# Reading Local Plan Partial Update

Highway Modelling

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Prepared for:
Reading Borough Council

Prepared by:
S Ampomah/J Pound

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Prepared by: Ampomah, Samuel Digitally signed by Ampomah, Samuel Date: 2025.05.02 14:47:26 +01'00'

Signature

Samuel Ampomah

Printed Name

Reviewed by: Pound, Jamie Digitally signed by Pound, Jamie Date: 2025.05.06 09:00:15 +01'00'

Signature

Jamie Pound

Printed Name

Approved by: Gebbett, Paul Digitally signed by Gebbett, Paul Date: 2025.05.06 09:21:35 +01'00'

Signature

Paul Gebbett

Printed Name

# Contents



# Figures



# Tables

## Appendices

# 1 Introduction

## 1.1 Overview

1.1.1 Stantec were commissioned by Reading Borough Council (RBC) to support in provision of the transport evidence base for Reading Local Plan Partial update.

1.1.2 This report sets the transport modelling that has been undertaken to support the transport evidence base for the Reading Borough Council Local Plan Partial Update.

1.1.3 The overall approach to the development of the transport evidence base is in line with the latest guidance, including the National Planning Policy Framework, which seeks a vision-led approach to assessing the impact of future development on the transport networks.

## 1.2 Reading Transport Model

1.2.1 The Reading Transport Model (RTM) is a highway model which has been developed within industry recognised software package, known as SATURN.

1.2.2 The model was originally validated with a model base year of 2015, and it is noted that this model is now quite old and will not take account of the impacts of COVID. Therefore, a model verification exercise has been undertaken. The purpose of this exercise was to demonstrate the suitability of the model for use to assess the impacts of the Local Plan developments on the highway network within Reading and the surrounding area, including the neighbouring authorities of Wokingham, West Berkshire and South Oxfordshire and on the Strategic Road Network, managed by National Highways, which in this case is limited to the M4 motorway.

1.2.3 The model is peak hour covering the AM peak hour (08:00-09:00) and the PM peak hour (17:00-18:00). It also includes a 1 hour warm up period before each peak hour.

1.2.4 The model has separate origin and destination trip matrices for the following:

- Light Vehicle – Commute
- Light Vehicle – Employers Business
- Light Vehicle - Other Trip Purpose
- Heavy Goods Vehicles (HGV).

## 1.3 Model Verification and Proportionality

1.3.1 Given the scale of development that is being promoted through the Partial Local Plan update it was felt that a proportionate approach to highway modelling should be undertaken. This involved a model verification exercise, which is detailed within Section 2.

1.3.2 The proposed development is focused on the town centre where expected car trip generation would be relatively low and, in many cases, involves conversion of existing office space to residential. This means that the expected number of new vehicle trips is low and therefore the resultant impacts are likely to be small. This is demonstrated through the outputs of the report.

1.3.3 The outputs presented within this report demonstrate that the proportionate approach taken is the correct approach for the purposes of understanding the impacts of the Local Plan development, both on Reading's highway network and within surrounding authorities and on the Strategic Road Network.

# 2 Model Verification Exercise

## 2.1 Introduction

2.1.1 This verification has been focused on the AM and PM peak hour models and consisted of the following steps:

- Undertake a data collection exercise – collection new traffic counts on screenlines and cordons within the model area. These counts were undertaken in October 2024.
- Obtaining journey time data for October 2023 from Inrix (data provided by Reading Borough Council) and extracting observed journey times on routes matching the original 2015 model validation.
- Updating the SATURN network to include any recent (post 2015) schemes that have been implemented, up to the date of new data collection.
- Assigning the 2015 matrices to the updated networks and undertaken initial checks comparing modelled flows and journey times against the new data.
- Undertaking a calibration exercise where necessary to better match modelled and observed data.

## 2.2 Model Updates

### Infrastructure

2.2.1 Transport infrastructure schemes that have been delivered between 2015 and 2024 has been coded into the model network, to represent the network position in 2024.

2.2.2 These schemes are listed below:

- A33 Mass Rapid Transit bus lanes
- Sidmouth Street cycle lanes
- Reading Bridge cycle lanes
- London Road bus lane between Cemetery Junction and the A329(M)
- M4 Smart Motorway
- Provision of fully segregated cycle tracks along the A327 Shinfield Road from the junction with Elmhurst Road to Shinfield Rise in Reading
- Bus Service Infrastructure Plan (BSIP) Oxford Rd scheme at Bedford Rd junction, eastbound approach capacity reduced
- Changes to the eastbound approach to Norcot Roundabout

### Developments

2.2.3 No adjustments were made to the matrices to account for new developments.

## 2.3 Data

2.3.1 To support the model verification exercise new traffic count data was collected, along with journey time data which was obtained from Inrix.

