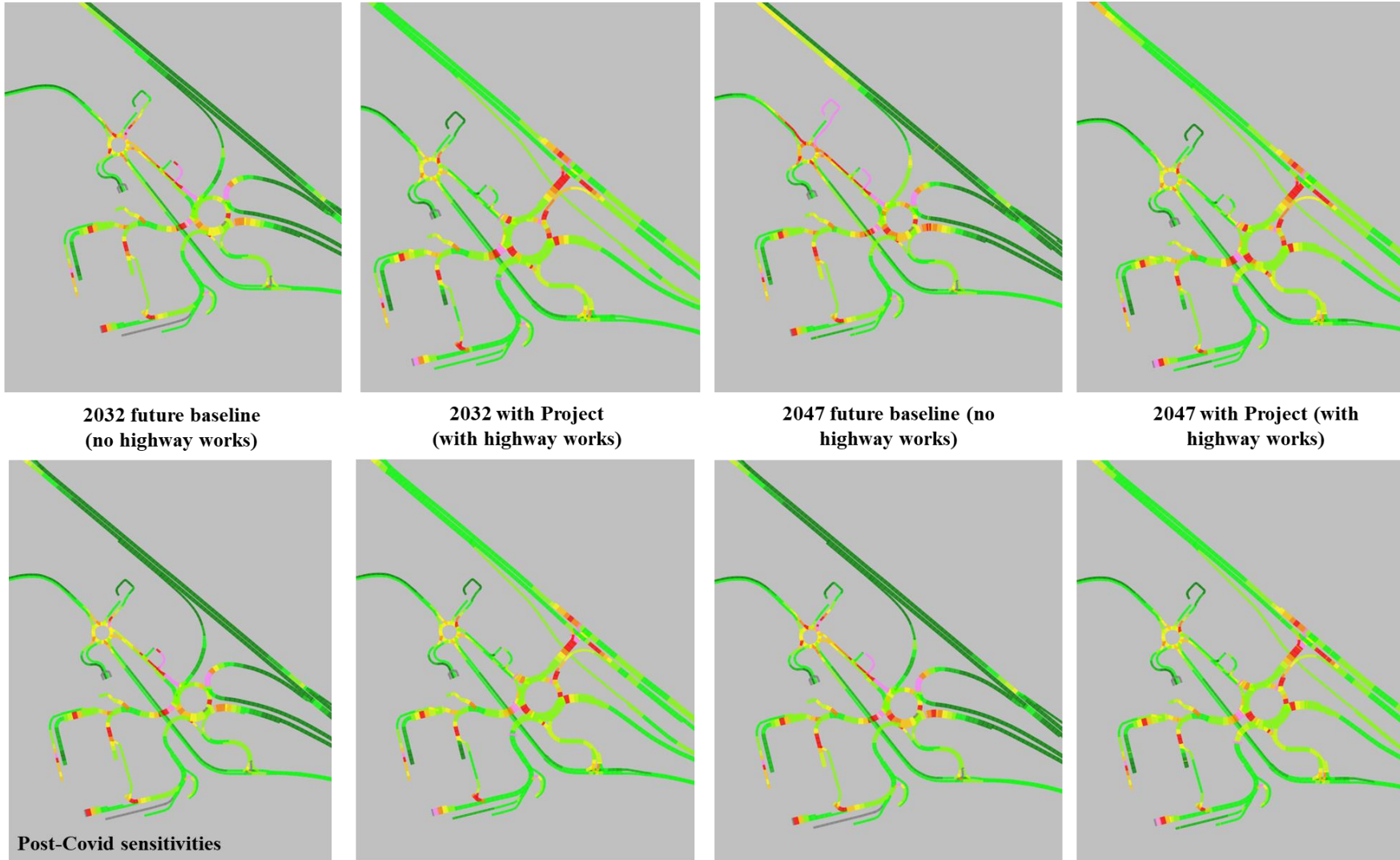2032 with Project (with highway works)

2047 future baseline (no highway works)

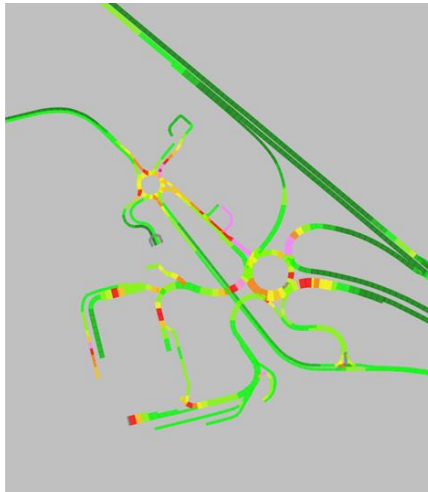2047 with Project (with highway works)

Post-Covid sensitivities
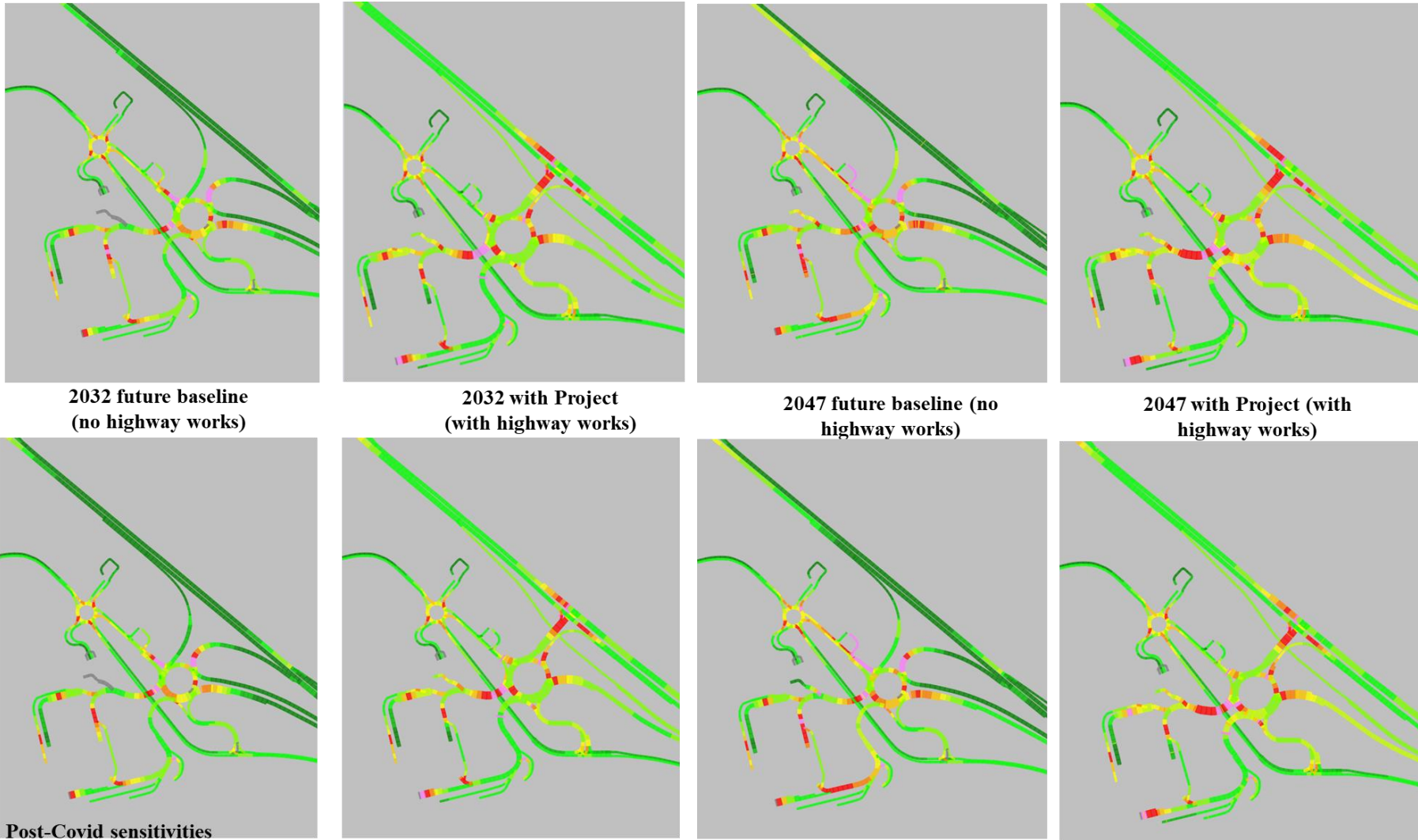
Figure 81: North Terminal Roundabout – 08:00 – 08:30
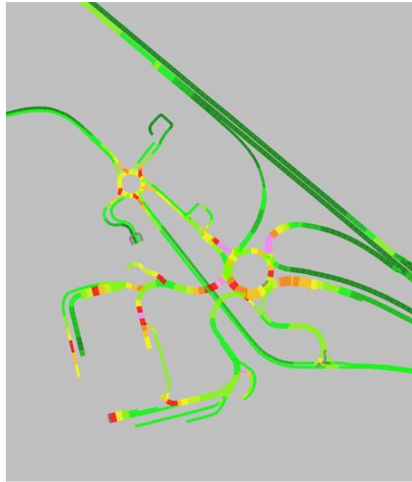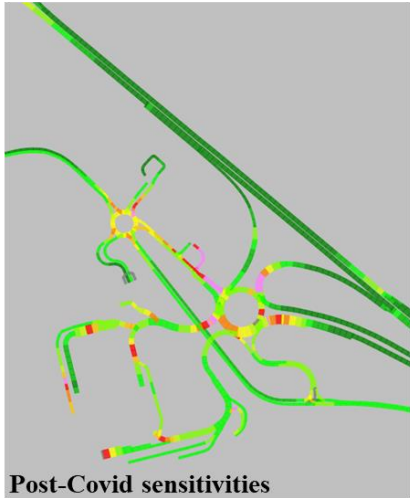
2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works)

Post-Covid sensitivities

Figure 82: North Terminal Roundabout – 08:30 – 09:00

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities

Figure 83: North Terminal Roundabout – 16:00 – 16:30

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

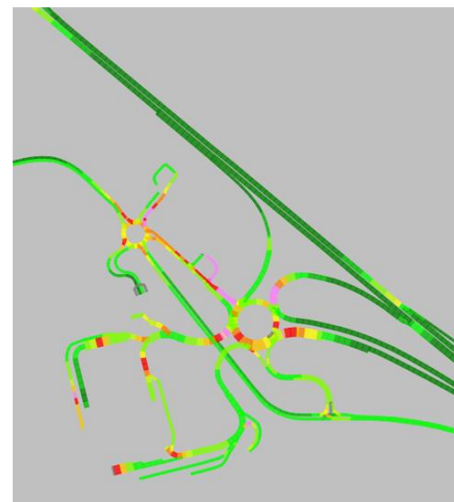2047 with Project (with highway works)

Post-Covid sensitivities
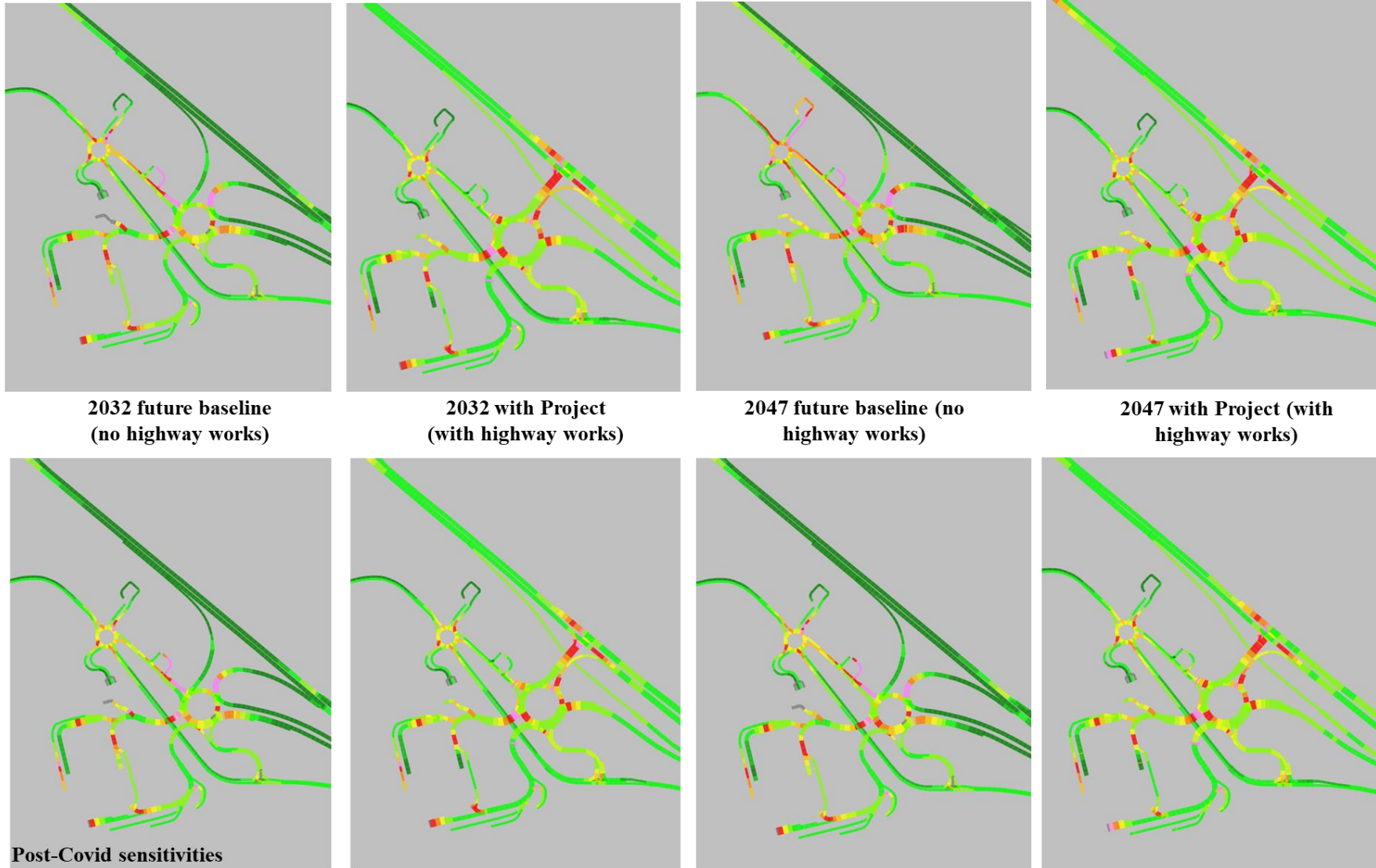
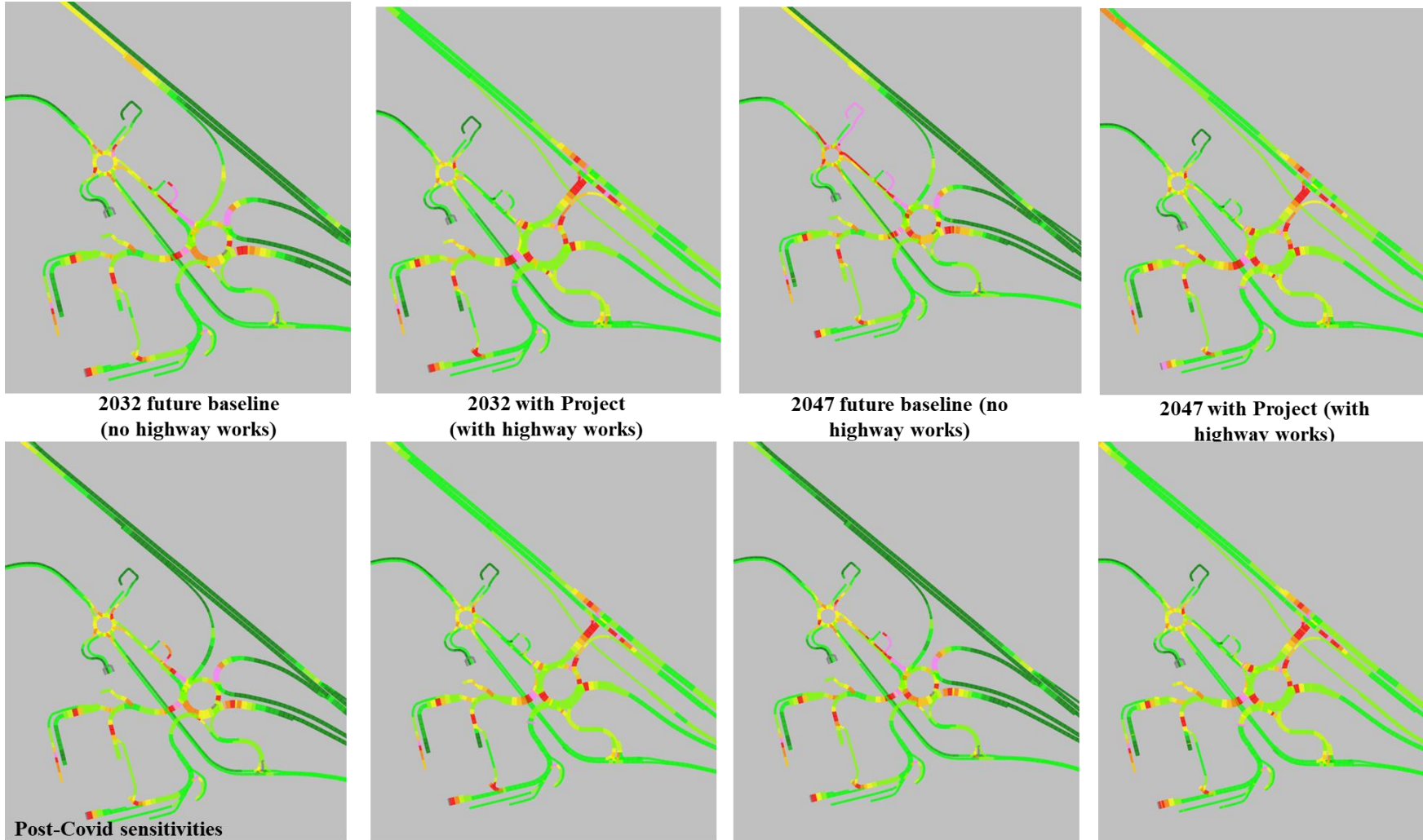**Figure 84: North Terminal Roundabout – 16:30 – 17:00**