2.3.2 No additional origin and demand data was collected and therefore the starting point was the same origin and destination patterns as seen within 2015.

## 2.4 Traffic Counts

2.4.1 Traffic count data was collected using automatic traffic counts collected for a two-week period during October 2024. The surveys avoiding school half term holidays and therefore represent a suitable neutral period.

2.4.2 On receipt of the data, checks for outliers and suitability was undertaken and data for Tuesday, Wednesday and Thursday for each of the two weeks, used for the model verification.

The 17 count sites were combined to for four cordons within the model area. The count locations and the screenlines are shown in Figure 2-1 and listed in Table 2-1.

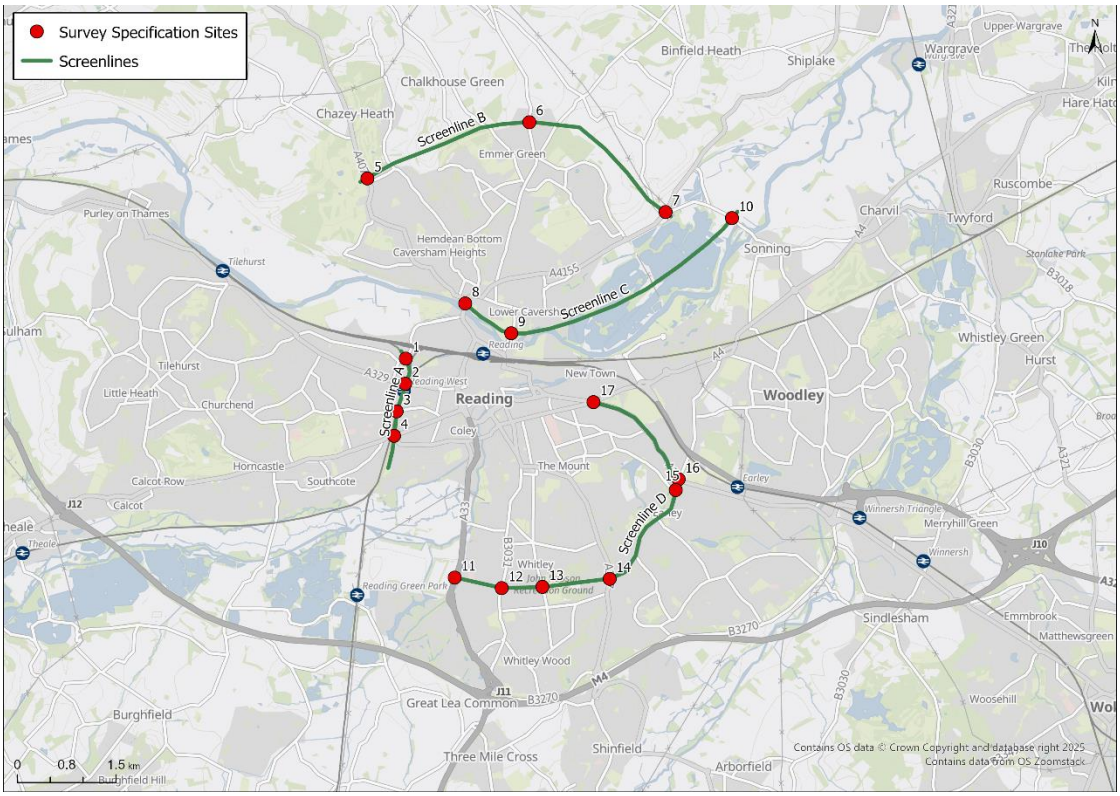


Figure 2-1: Count Locations

Table 2-1: Count Locations

| Screen line | ATC No | ATC Location |
|---|---|---|
| Western Railway Screenline (A) | 1 | Cow Lane Bridges |
| | 2 | Oxford Road near Beresford Road |
| | 3 | Tilehurst Road |
| | 4 | Bath Road West of Berkeley Road Junction |
| Northern Screenline (B) | 5 | Upper Woodcote Road |
| | 6 | Peppard Road The Riding Junction |
| | 7 | Henley Road |
| River Screenline (C) | 8 | Caversham Bridge |
| | 9 | George Street |
| | 10 | Sonning Bridge |
| Inner Southern Screenline (D) | 11 | A33 |
| | 12 | Basingstoke Road |
| | 13 | Northumberland Avenue |
| | 14 | Shinfield Road near Beech Road |
| | 15 | Whiteknights Road |
| | 16 | Wokingham Road Bell Avenue Junction |
| | 17 | London Road |

## 2.5 Journey Times

2.5.1 At the time of the model update October 2024 journey time data was not available so October 2023 data was used. Inrix data was obtained from Reading Borough Council, and the data was extracted along 14 journey time routes which are shown in Figure 2-2 and listed in Table 2-2.

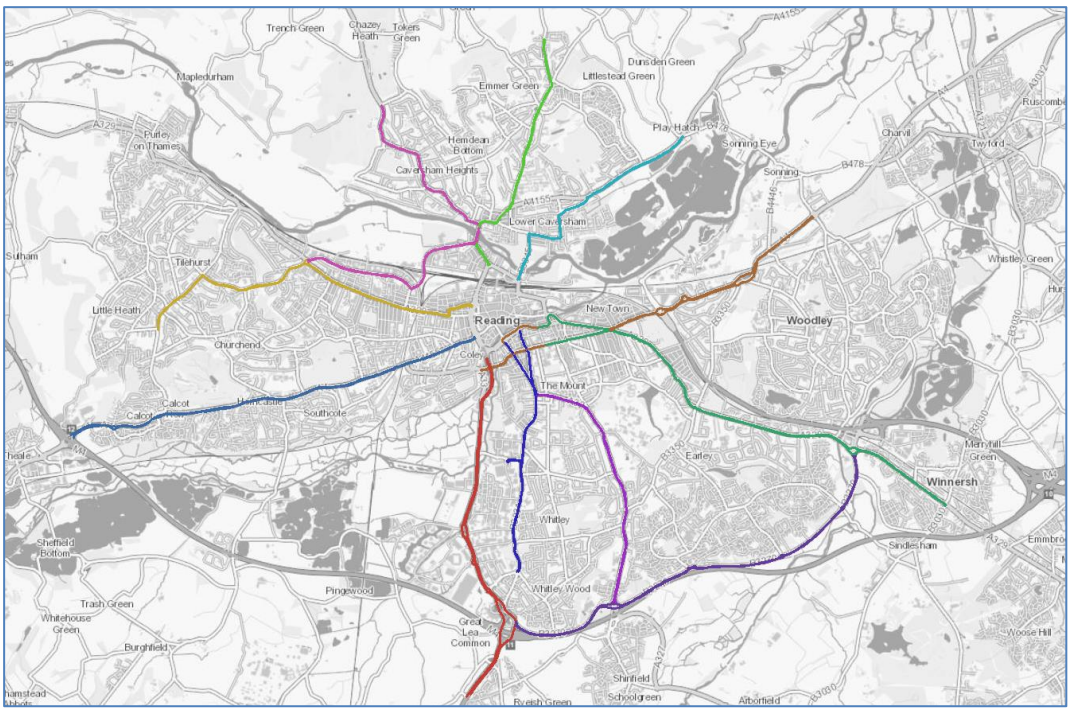


Figure 2-2: Journey Time Routes

Table 2-2: Journey Time Routes

| Route Number | Description | Direction | From | To |
|---|---|---|---|---|
| 1 | Wokingham Road | NB | Robinhood Ln | London Rd/Denmark Rd |
| | | SB | London Rd/Denmark Rd | Robinhood Ln |
| 2 | Basingstoke Rd | NB | Imperial Way | London Rd |
| | | SB | London Rd | Imperial Way |
| 3 | A33 | NB | South of Mereoak | Rose Kiln Court |
| | | SB | Rose Kiln Court | South of Mereoak |
| 4 | Bath Road | EB | M4 Junction 12 | Berkeley Ave |
| | | WB | Berkeley Ave | M4 Junction 12 |
| 5 | Norcot Rd/Oxford Rd | EB | School Rd | Eaton Place |
| | | WB | Eaton Place | School Rd |
| 6 | Woodcote Road | SB | Shepherds Ln | Norcot Rd |
| | | NB | Norcot Rd | Shepherds Lane |
| 7 | Peppard Road | SB | Tower Cl | Richfields Ave |
| | | NB | Richfields Ave | Tower Cl |
| 8 | Henley Road | SB | Playhatch | Vastern Rd |
| | | NB | Vastern Rd | Playhatch |
| 9 | London Road | WB | Bath Rd | Craven Ro |
| | | EB | London Rd/Denmark Rd | Bath Rd |
| 10 | Shinfield Road | NB | B3270 | Elmhurst Rd |
| | | SB | Elmhurst Rd | B3270 |
| 13 | Langley Hill / Meadway / Tilehurst Road | EB | Bath Rd | Brunswick Hill |
| | | WB | Brunswick Hill | Bath Rd |
| 14 | B3270 | EB | M4 Junction 11 | A329 |
| | | WB | A329 | M4 Junction 11 |