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities

Figure 85: North Terminal Roundabout – 17:00 – 17:30

2032 future baseline
(no highway works)

2032 with Project
(with highway works)

2047 future baseline (no
highway works)

2047 with Project (with
highway works)

Post-Covid sensitivities

Figure 86: North Terminal Roundabout – 17:30 – 18:00

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)
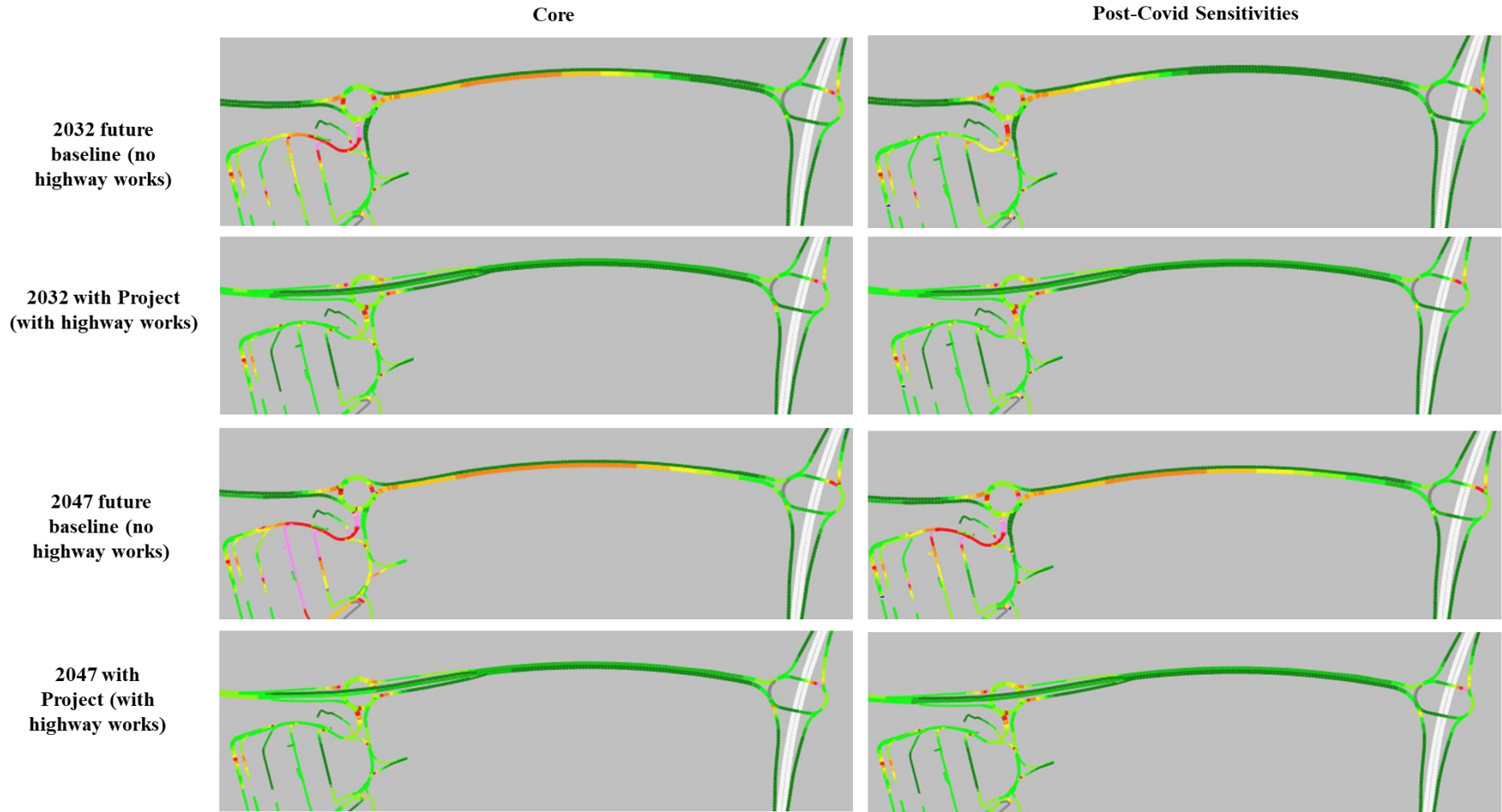
Post-Covid sensitivities

Figure 87: South Terminal Roundabout – 07:00 – 07:30
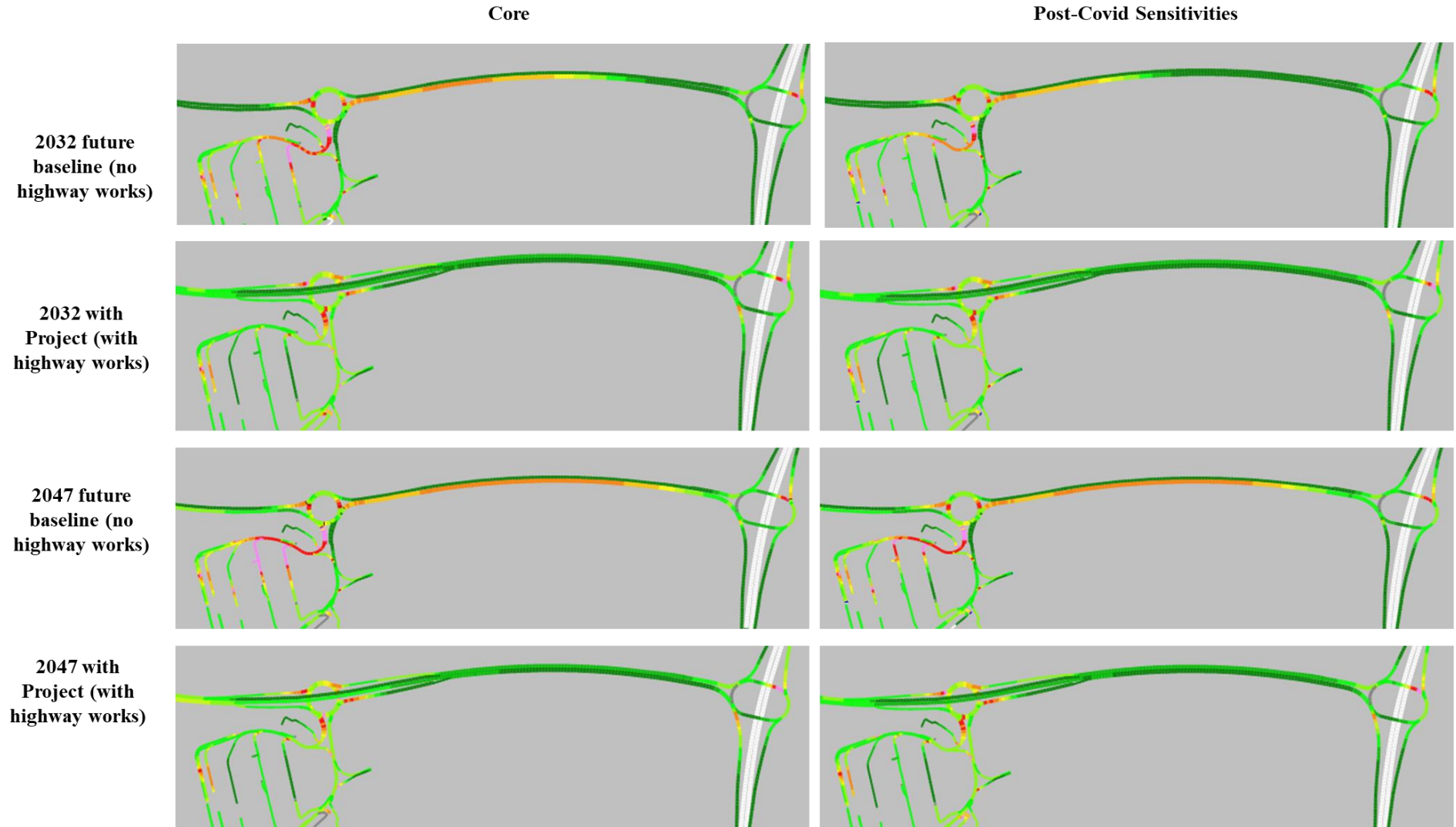
Figure 88: South Terminal Roundabout – 07:30 – 08:00
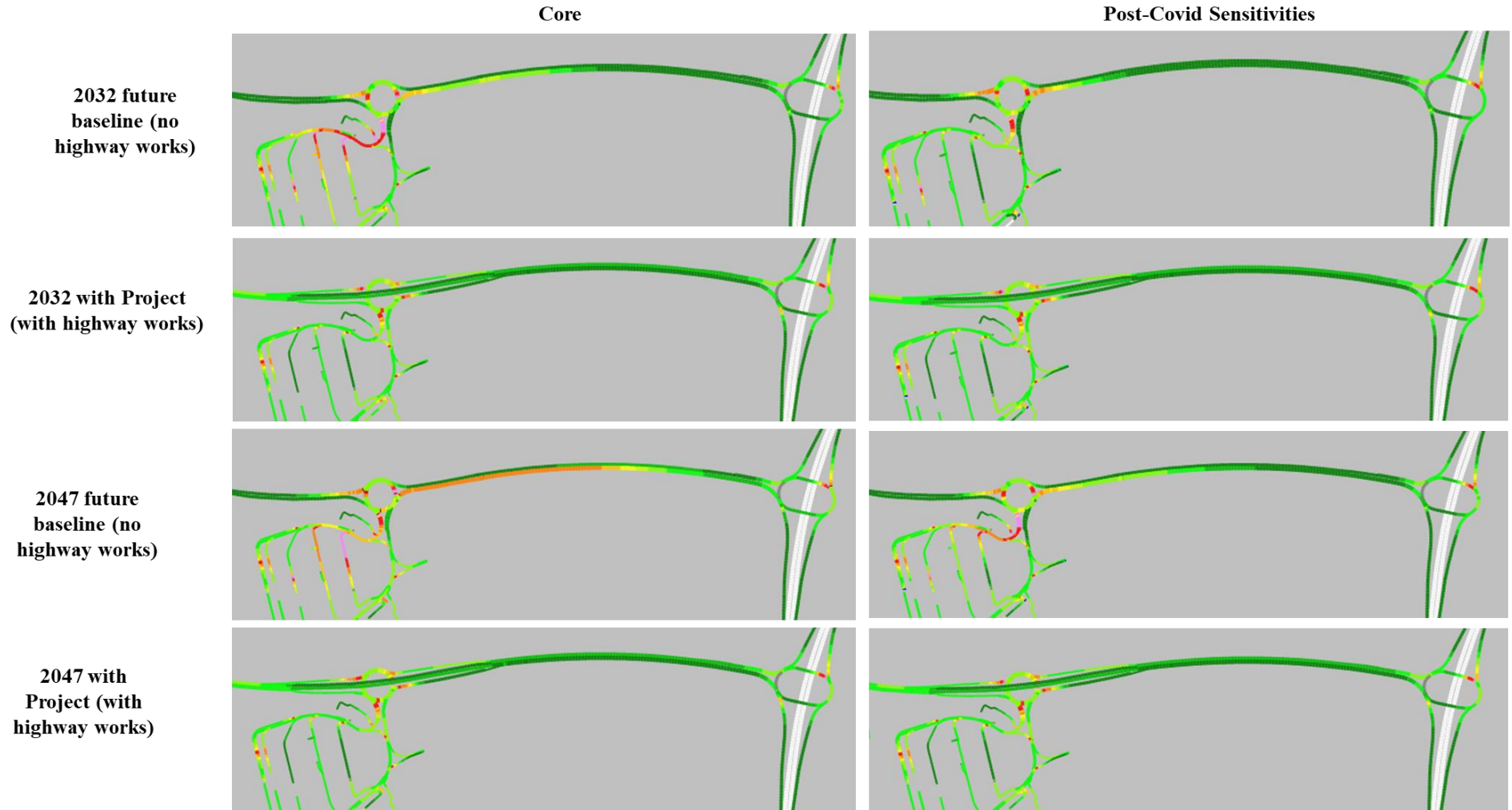
Figure 89: South Terminal Roundabout – 08:00 – 08:30
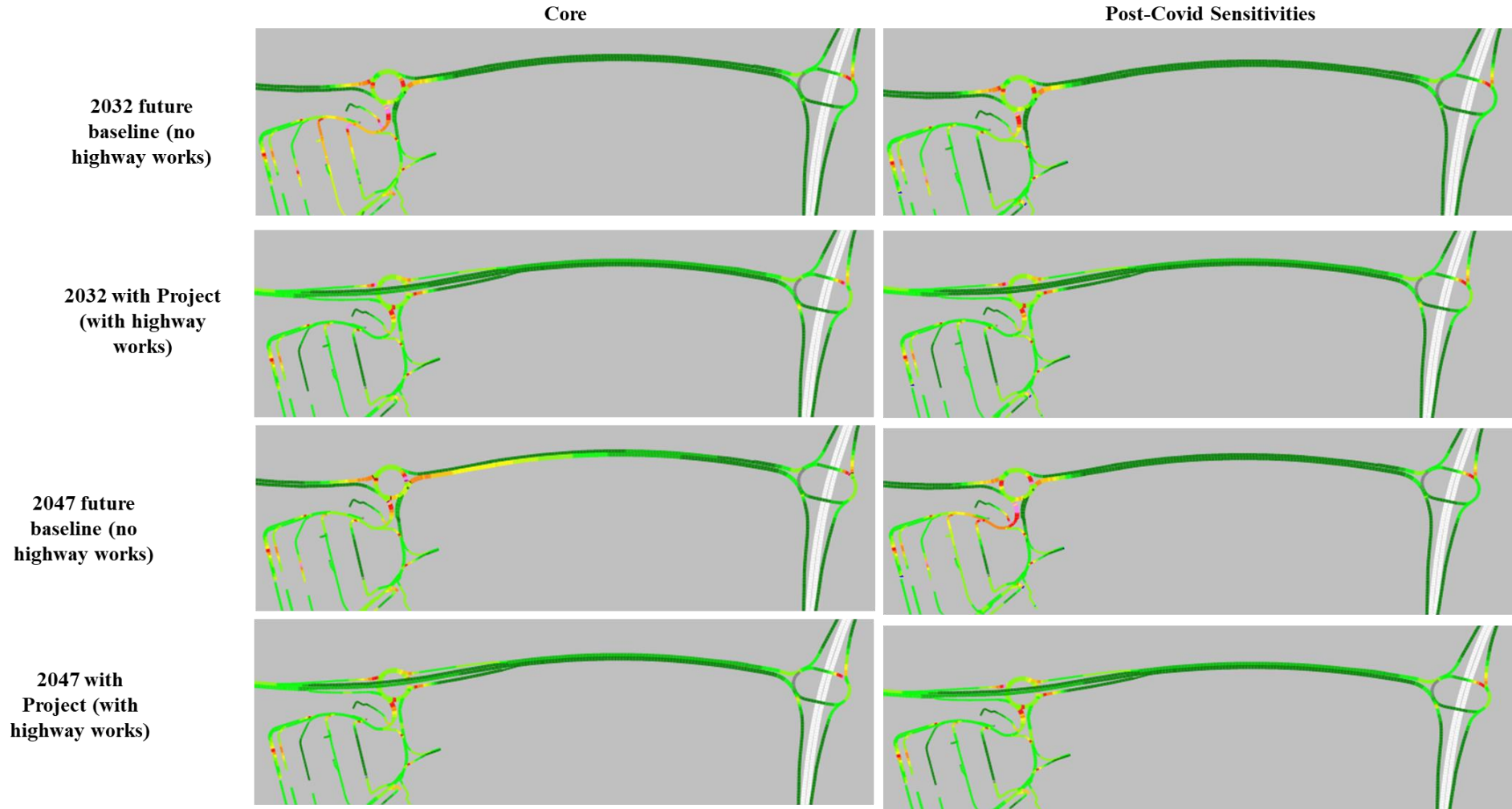
Figure 90: South Terminal Roundabout – 08:30 – 09:00
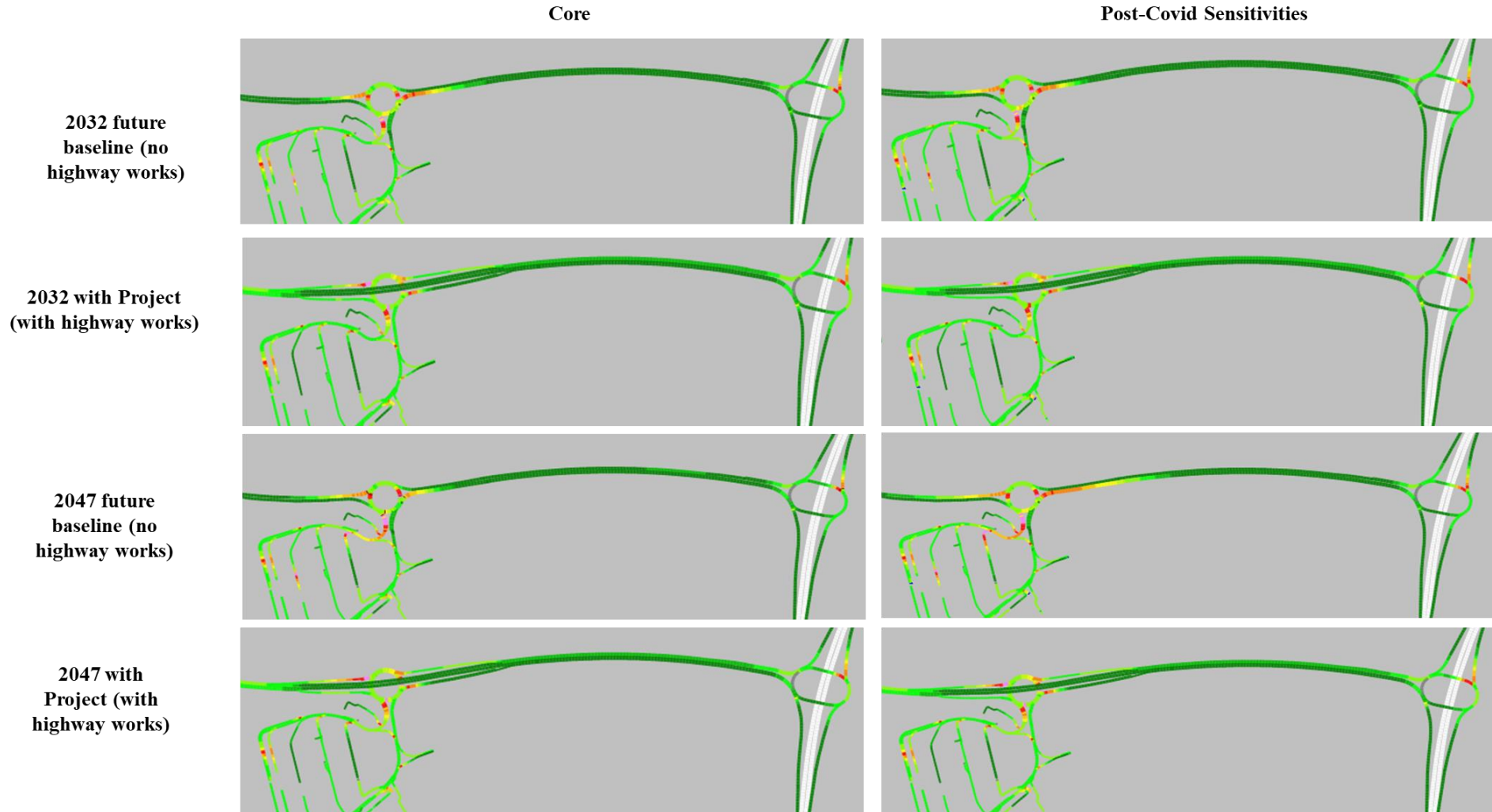
Figure 91: South Terminal Roundabout – 16:00 – 16:30