## 2.6 Model Verification Process

2.6.1 The process for the model verification involved taking the updated highway network, including the changes made as detailed in Section 2.2 and firstly assigning the 2015 matrices to the network.

2.6.2 The initial model flows were then compared to the new traffic count data at a screenline level and similarly journey times were also checked. Following this, an exercise was undertaken to best fit the observed and modelled data by making minor adjustments to the model network (network calibration) and some minor matrix changes were made. The purpose of this was to

get the best fit possible to provide a model that was felt to be suitable for testing the Local Plan developments. The adjustments made to the model network included:

- Signal timings
- Saturation flows
- Lane allocations

2.6.3 Standard model validation criteria provided by DfT was used as the starting point but given the specific purpose of the model and the likely minimal impacts from the developments, given the low level of flow increase, the outputs were checked against a lower threshold. The validation criteria is set out in Table 2-3, alongside the lower thresholds used in this instance, which are felt to be proportionate. The focus has been on the GEH (Geoffrey Edward Havers) value for individual flows and Screenline Flows.

2.6.4 The GEH Statistic is a standard formula used in traffic modelling to compare two sets of traffic volumes and assess the fit between the observed and modelled flows. It takes account of the fact that when traffic flows are low, the percentage difference between observed and modelled flows may be high but the significance of this difference is small. It was named after Geoffrey Edward Havers who came up with the formula.

Table 2-3: Validation Criteria

| Criteria | Description of Criteria | Acceptability Guideline | Lower Threshold |
|---|---|---|---|
| 1 | GEH < 5 for individual flows | >85% of cases | GEH < 10 |
| 2 | Differences between modelled flows and observed counts on screenlines should be less than 5% of the observed counts | All or nearly all screenlines | 10% difference |
| 4 | Modelled Times along routes should be within 15% of surveyed times (or 1 minute, if higher than 15%) | >85% of routes | 30% |

## 2.7 Traffic Count Checks

### AM Peak

2.7.1 Traffic count checks were undertaken at a Screenline level, with the final outputs reported within Table 2-4 to 2-11 for the AM Peak.

Table 2-4: Screenline A– Western Railway Screenline – Eastbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Cow Lane Bridges | 796 | 1200 | 403 | 12.8 |
| Oxford Road near Beresford Road | 761 | 637 | -123 | 4.7 |
| Tilehurst Road | 931 | 809 | -121 | 4.1 |
| Bath Road Benyon Court Junction | 800 | 1313 | 512 | 15.8 |
| Total | 3288 | 3959 | 671 | 11.1 |
| Screenline % Difference | | | 20% | |

Table 2-5: Screenline A – Western Railway Screenline – Westbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Cow Lane Bridges | 592 | 649 | 57 | 2.3 |
| Oxford Road near Beresford Road | 511 | 478 | -33 | 1.5 |
| Tilehurst Road | 443 | 293 | -149 | 7.8 |
| Bath Road Benyon Court Junction | 849 | 931 | 82 | 2.8 |
| Total | 2394 | 2351 | -43 | 0.9 |
| Screenline % Difference | | | -2% | |

Table 2-6: Screenline B – Northern Screenline – Northbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Upper Woodcote Road | 637 | 679 | 42 | 1.6 |
| Peppard Road The Riding Junction | 592 | 464 | -128 | 5.6 |
| Henley Road | 809 | 1003 | 194 | 6.5 |
| Total | 2038 | 2146 | 108 | 2.4 |
| Screenline % Difference | | | 5% | |

Table 2-7: Screenline B– Northern Screenline – Southbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Upper Woodcote Road | 475 | 480 | 4 | 0.2 |
| Peppard Road The Riding Junction | 534 | 361 | -172 | 8.1 |
| Henley Road | 690 | 794 | 103 | 3.8 |
| Total | 1700 | 1635 | -65 | 1.6 |
| Screenline % Difference | | | -4% | |