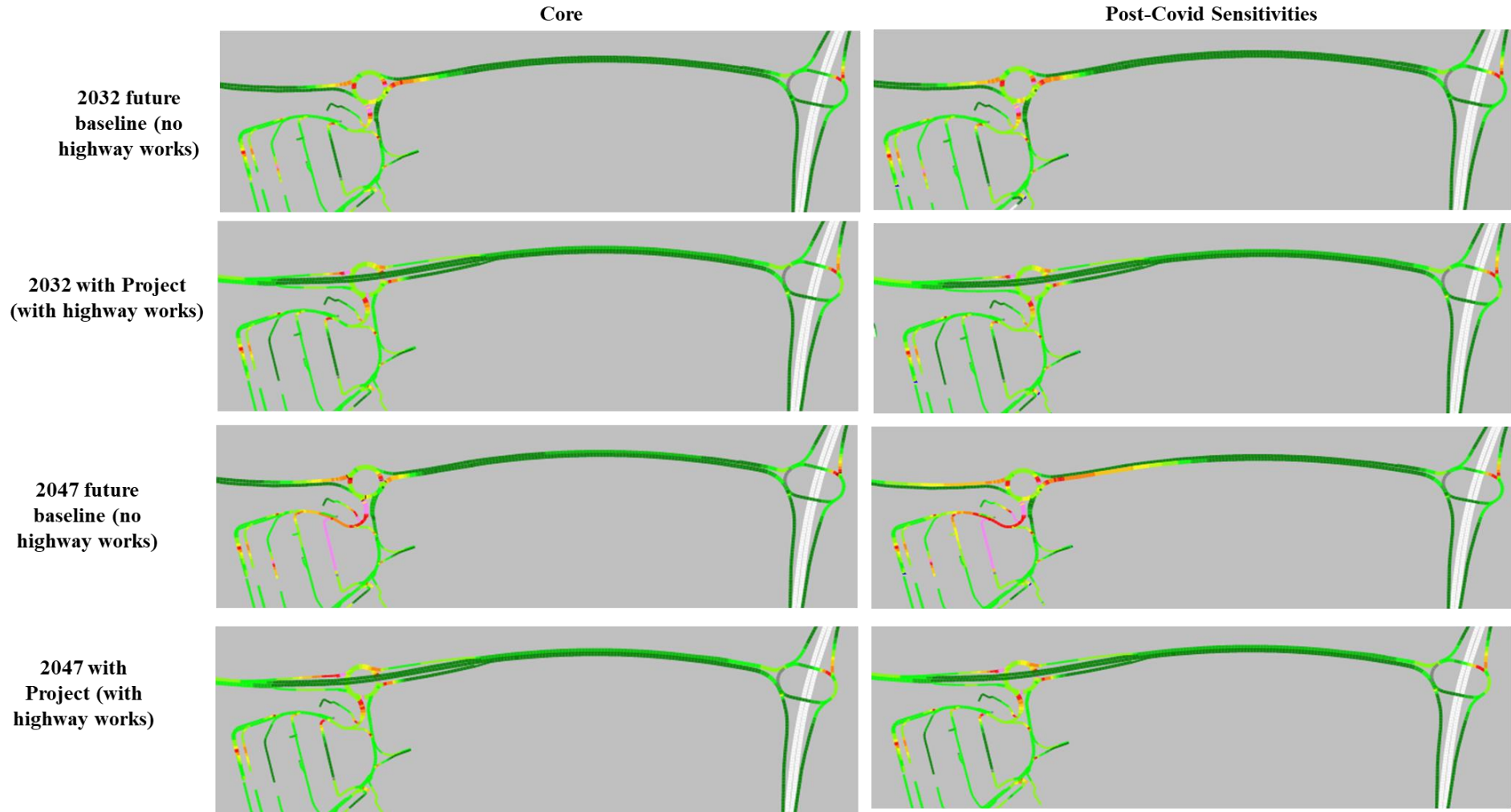**Figure 92: South Terminal Roundabout – 16:30– 17:00**
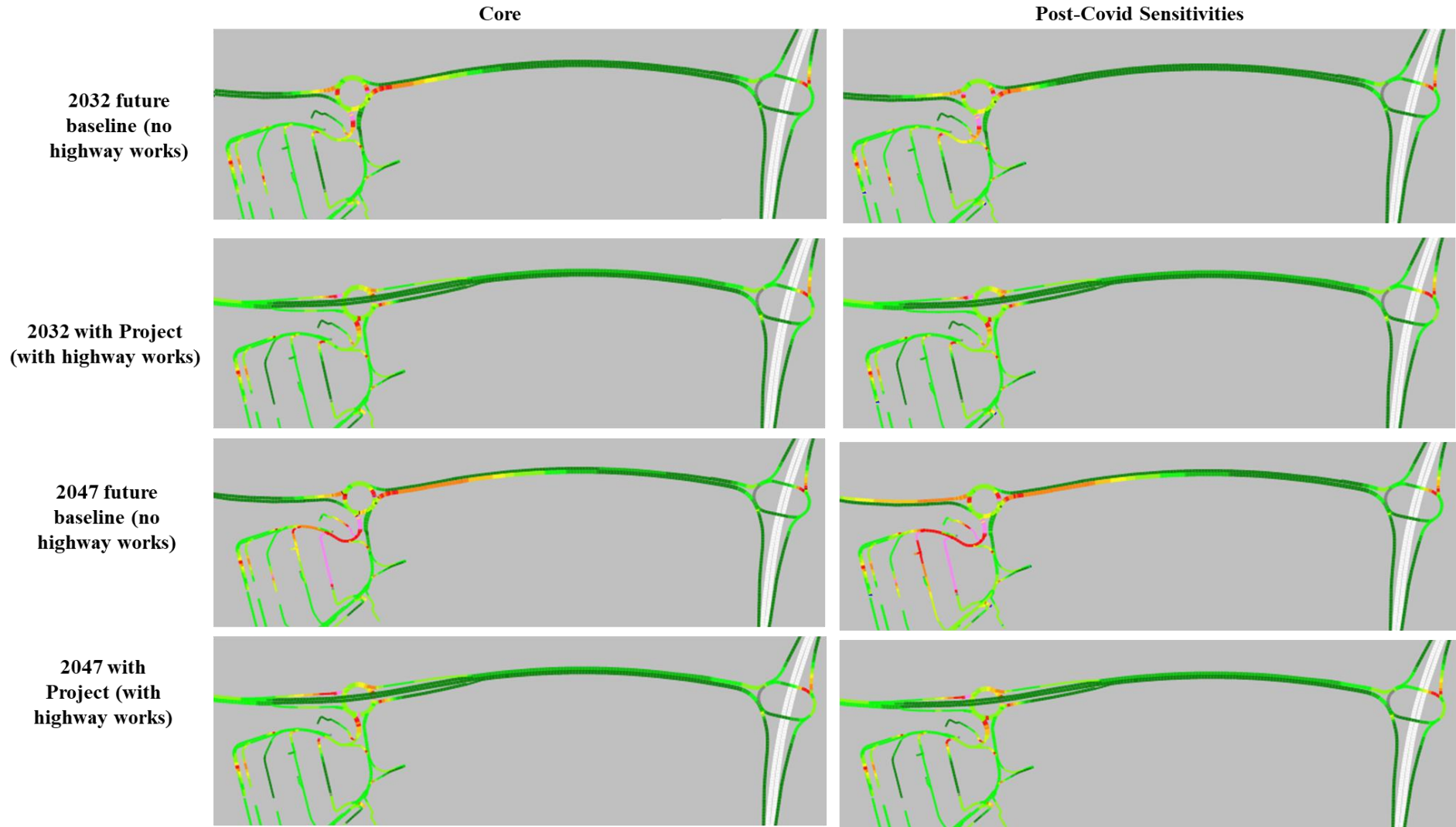
Figure 93: South Terminal Roundabout – 17:00 – 17:30
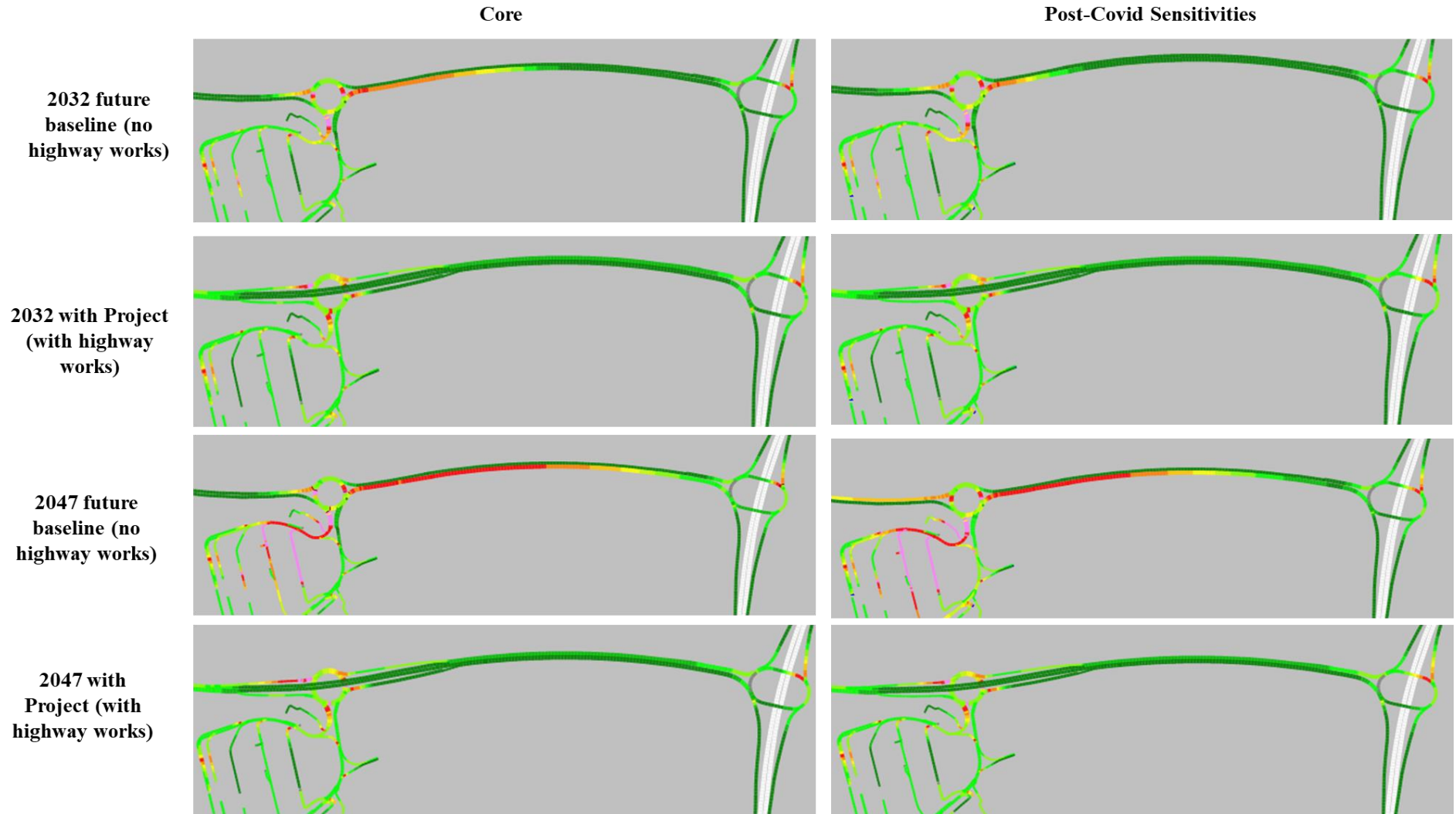
Figure 94: South Terminal Roundabout – 17:30 – 18:00
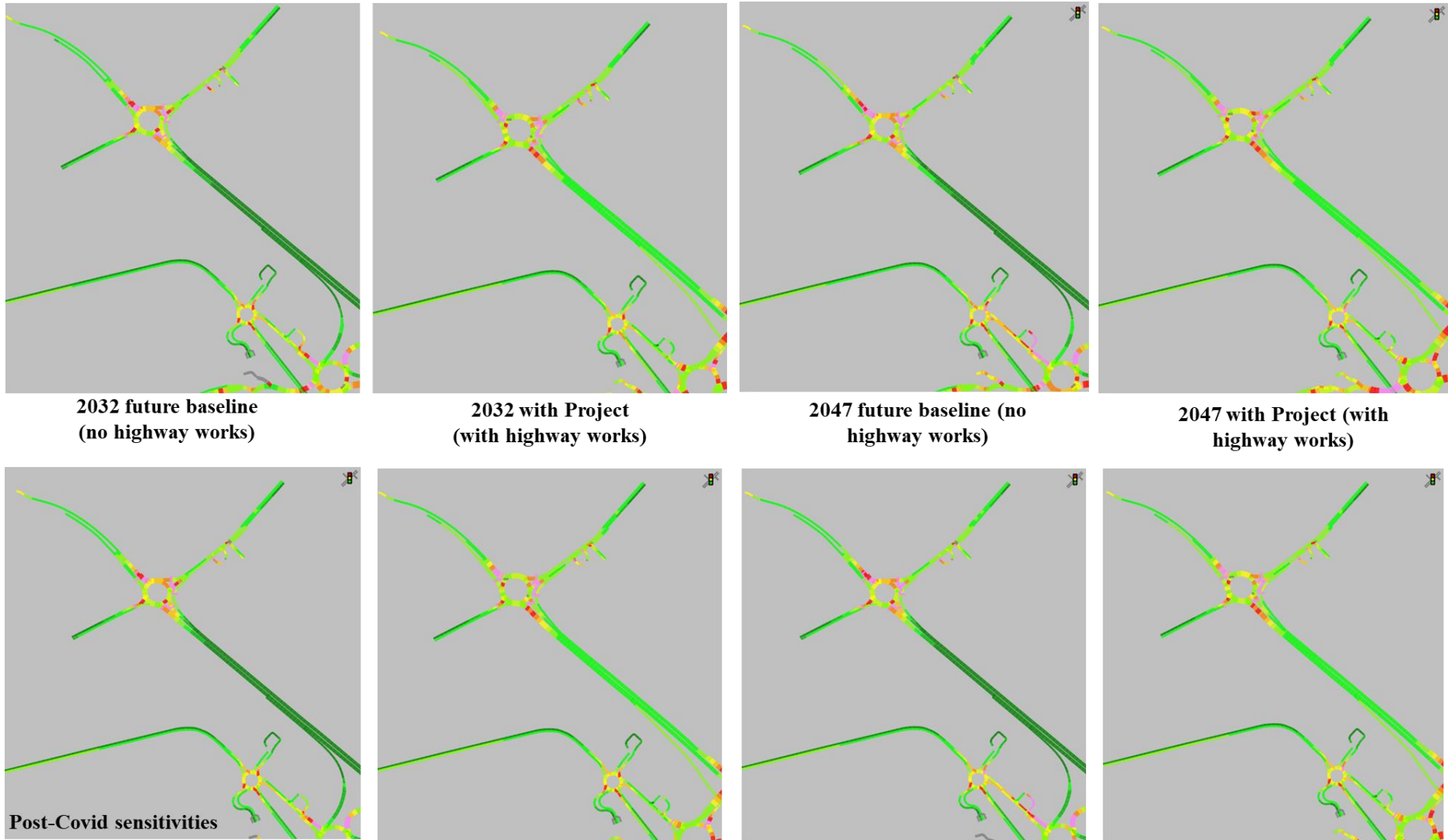
Figure 95: Longbridge Roundabout – 07:00 – 07:30

2032 future baseline
(no highway works)

2032 with Project
(with highway works)

2047 future baseline (no
highway works)

2047 with Project (with
highway works)

Post-Covid sensitivities

Figure 96: Longbridge Roundabout – 07:30 – 08:00

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

Post-Covid sensitivities
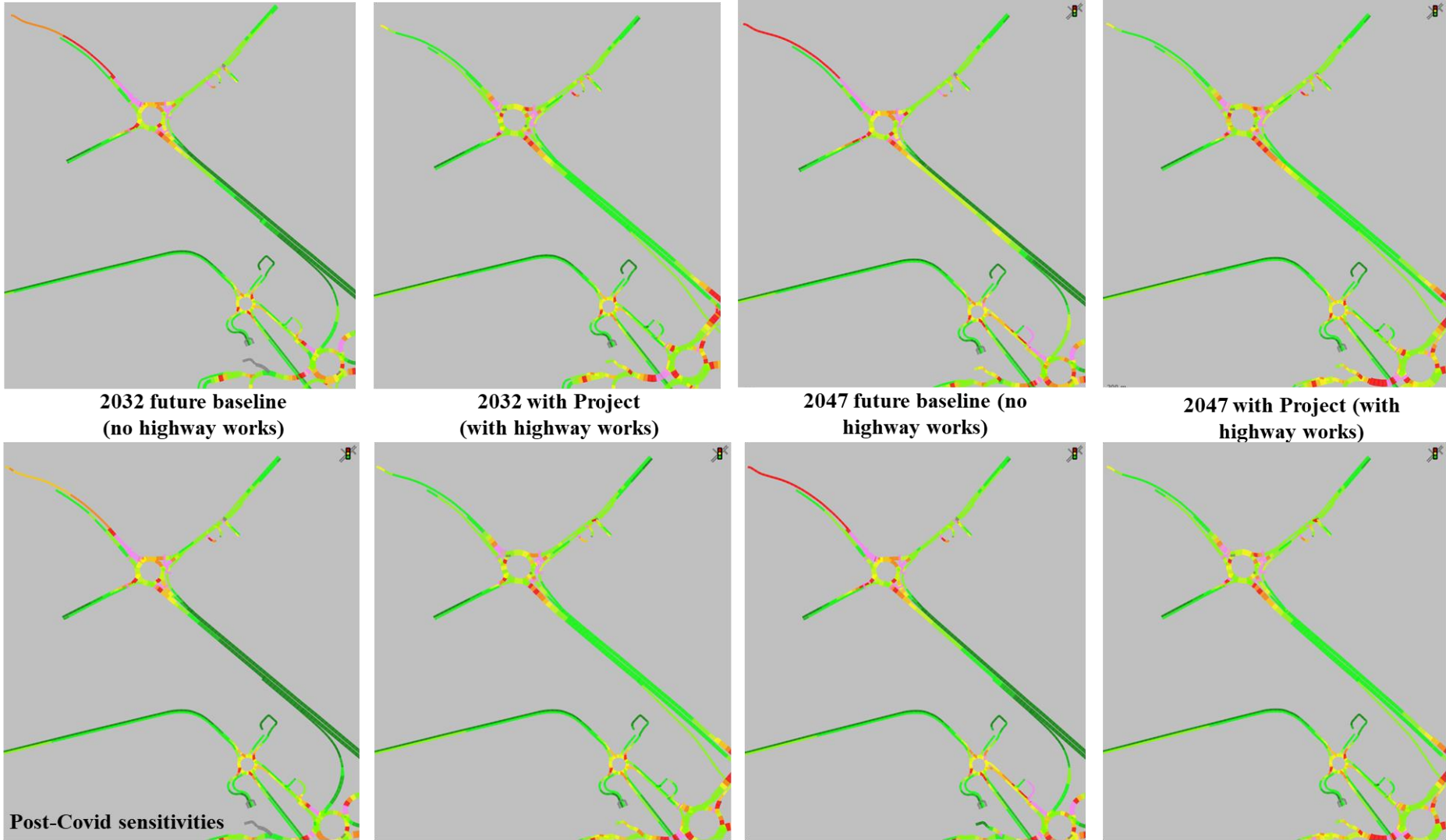
Figure 97: Longbridge Roundabout – 08:00 – 08:30

| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |

Post-Covid sensitivities
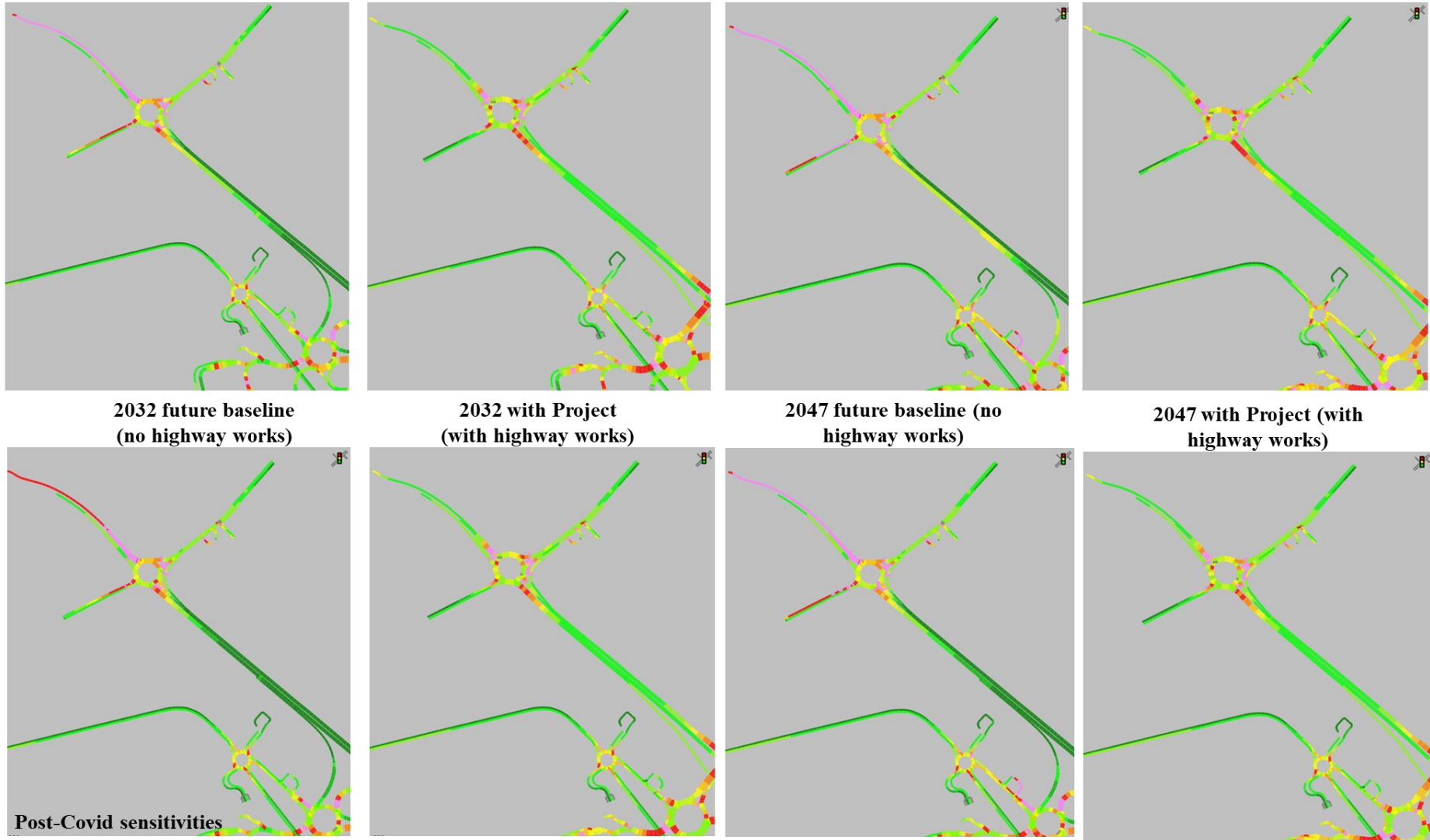
Figure 98: Longbridge Roundabout – 08:30 – 09:00

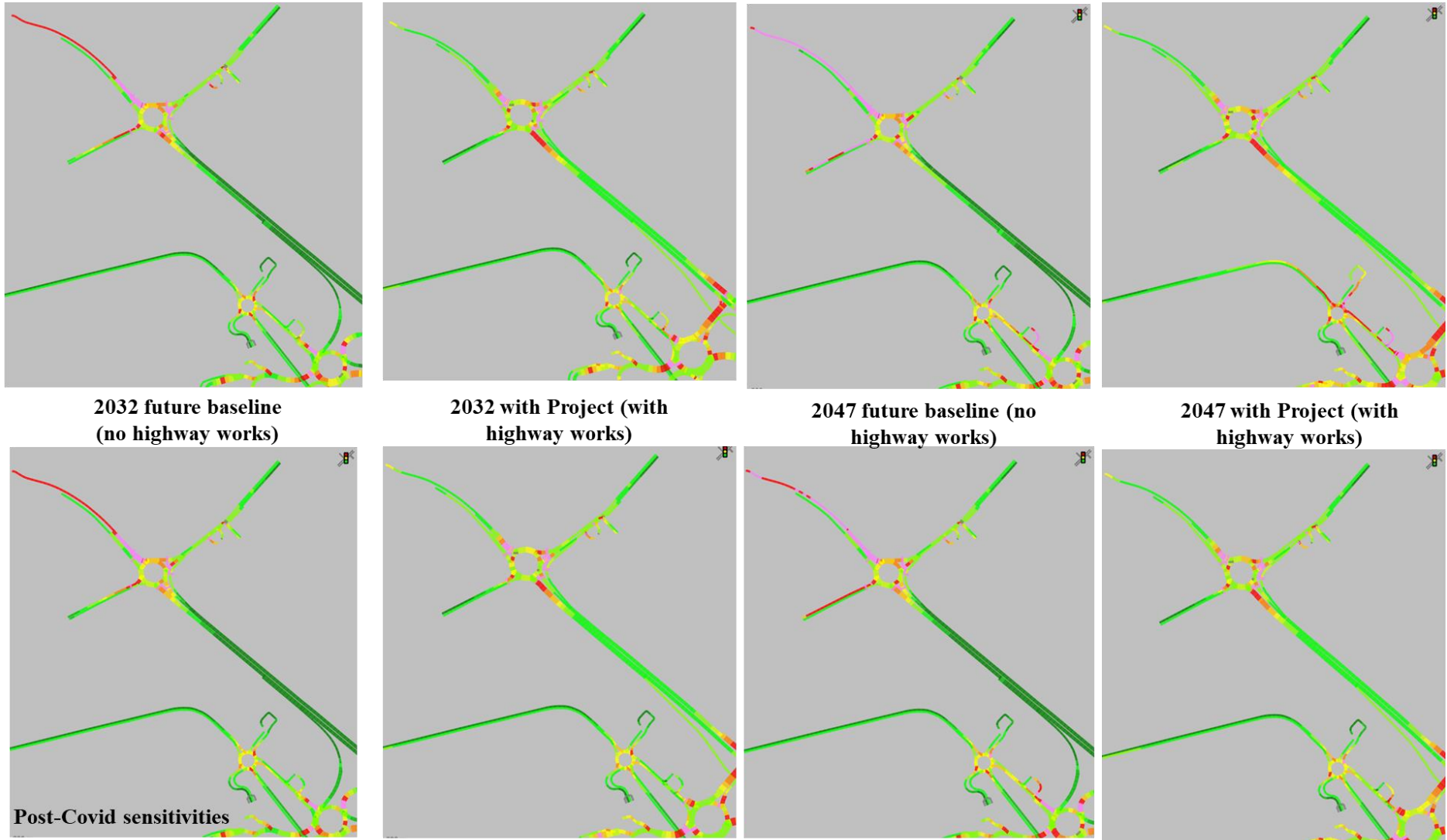| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |

Figure 99: Longbridge Roundabout – 16:00 – 16:30

2032 future baseline
(no highway works)

2032 with Project (with
highway works)

2047 future baseline (no
highway works)

2047 with Project (with
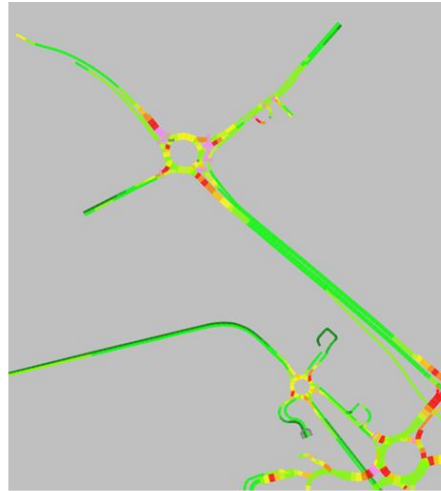highway works)

Post-Covid sensitivities

Figure 100: Longbridge Roundabout – 16:30 – 17:00
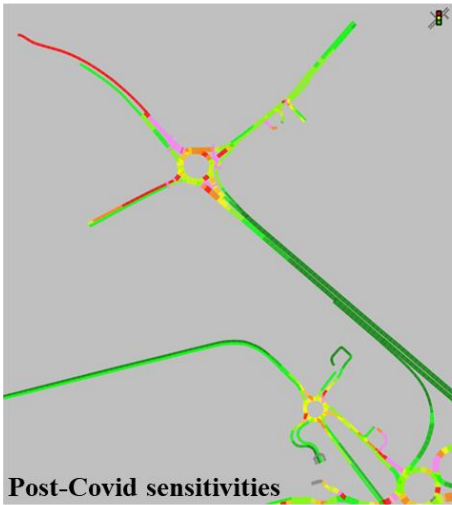

2032 future baseline (no highway works)

2032 with Project (with highway works)

2047 future baseline (no highway works)

2047 with Project (with highway works)