Table 2-8: – Screenline C– River Screenline – Northbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Caversham Bridge | 1142 | 1345 | 203 | 5.7 |
| George Street | 582 | 838 | 256 | 9.6 |
| Sonning Bridge | 564 | 611 | 47 | 1.9 |
| Total | 2288 | 2793 | 505 | 10.0 |
| Screenline % Difference | | | 22% | |

Table 2-9: Screenline C – River Screenline – Southbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Caversham Bridge | 1314 | 1572 | 258 | 6.8 |
| George Street | 870 | 837 | -33 | 1.1 |
| Sonning Bridge | 635 | 405 | -230 | 10.1 |
| Total | 2819 | 2814 | -5 | 0.1 |
| Screenline % Difference | | | 0% | |

Table 2-10: Screenline D– Inner Southern and Eastern Screenline – Northbound/Eastbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| A33 | 1472 | 1812 | 340 | 8.4 |
| Basingstoke Road | 411 | 352 | -59 | 3.0 |
| Northumberland Avenue | 708 | 371 | -338 | 14.5 |
| Shinfield Road near Beech Road | 695 | 594 | -101 | 4.0 |
| Whiteknights Road | 313 | 409 | 97 | 5.1 |
| Wokingham Road Bell Avenue Junction | 417 | 212 | -205 | 11.6 |
| London Road | 847 | 1135 | 288 | 9.1 |
| Total | 4863 | 4884 | 21 | 0.3 |
| Screenline % Difference | | | 0% | |

Table 2-11: Screenline D – Inner Southern and Eastern Screenline – Southbound/Westbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| A33 | 1349 | 1785 | 436 | 11.0 |
| Basingstoke Road | 466 | 244 | -222 | 11.8 |
| Northumberland Avenue | 499 | 439 | -59 | 2.7 |
| Shinfield Road near Beech Road | 433 | 515 | 82 | 3.8 |
| Whiteknights Road | 607 | 386 | -221 | 9.9 |
| Wokingham Road Bell Avenue Junction | 468 | 335 | -133 | 6.6 |
| London Road | 841 | 1118 | 277 | 8.8 |
| Total | 4662 | 4823 | 160 | 2.3 |
| Screenline % Difference | | | 3% | |

## PM Peak

2.7.2 Traffic count checks were undertaken at a Screenline level, with the final outputs reported within Table 2-12 to 2-19 for the PM Peak.

Table 2-12: Screenline A– Western Railway Screenline – Eastbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Cow Lane Bridges | 606 | 985 | 379 | 13.5 |
| Oxford Road near Beresford Road | 529 | 456 | -73 | 3.3 |
| Tilehurst Road | 473 | 399 | -74 | 3.5 |
| Bath Road Benyon Court Junction | 824 | 1030 | 206 | 6.8 |
| Total | 2432 | 2870 | 438 | 8.5 |
| Screenline % Difference | | | 18% | |

Table 2-13: Screenline A – Western Railway Screenline – Westbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Cow Lane Bridges | 795 | 899 | 104 | 3.6 |
| Oxford Road near Beresford Road | 634 | 1084 | 450 | 15.4 |
| Tilehurst Road | 791 | 789 | -2 | 0.1 |
| Bath Road Benyon Court Junction | 1114 | 1380 | 266 | 7.5 |
| Total | 3334 | 4151 | 817 | 13.4 |
| Screenline % Difference | | | 25% | |

Table 2-14: Screenline B – Northern Screenline – Northbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Upper Woodcote Road | 583 | 429 | -154 | 6.9 |
| Peppard Road The Riding Junction | 454 | 193 | -260 | 14.5 |
| Henley Road | 570 | 866 | 297 | 11.1 |
| Total | 1606 | 1489 | -118 | 3.0 |
| Screenline % Difference | | | -7% | |

Table 2-15: Screenline B– Northern Screenline – Southbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Upper Woodcote Road | 512 | 452 | -61 | 2.8 |
| Peppard Road The Riding Junction | 493 | 342 | -152 | 7.4 |
| Henley Road | 823 | 1016 | 193 | 6.4 |
| Total | 1829 | 1809 | -19 | 0.5 |
| Screenline % Difference | | | -1% | |