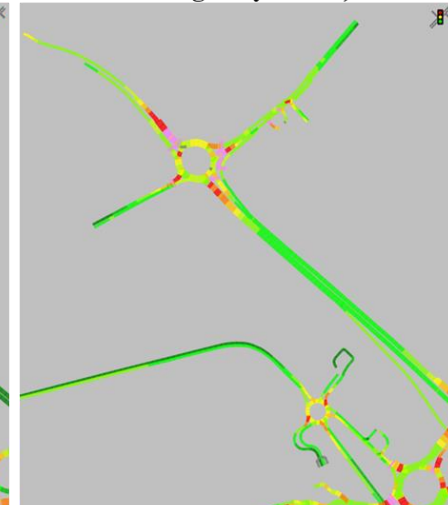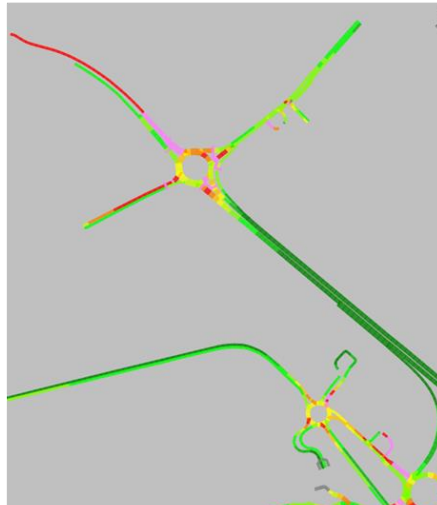Post-Covid sensitivities
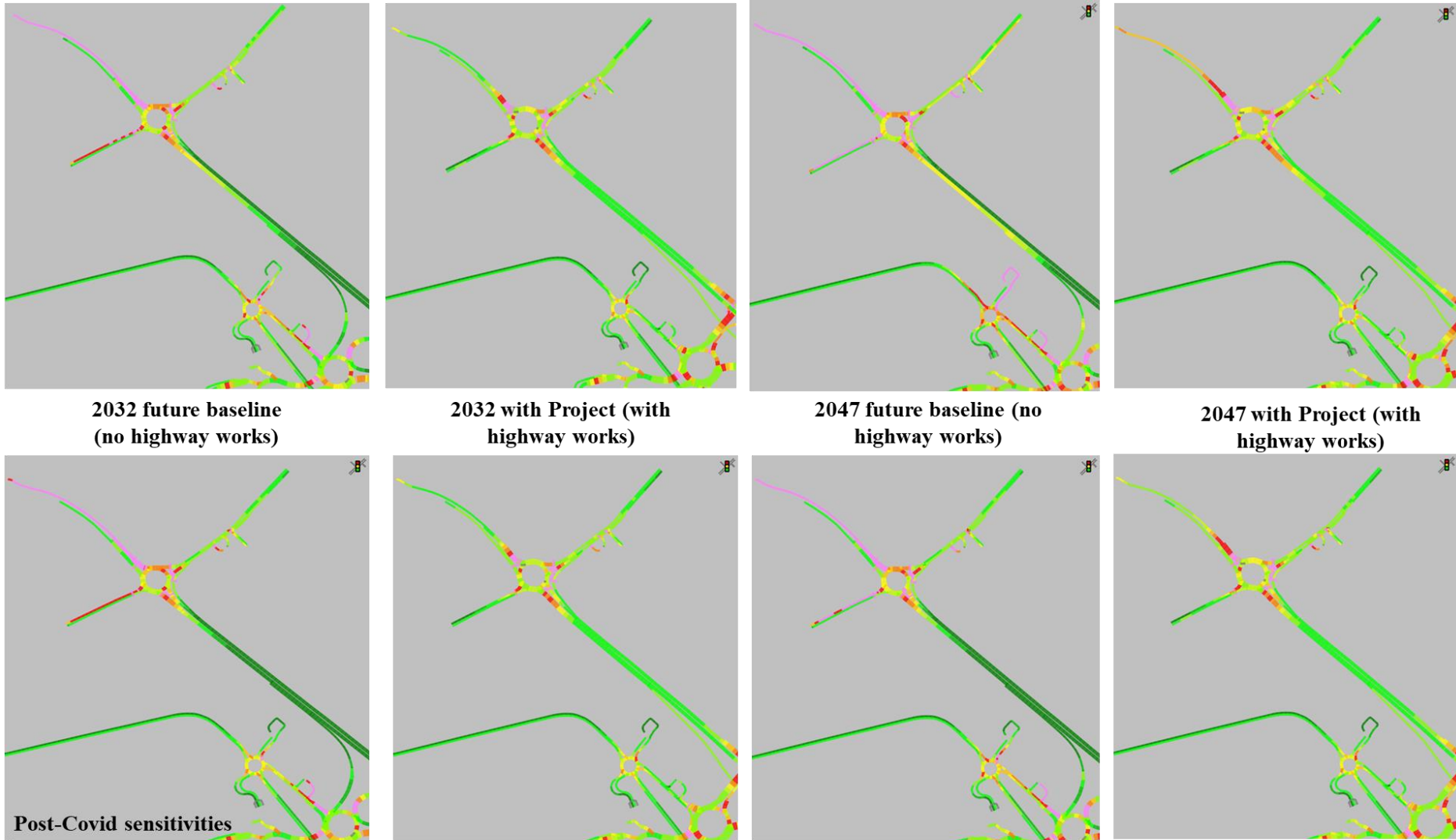
Figure 101: Longbridge Roundabout – 17:00 – 17:30

| 2032 future baseline (no highway works) | 2032 with Project (with highway works) | 2047 future baseline (no highway works) | 2047 with Project (with highway works) |
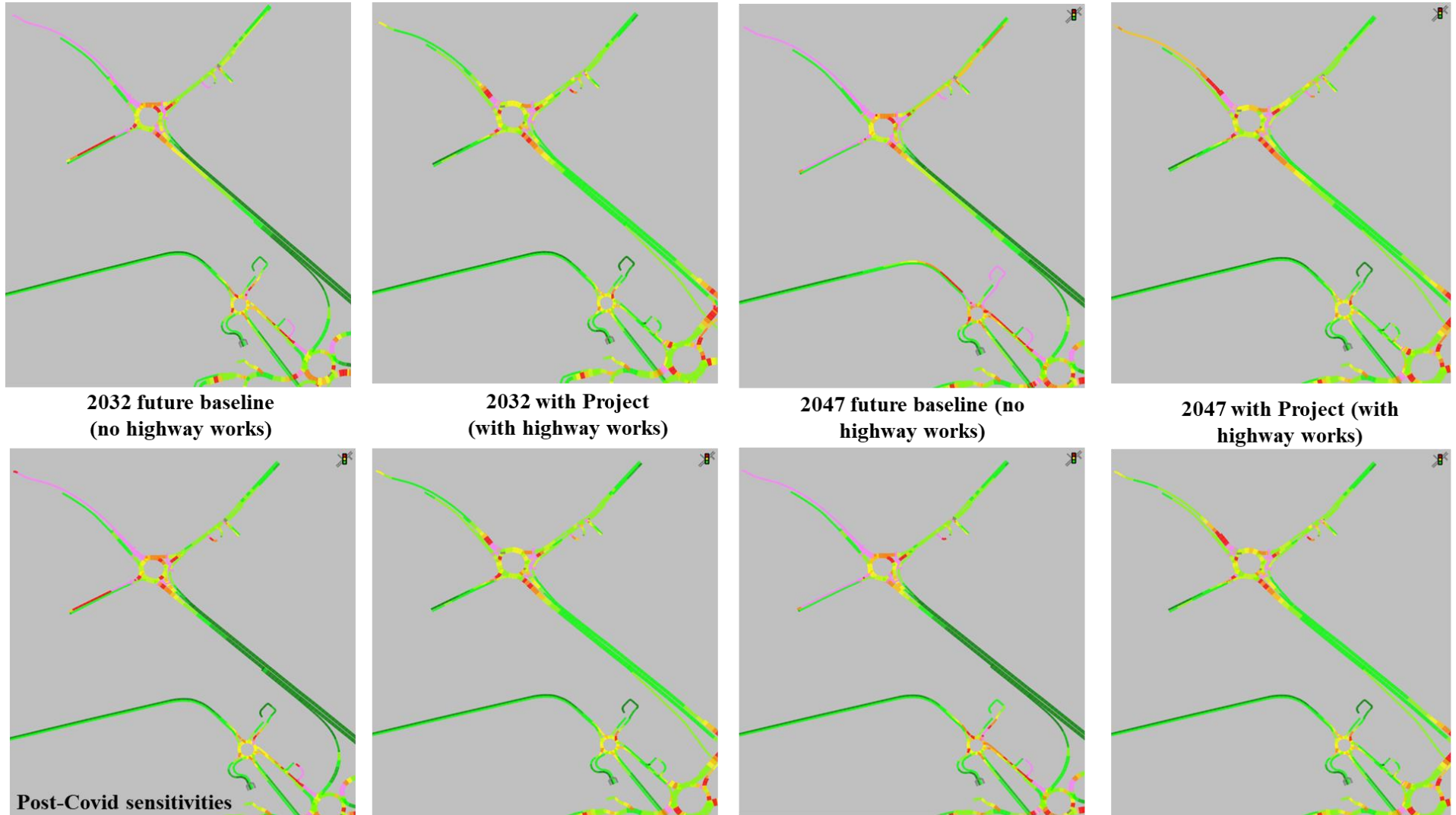
Figure 102: Longbridge Roundabout – 17:30 – 18:00

2032 future baseline (no highway works)   **2032 with Project (with highway works)**   **2047 future baseline (no highway works)**   **2047 with Project (with highway works)**

Post-Covid sensitivities

Figure 103: A23 London Road (at Gatwick Road) – 07:00 – 07:30

Figure 104: A23 London Road (at Gatwick Road) – 07:30 – 08:00

Figure 105: A23 London Road (at Gatwick Road) – 08:00 – 08:30

Figure 106: A23 London Road (at Gatwick Road) – 08:30 – 09:00

Figure 107: A23 London Road (at Gatwick Road) – 16:00 – 16:30

Figure 108: A23 London Road (at Gatwick Road) – 16:30 – 17:00
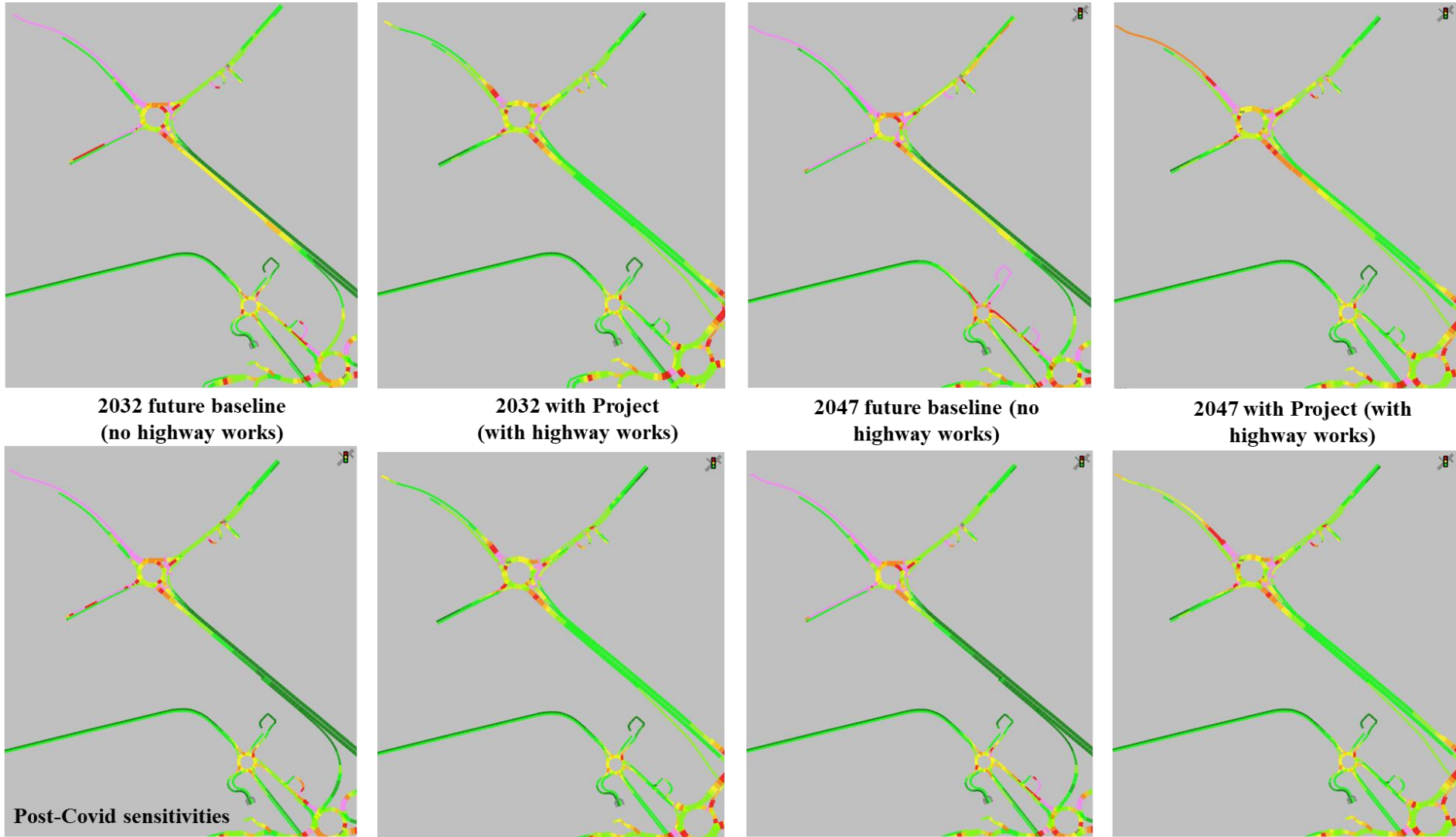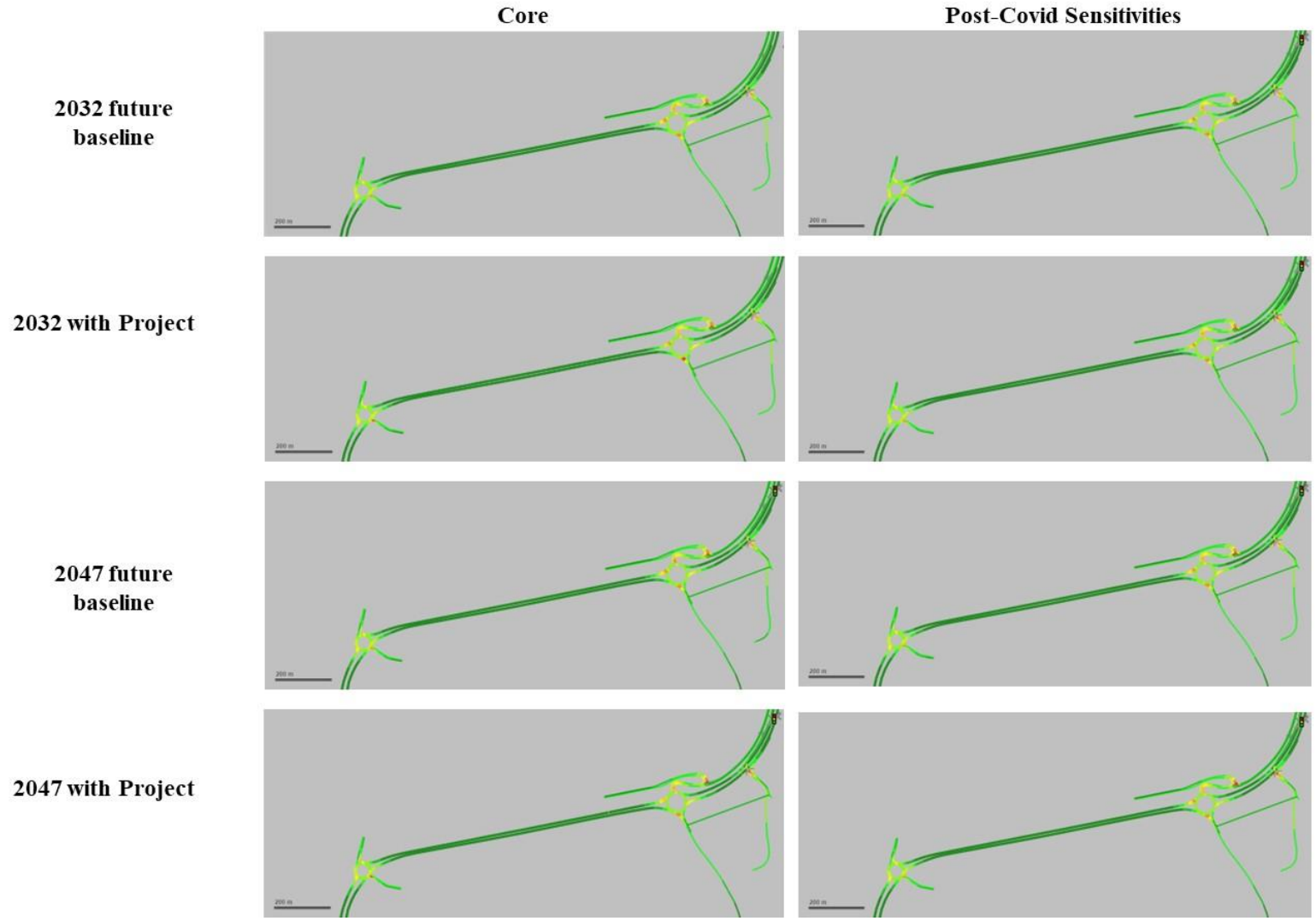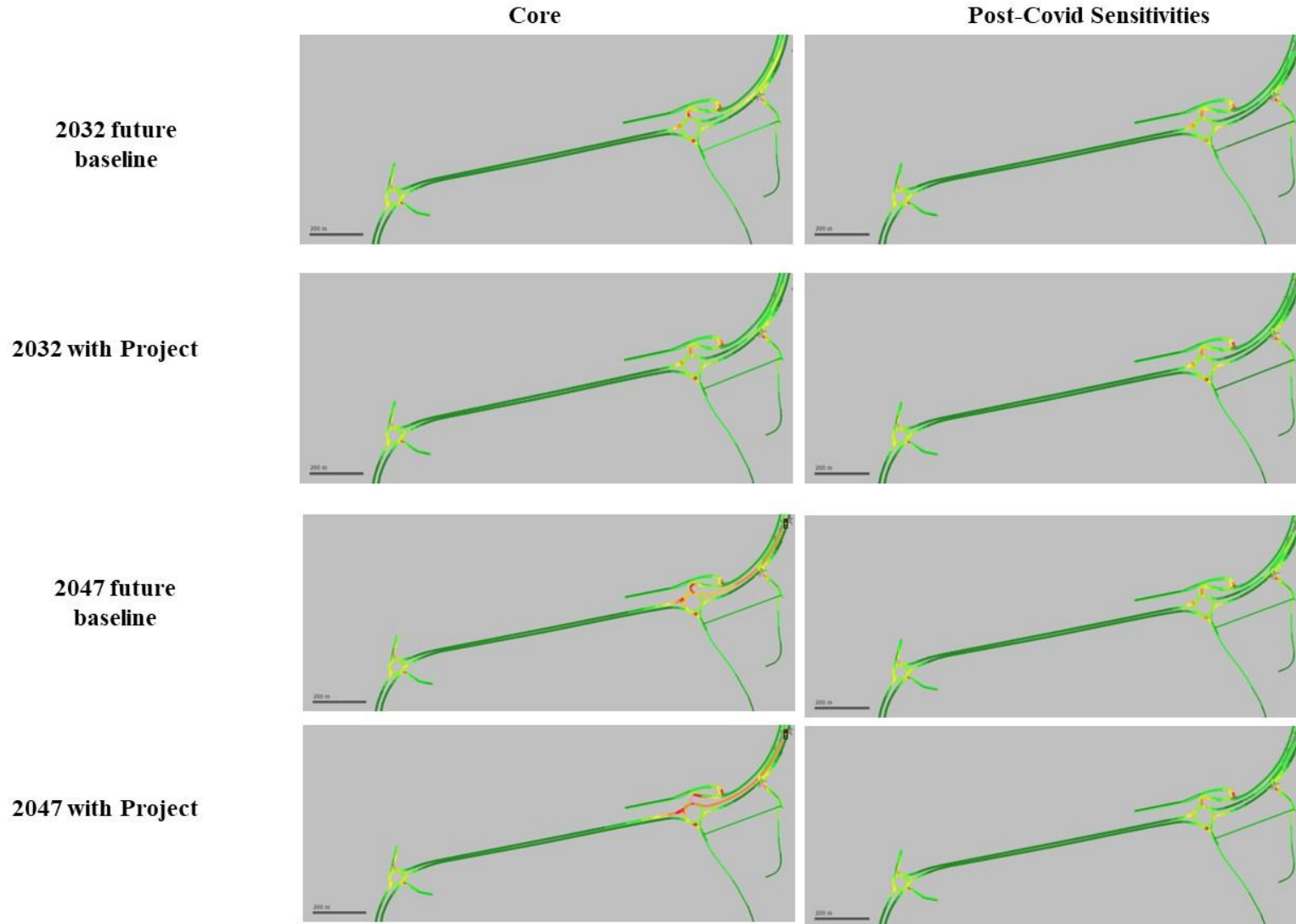
Figure 109: A23 London Road (at Gatwick Road) – 17:00 – 17:30

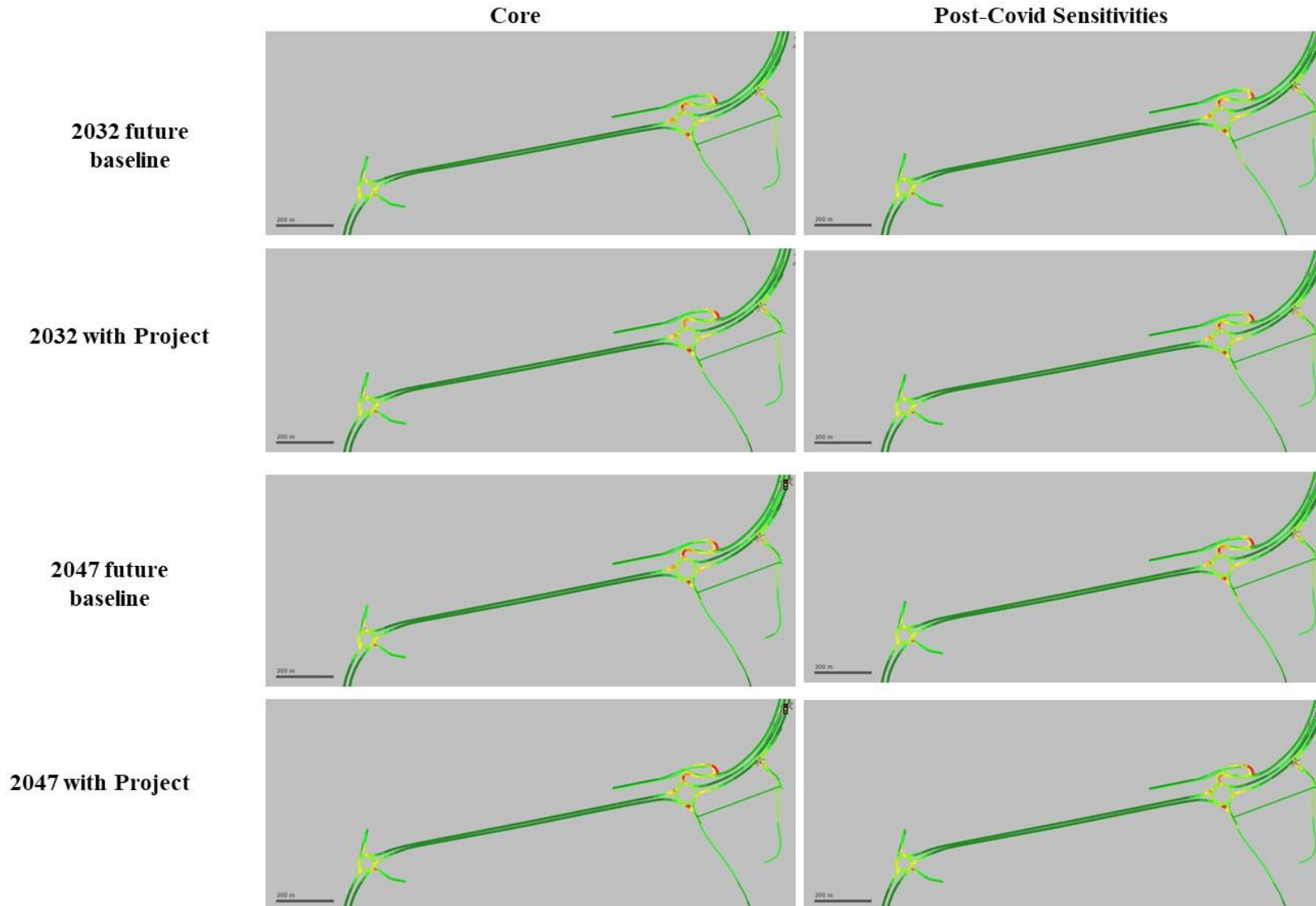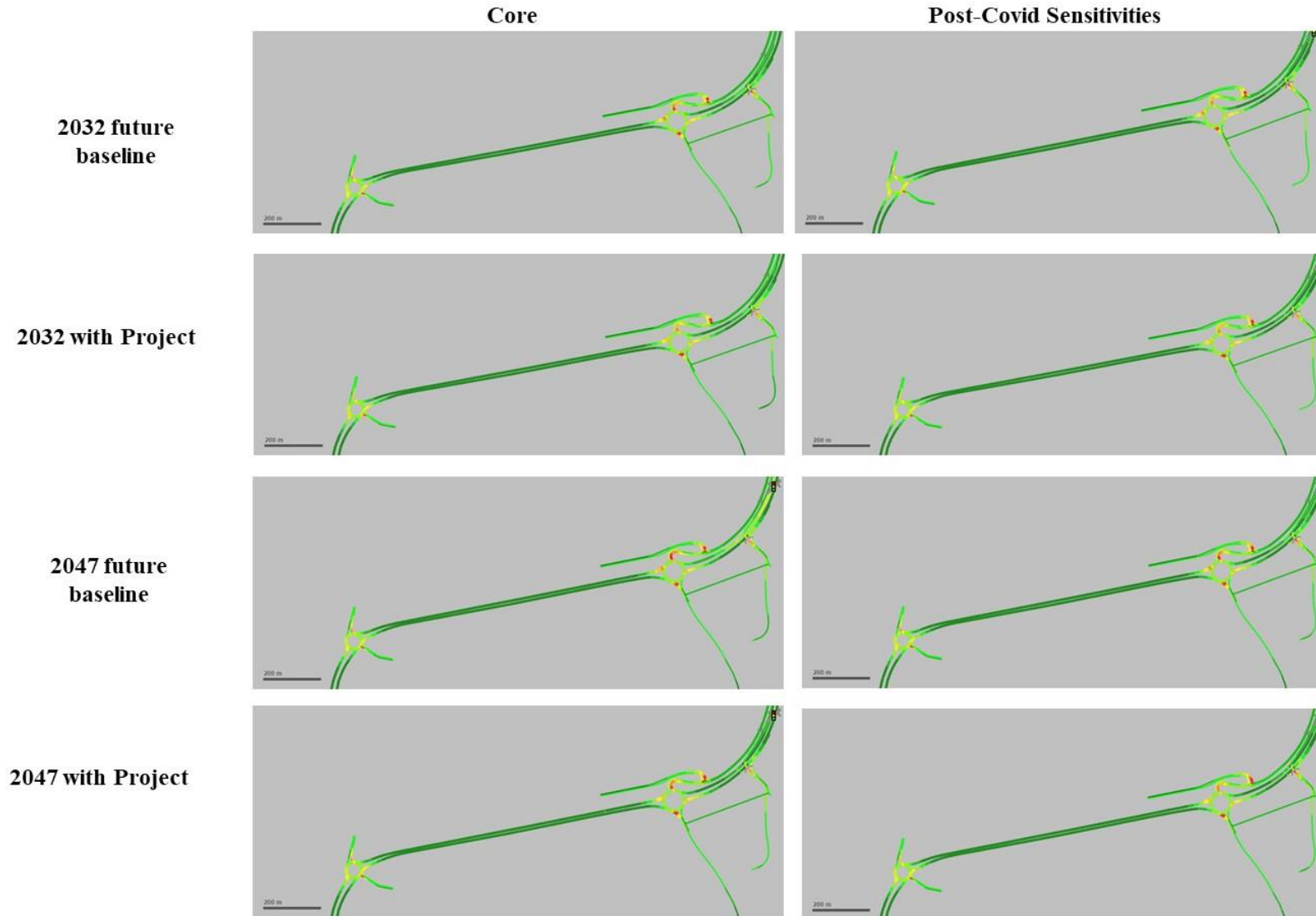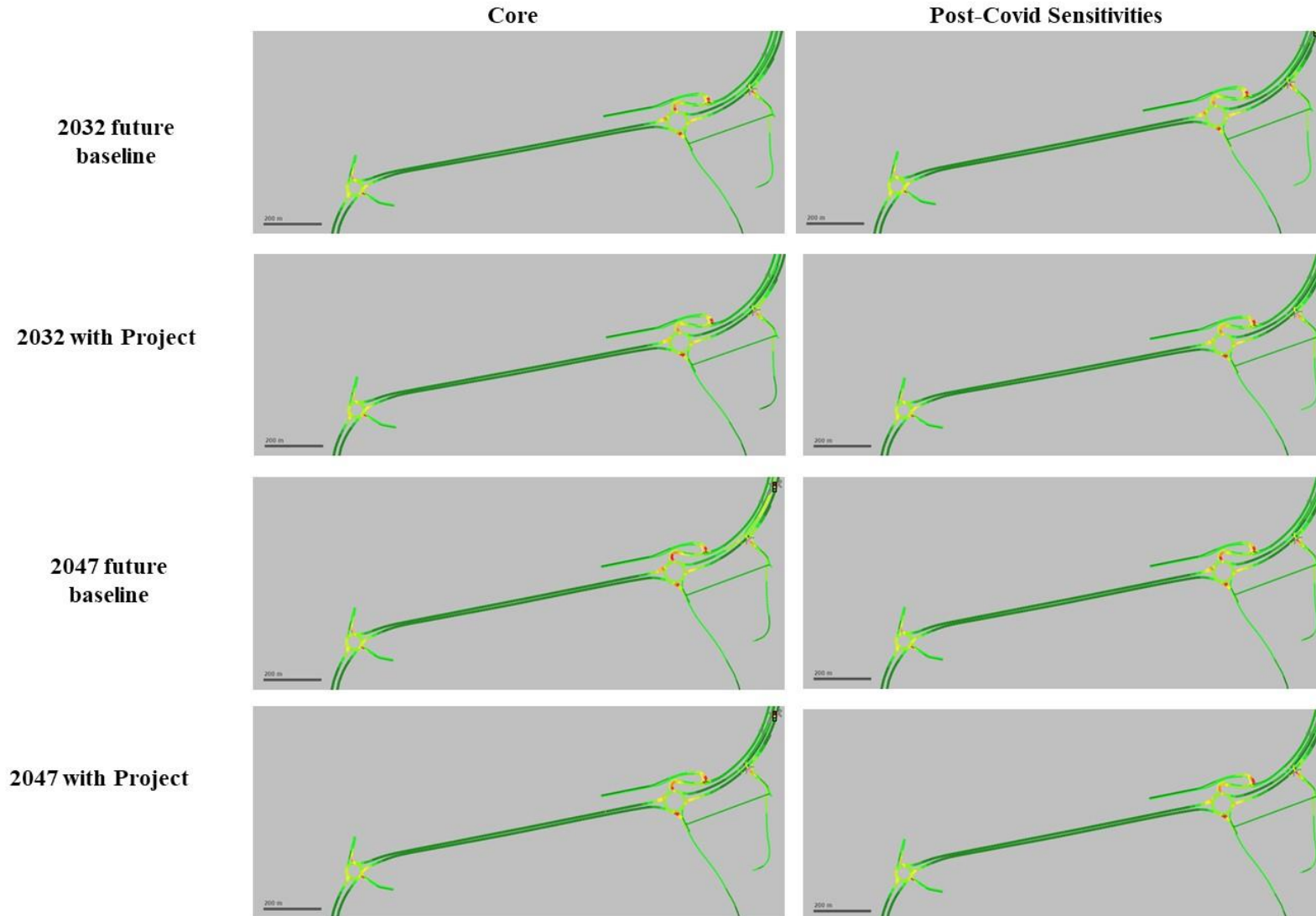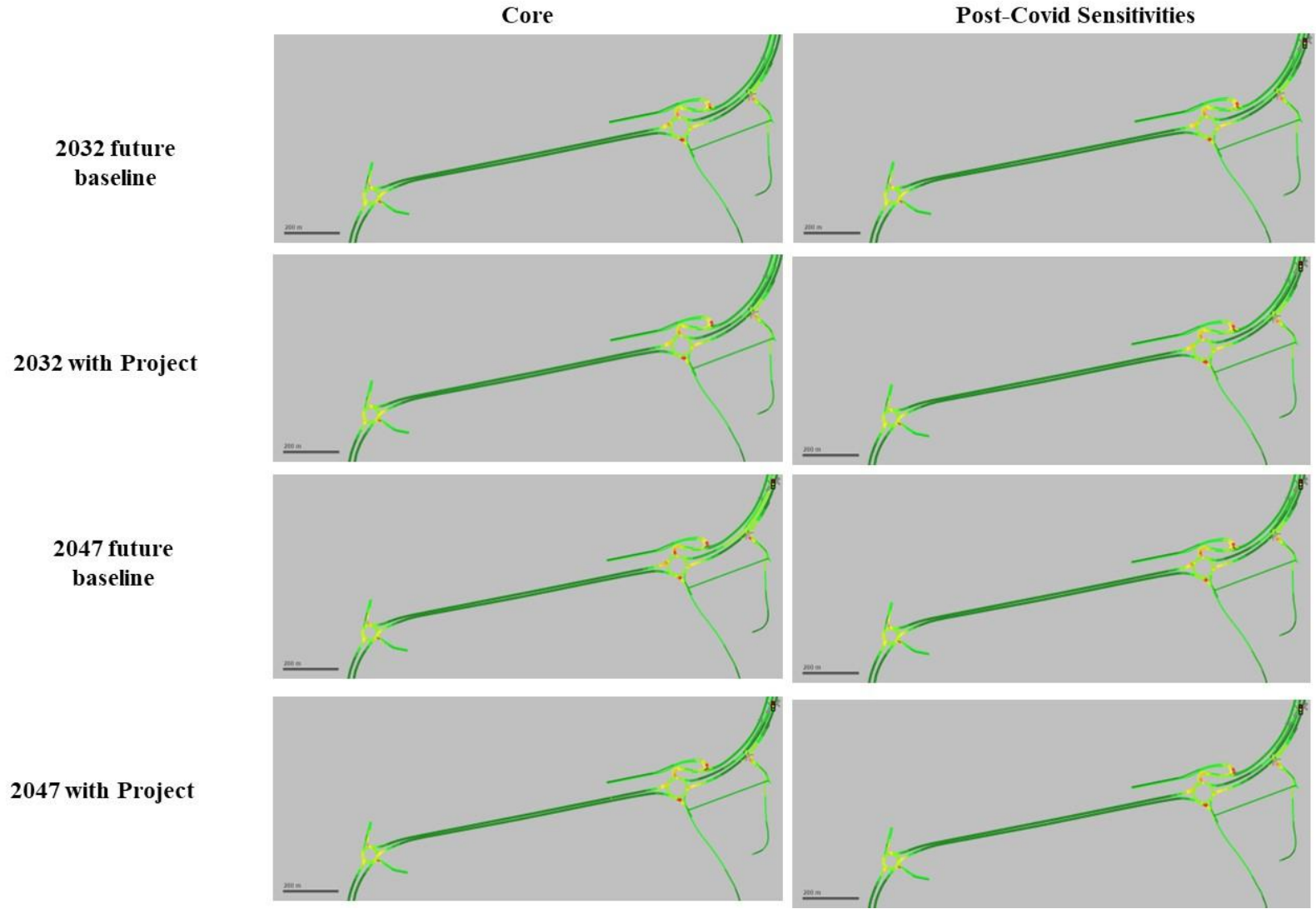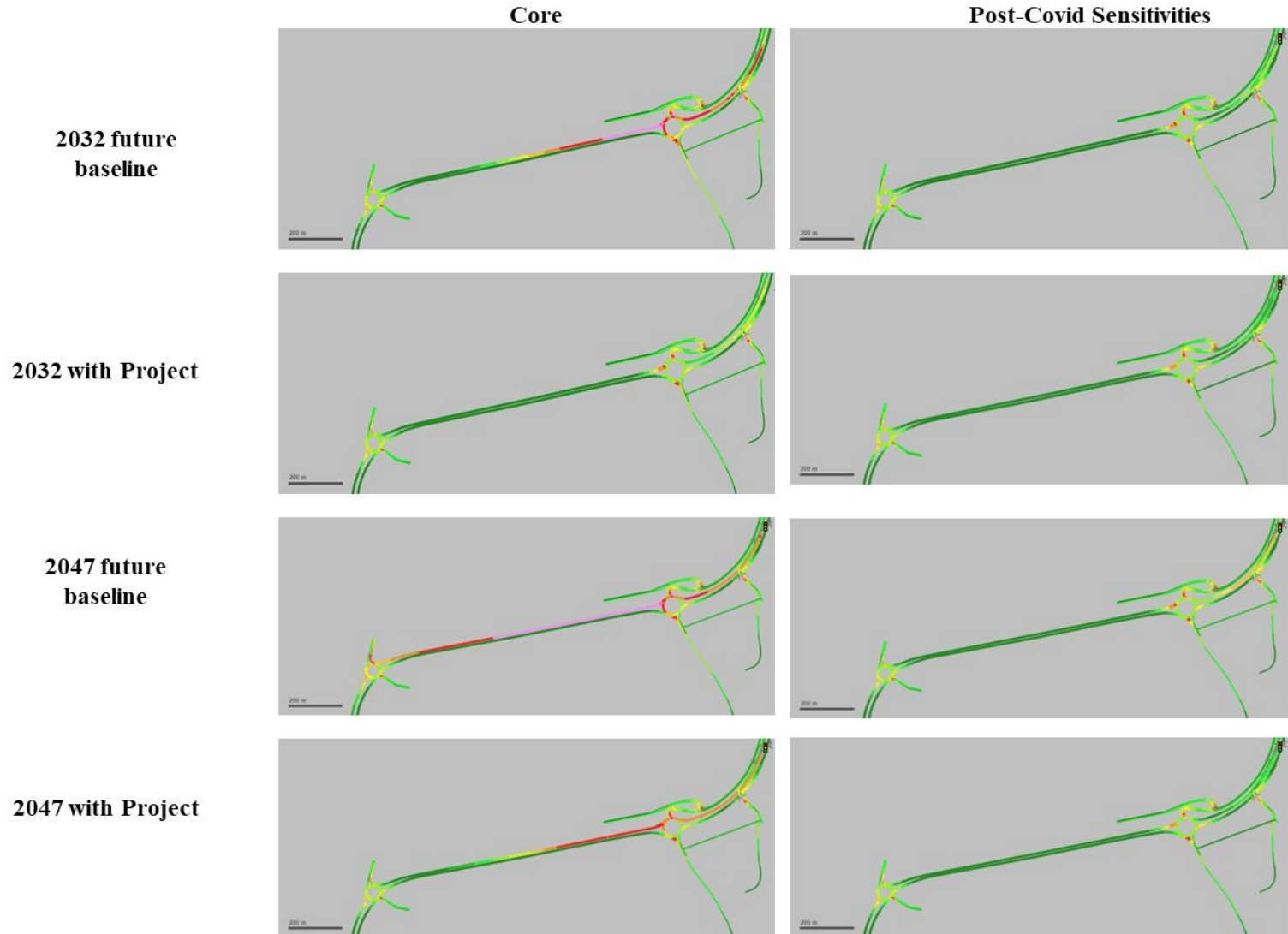**Figure 110: A23 London Road (at Gatwick Road) – 17:30 – 18:00**
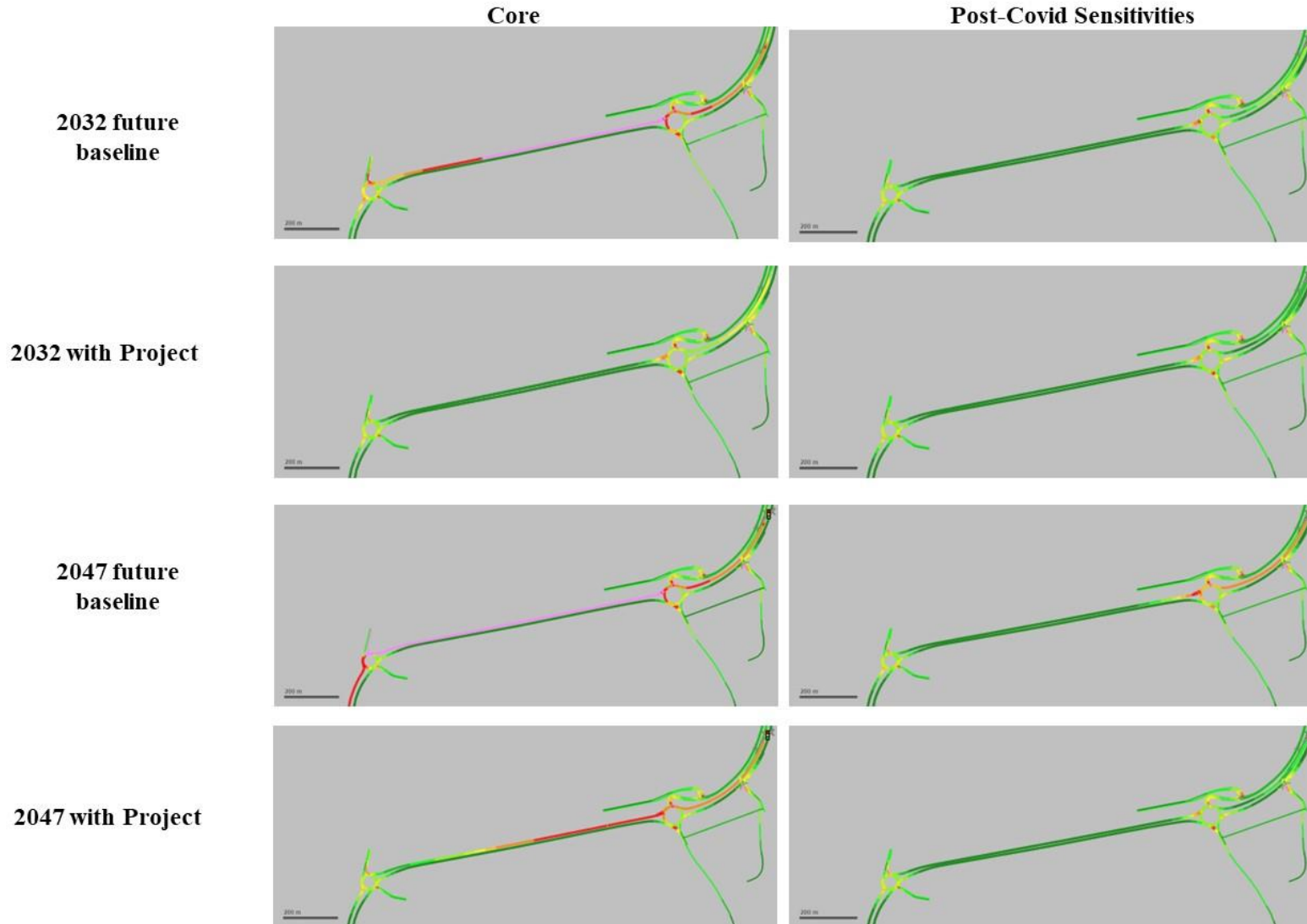
Appendix 4 – Full journey time graph set