Table 2-16: Screenline C– River Screenline – Northbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Caversham Bridge | 1339 | 1671 | 332 | 8.6 |
| George Street | 890 | 939 | 49 | 1.6 |
| Sonning Bridge | 661 | 445 | -216 | 9.2 |
| Total | 2890 | 3056 | 165 | 3.0 |
| Screenline % Difference | | | 6% | |

Table 2-17: Screenline C – River Screenline – Southbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| Caversham Bridge | 1109 | 1304 | 195 | 5.6 |
| George Street | 595 | 710 | 114 | 4.5 |
| Sonning Bridge | 513 | 514 | 1 | 0.0 |
| Total | 2218 | 2528 | 310 | 6.4 |
| Screenline % Difference | | | 14% | |

Table 2-18: Screenline D– Inner Southern and Eastern Screenline – Northbound/Eastbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| A33 | 1623 | 1834 | 211 | 5.1 |
| Basingstoke Road | 457 | 560 | 103 | 4.6 |
| Northumberland Avenue | 530 | 504 | -26 | 1.1 |
| Shinfield Road near Beech Road | 459 | 455 | -3 | 0.1 |
| Whiteknights Road | 422 | 959 | 536 | 20.4 |
| Wokingham Road Bell Avenue Junction | 493 | 342 | -151 | 7.4 |
| London Road | 850 | 1027 | 177 | 5.8 |
| Total | 4833 | 5681 | 847 | 11.7 |
| Screenline % Difference | | | 18% | |

Table 2-19: Screenline D – Inner Southern and Eastern Screenline – Southbound/Westbound

| Count Location | Observed (PCU/Hr) | Modelled (PCU/Hr) | Flow Difference (PCU/Hr) | GEH |
|---|---|---|---|---|
| A33 | 1356 | 1516 | 160 | 4.2 |
| Basingstoke Road | 480 | 311 | -169 | 8.5 |
| Northumberland Avenue | 635 | 541 | -94 | 3.9 |
| Shinfield Road near Beech Road | 445 | 644 | 198 | 8.5 |
| Whiteknights Road | 256 | 219 | -38 | 2.4 |
| Wokingham Road Bell Avenue Junction | 410 | 183 | -227 | 13.2 |
| London Road | 855 | 1167 | 313 | 9.8 |
| Total | 4437 | 4580 | 143 | 2.1 |
| Screenline % Difference | | | 3% | |

### Summary of Outputs

2.7.3 Table 2-20 provides an overall summary of the count validation statistics at an individual count level and for the screenlines respectively.

Table 2-20: Count Summary Statistics

| Statistic | AM Peak | PM Peak |
|---|---|---|
| Total Counts | 34 | 34 |
| Counts with GEH < 5 | 14 | 14 |
| Counts with GEH < 10 | 27 | 28 |
| % Passing Lower Threshold | 79.4% | 82.4% |
| Total Screenlines | 8 | 8 |
| Total Flow < 5% Difference | 6 | 2 |
| Total Flow < 10% Difference | 6 | 4 |

2.7.4 From the summary statistics, it can be seen that both the AM and PM peak models fall just short of the required 85% of counts below a GEH of the lower threshold set at 10. However, the screenline GEH is below 5 in all but two cases in the AM peak and four cases in the PM peak.

2.7.5 The total screenline flow does fall within 5% in most cases.

2.7.6 Given the purpose of the model, these validation statistics need to be considered alongside the flow levels that are generated by the new developments as reported later within this report.

## 2.8 Journey Time Checks

2.8.1 Table 2-22 and 2-23 show the journey time validation for the AM and PM respectively.

Table 2-22: AM Journey Time Verification

| Route | Observed | Lower 15% | Upper 15% | Lower 30% | Upper 30% | Modelled | Within 15% | Within 30% |
|---|---|---|---|---|---|---|---|---|
| 1 inbound | 22:18 | 18:57 | 25:39 | 15:37 | 28:59 | 13:01 | N | N |
| 1 outbound | 24:08 | 20:31 | 27:45 | 16:54 | 31:22 | 20:45 | Y | Y |
| 2 inbound | 12:07 | 10:18 | 13:56 | 08:29 | 15:45 | 13:43 | Y | Y |
| 2 outbound | 12:07 | 10:18 | 13:56 | 08:29 | 15:45 | 10:01 | N | Y |
| 3 inbound | 12:49 | 10:54 | 14:44 | 08:58 | 16:40 | 12:06 | Y | Y |
| 3 outbound | 12:32 | 10:39 | 14:25 | 08:46 | 16:18 | 12:02 | Y | Y |
| 4 inbound | 33:46 | 28:42 | 38:50 | 23:38 | 43:54 | 12:27 | N | N |
| 4 outbound | 31:59 | 27:11 | 36:47 | 22:23 | 41:35 | 12:21 | N | N |
| 5 inbound | 29:42 | 25:15 | 34:09 | 20:47 | 38:37 | 11:03 | N | N |
| 5 outbound | 14:59 | 12:44 | 17:14 | 10:29 | 19:29 | 11:01 | N | Y |
| 6 inbound | 07:01 | 05:58 | 08:04 | 04:55 | 09:07 | 17:57 | N | N |
| 6 outbound | 21:01 | 17:52 | 24:10 | 14:43 | 27:19 | 10:28 | N | N |
| 7 inbound | 12:31 | 10:38 | 14:24 | 08:46 | 16:16 | 13:11 | Y | Y |
| 7 outbound | 14:04 | 11:57 | 16:11 | 09:51 | 18:17 | 09:16 | N | N |
| 8 inbound | 07:42 | 06:33 | 08:51 | 05:23 | 10:01 | 08:36 | Y | Y |
| 8 outbound | 07:20 | 06:14 | 08:26 | 05:08 | 09:32 | 08:53 | N | Y |
| 9 inbound | 21:32 | 18:18 | 24:46 | 15:04 | 28:00 | 19:10 | Y | Y |
| 9 outbound | 18:21 | 15:36 | 21:06 | 12:51 | 23:51 | 23:16 | N | Y |
| 10a inbound | 23:42 | 20:09 | 27:15 | 16:35 | 30:49 | 10:49 | N | N |
| 10a outbound | 18:00 | 15:18 | 20:42 | 12:36 | 23:24 | 08:54 | N | N |
| 13 inbound | 23:47 | 20:13 | 27:21 | 16:39 | 30:55 | 11:55 | N | N |
| 13 outbound | 13:16 | 11:17 | 15:15 | 09:17 | 17:15 | 12:12 | Y | Y |
| 14 westbound | 10:57 | 09:18 | 12:36 | 07:40 | 14:14 | 09:27 | Y | Y |
| 14 eastbound | 13:08 | 11:10 | 15:06 | 09:12 | 17:04 | 11:31 | Y | Y |

Table 2-23 PM Journey Time Verification

| Route | Observed | Lower 15% | Upper 15% | Lower 30% | Upper 30% | Modelled | Within 15% | Within 30% |
|---|---|---|---|---|---|---|---|---|
| 1 inbound | 20:57 | 17:48 | 24:06 | 14:40 | 27:14 | 21:11 | Y | Y |
| 1 outbound | 23:29 | 19:58 | 27:00 | 16:26 | 30:32 | 29:34 | N | Y |
| 2 inbound | 11:53 | 10:06 | 13:40 | 08:19 | 15:27 | 17:57 | N | N |
| 2 outbound | 15:03 | 12:48 | 17:18 | 10:32 | 19:34 | 11:54 | N | Y |
| 3 inbound | 11:26 | 09:43 | 13:09 | 08:00 | 14:52 | 18:25 | N | N |
| 3 outbound | 27:38 | 23:29 | 31:47 | 19:21 | 35:55 | 15:55 | N | N |
| 4 inbound | 14:25 | 12:15 | 16:35 | 10:05 | 18:45 | 14:27 | Y | Y |
| 4 outbound | 25:52 | 21:59 | 29:45 | 18:06 | 33:38 | 13:11 | N | N |
| 5 inbound | 17:31 | 14:53 | 20:09 | 12:16 | 22:46 | 11:09 | N | N |