Figure 111: M23 North to South Terminal Roundabout

Route 1-3 - M23 North to South Terminal Roundabout

Route 1-3 - M23 North to South Terminal Roundabout

Figure 112: South Terminal Roundabout to M23 North

Route 3-1 - South Terminal Roundabout to M23 North

- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Route 3-1 - South Terminal Roundabout to M23 North

- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Figure 113: Junction 9 to M23 South

Route 7-2 - Junction 9 to M23 South

Legend:
- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Route 7-2 - Junction 9 to M23 South

Legend:
- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Figure 114: M23 South to Junction 9

Route 2-7 - M23 South to Junction 9

- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Route 2-7 - M23 South to Junction 9

- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Figure 115: South Terminal Roundabout to Longbridge Roundabout

Route 3-5 - South Terminal Roundabout to Longbridge Roundabout

Figure 116: Longbridge Roundabout to South Terminal Roundabout

Route 5-3 - Longbridge Roundabout to South Terminal Roundabout

Legend:
- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Figure 117: North Terminal Roundabout to Lowfield Heath Roundabout

Route 4-6 - North Terminal Roundabout to Lowfield Heath Roundabout

Route 4-6 - North Terminal Roundabout to Lowfield Heath Roundabout

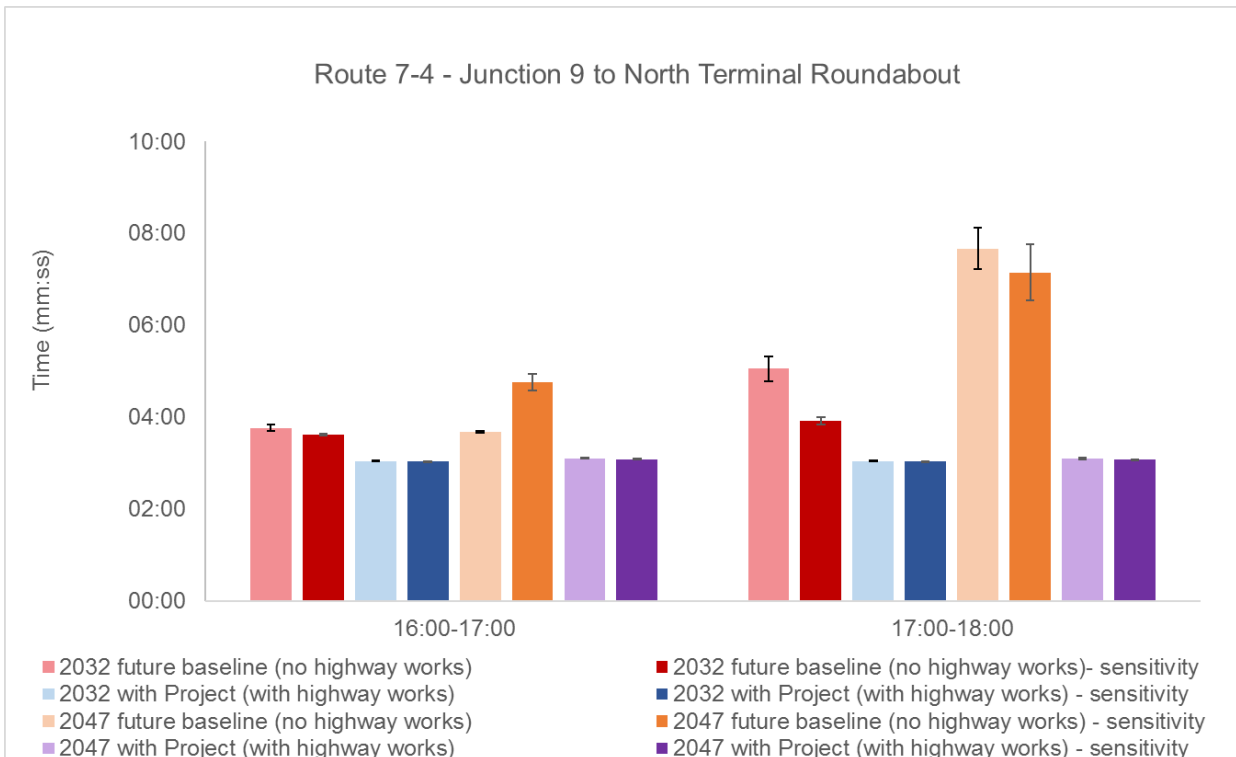**Figure 118: Lowfield Heath Roundabout to South Terminal Roundabout**

Figure 119: North Terminal Roundabout to Junction 9

Route 4-7 - North Terminal Roundabout to Junction 9

- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Route 4-7 - North Terminal Roundabout to Junction 9

- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Figure 120: Junction 9 to North Terminal Roundabout

Route 7-4 - Junction 9 to North Terminal Roundabout

- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Route 7-4 - Junction 9 to North Terminal Roundabout

- 2032 future baseline (no highway works)
- 2032 future baseline (no highway works)- sensitivity
- 2032 with Project (with highway works)
- 2032 with Project (with highway works) - sensitivity
- 2047 future baseline (no highway works)
- 2047 future baseline (no highway works) - sensitivity
- 2047 with Project (with highway works)
- 2047 with Project (with highway works) - sensitivity

Figure 121: Lowfield Heath Roundabout to Longbridge Roundabout

Route 6-5 - Lowfield Heath Roundabout to Longbridge Roundabout

Route 6-5 - Lowfield Heath Roundabout to Longbridge Roundabout
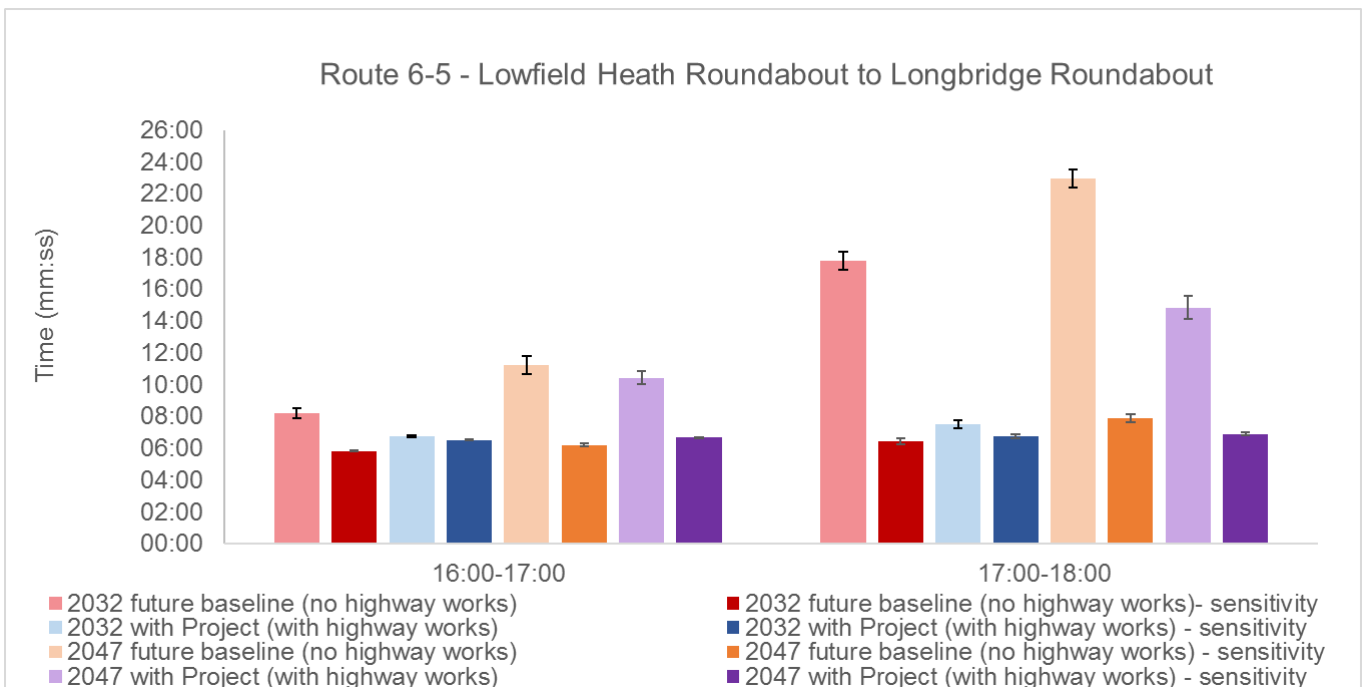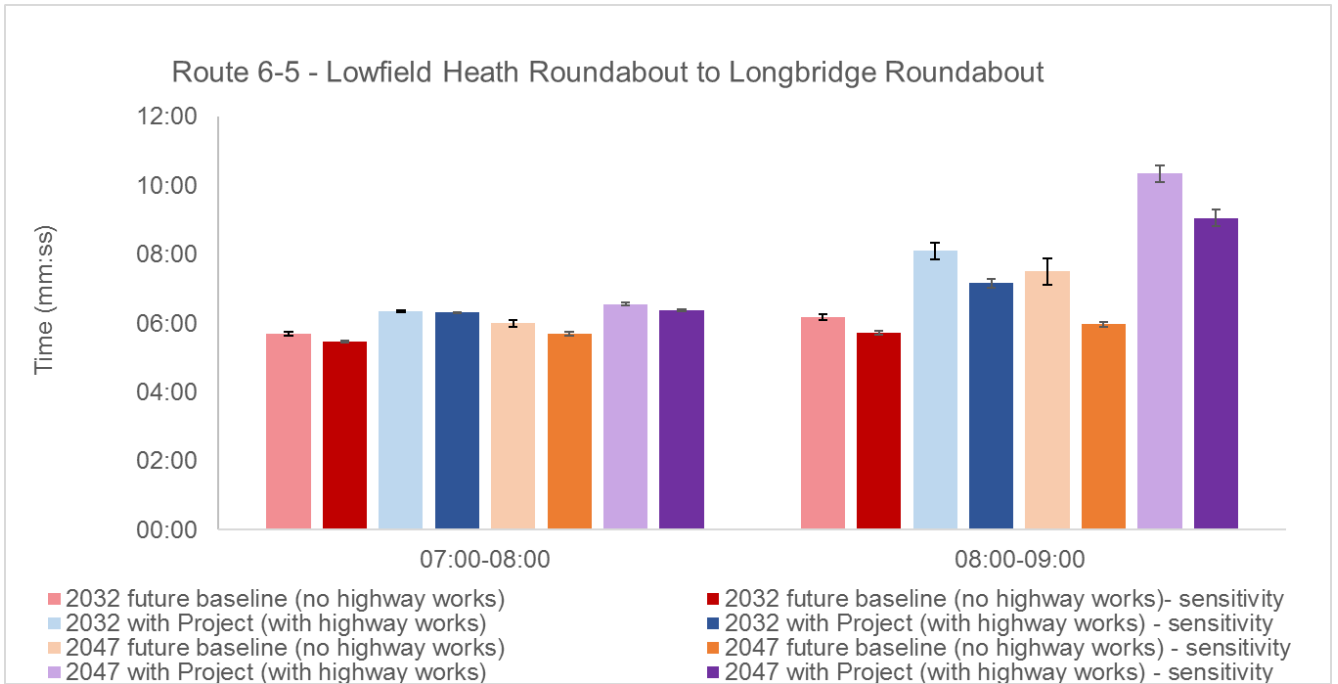
Figure 122: Longbridge Roundabout to Lowfield Heath Roundabout

Route 5-6 - Longbridge Roundabout to Lowfield Heath Roundabout

Route 5-6 - Longbridge Roundabout to Lowfield Heath Roundabout
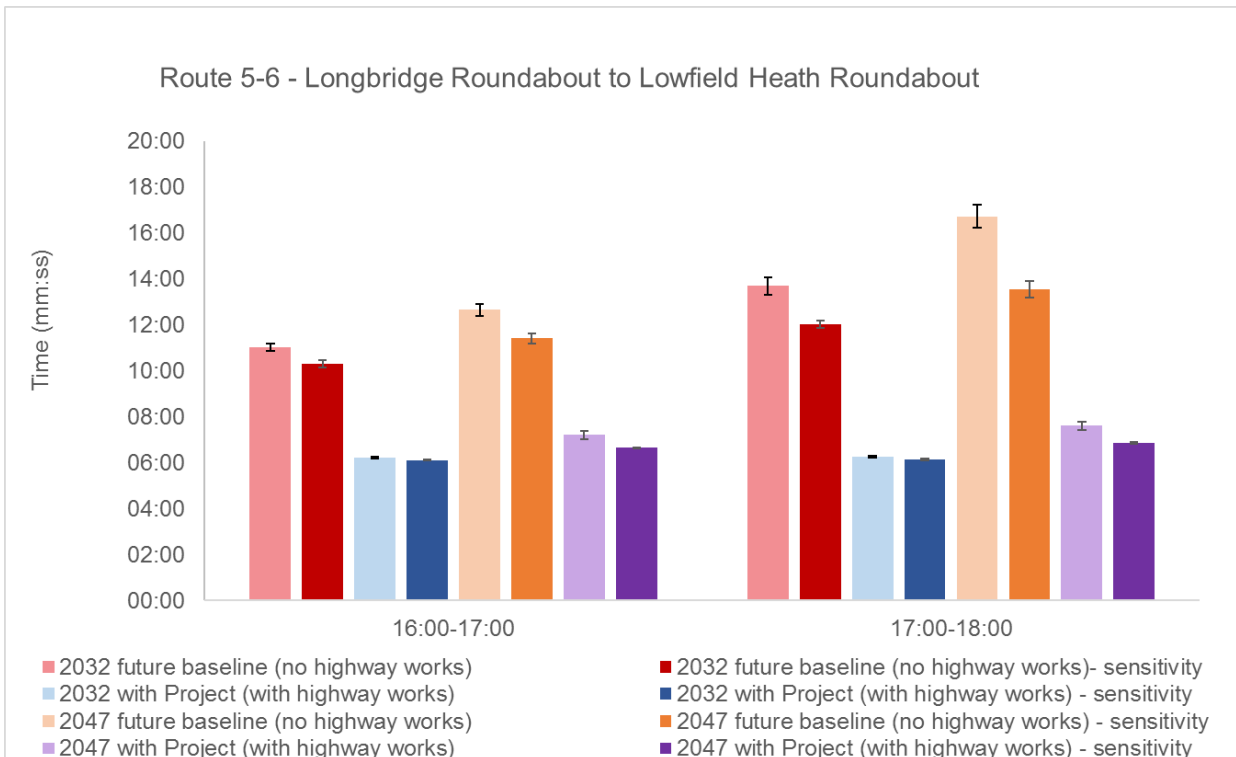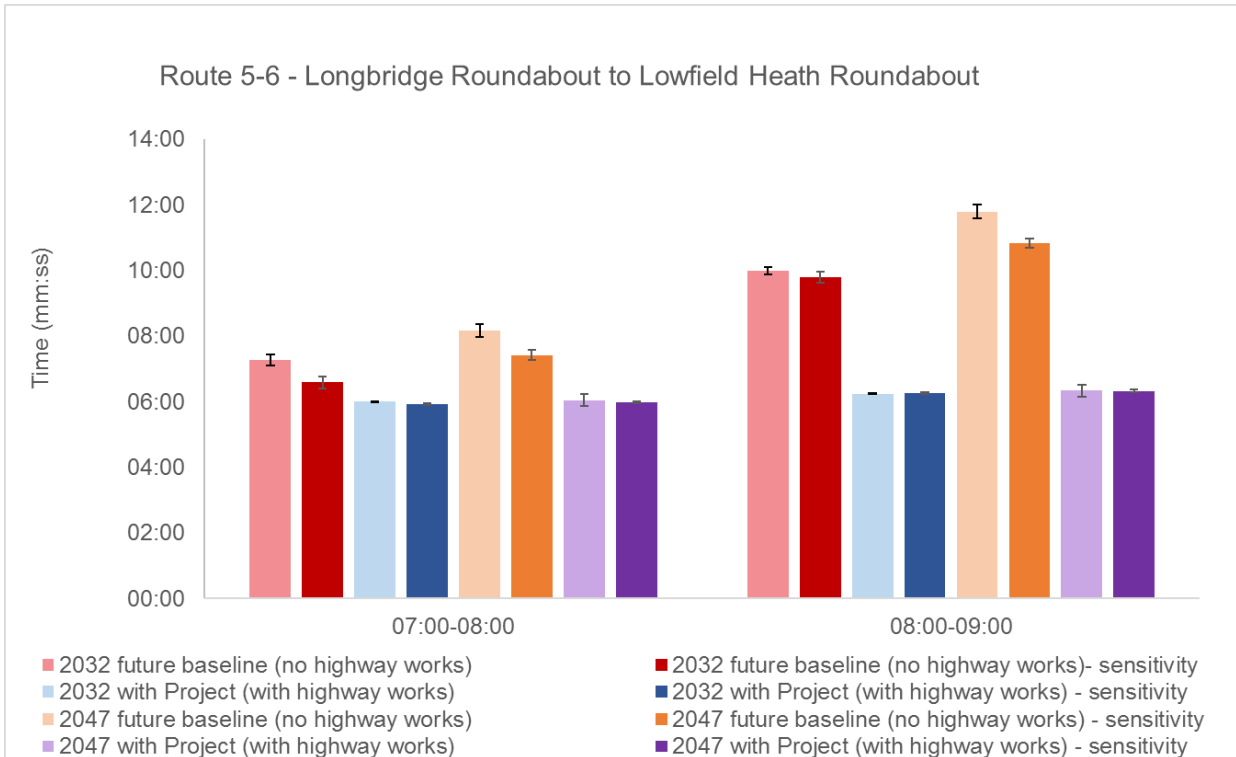
Figure 123: Junction 9 to Longbridge Roundabout
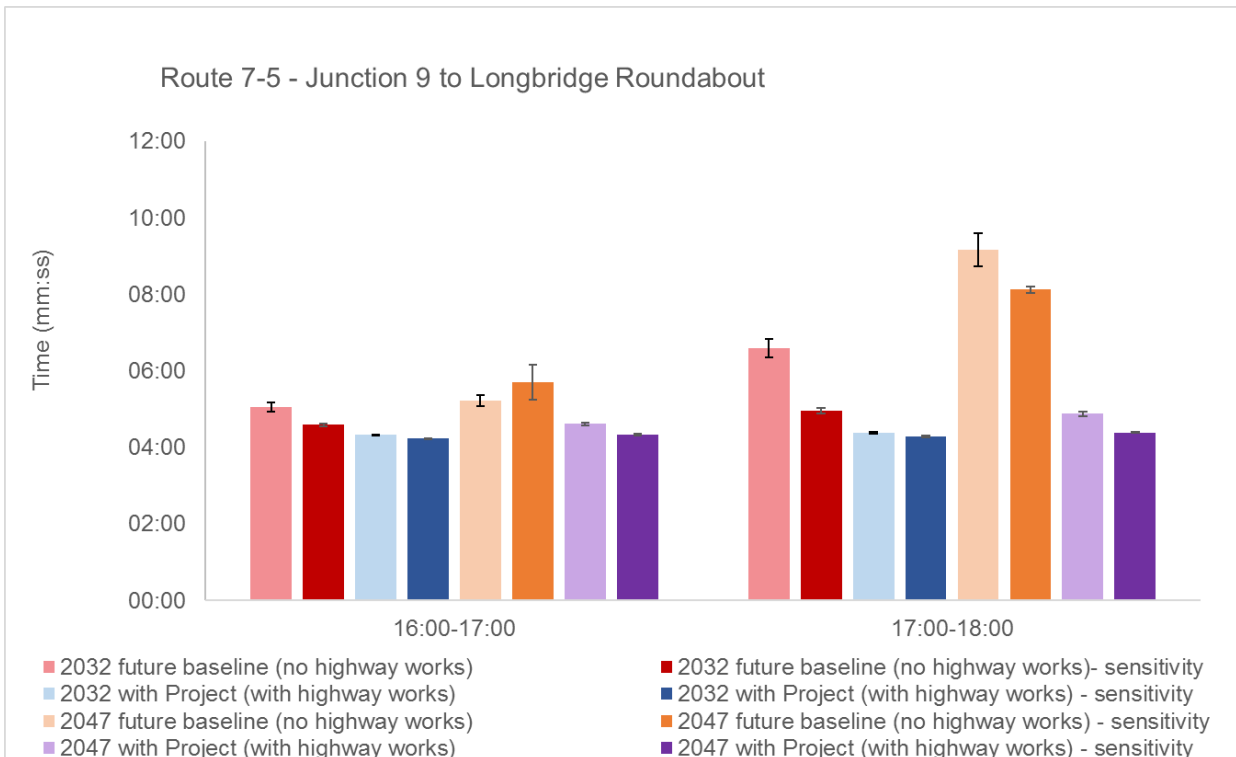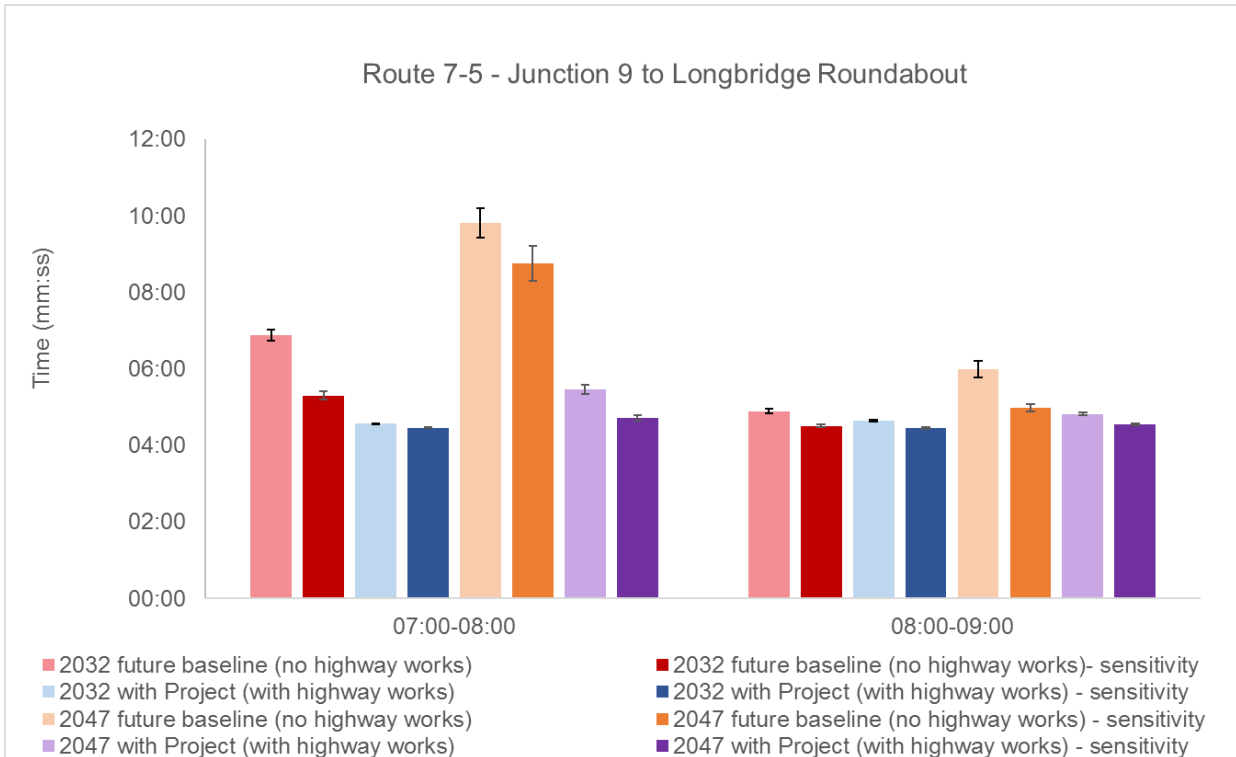
Figure 124: Longbridge Roundabout to Junction 9

Route 5-7 - Longbridge Roundabout to Junction 9

Route 5-7 - Longbridge Roundabout to Junction 9