| Route | Observed | Lower 15% | Upper 15% | Lower 30% | Upper 30% | Modelled | Within 15% | Within 30% |
|---|---|---|---|---|---|---|---|---|
| 5 outbound | 19:20 | 16:26 | 22:14 | 13:32 | 25:08 | 14:12 | N | Y |
| 6 inbound | 22:16 | 18:56 | 25:36 | 15:35 | 28:57 | 20:37 | Y | Y |
| 6 outbound | 13:07 | 11:09 | 15:05 | 09:11 | 17:03 | 11:50 | Y | Y |
| 7 inbound | 11:57 | 10:09 | 13:45 | 08:22 | 15:32 | 12:01 | Y | Y |
| 7 outbound | 12:40 | 10:46 | 14:34 | 08:52 | 16:28 | 10:16 | N | Y |
| 8 inbound | 07:28 | 06:21 | 08:35 | 05:14 | 09:42 | 06:37 | Y | Y |
| 8 outbound | 06:56 | 05:54 | 07:58 | 04:51 | 09:01 | 10:03 | N | N |
| 9 inbound | 20:22 | 17:19 | 23:25 | 14:15 | 26:29 | 28:16 | N | N |
| 9 outbound | 23:16 | 19:47 | 26:45 | 16:17 | 30:15 | 26:07 | Y | Y |
| 10a inbound | 15:49 | 13:27 | 18:11 | 11:04 | 20:34 | 08:59 | N | N |
| 10a outbound | 19:00 | 16:09 | 21:51 | 13:18 | 24:42 | 10:21 | N | N |
| 13 inbound | 13:46 | 11:42 | 15:50 | 09:38 | 17:54 | 11:59 | Y | Y |
| 13 outbound | 16:34 | 14:05 | 19:03 | 11:36 | 21:32 | 14:10 | Y | Y |
| 14 westbound | 10:20 | 08:47 | 11:53 | 07:14 | 13:26 | 12:00 | N | Y |
| 14 eastbound | 10:41 | 09:05 | 12:17 | 07:29 | 13:53 | 09:54 | Y | Y |

2.8.2 In October 2023 extensive roadworks were being undertaken in West Reading along the 2 main corridors of the Oxford Road and the A4 Bath Road which has significantly impacted the model's ability to match the journey times. The routes in the west of Reading are:

- Route 4
- Route 5
- Route 6
- Route 13

2.8.3 As stated previously the traffic counts were undertaken in October 2024 when there were no roadworks and hence will be unaffected.

2.8.4 Due to the roadworks some routes did not contain full information which has led to some not validating. In both the AM and PM these routes are 1 Inbound, 6 Inbound, 8 Outbound and 9 Outbound.

2.8.5 The extent of the impact of the roadworks can be seen when comparing the observed data back to 2015 data when the model was last validated. Route 4 in both directions and route 5 inbound in the AM have each increased by nearly 100%.

2.8.6 As the majority of the LP developments are in central, east and south Reading those have been the areas of the main focus of model validation.

## 2.9 Model Verification Conclusion

2.9.1 The purpose of the model is to inform the impact of the Local Plan Partial Update and as can be seen in Section 3, the number of additional trips generated by the developments is small, therefore only a light touch update of the model has been undertaken. Whilst the verification

exercise has shown some areas of the model fall short of normal validation criteria, the flow validation is seen to be reasonable when comparting against a slightly lower threshold.

2.9.2 The journey time validation is seen to be reasonable within areas where the new development will take place. Where there is not such a good match between modelled and observed data, no or very little Local Plan associated traffic will be seen.

2.9.3 Therefore the conclusion of the verification exercise was that the model was suitable for the purpose of testing Local Plan impacts and would be used as the basis for producing Reference Case and Local Plan models to inform the impact assessment.

# 3 Forecast Model Development

## 3.1 Introduction

3.1.1 Once the model verification exercise was completed the 2024 base year models were then used to develop forecast models to test the impact of the Local Plan proposals on the highway network. This process involved development of Reference Case models, which are used as a baseline for checking the impact of the plan, and Local Plan Models, including the Plan development.

3.1.2 The models were developed for a forecast year of 2041, to represent the end of the plan period and involve the following tasks:

- Updating the network to include any committed highway schemes (BSIP schemes at Oracle Roundabout and Southampton Street)
- Updating Reference Case matrices utilising committed development information collated from Reading Borough Council
- Inclusion of National Trip End Model Growth to ensure growth in neighbouring authorities was captured
- Adding on trips associated with the Local Plan sites (for the Local Plan scenario)

## 3.2 Trip Generation and Distribution

3.2.1 A high-level analysis of likely vehicular trip generation and distribution of the proposed sites was undertaken. This considered the likely trip distribution of vehicle trips associated with proposed development at the new sites identified within the LPPU. It considers impacts of reductions in trips associated with extant uses of these sites, and increases in trip generation associated with intensified development at existing Local Plan allocated sites.

3.2.2 Trio generation and distribution is detailed fully with Section 3 of Sustainable Connectivity and Vehicle Trip Distribution Study Report, Stantec, December 2024.

3.2.3 The trip generation is based on trip rates derived from industry recognised software, TRICS. A sector-based approach has been developed, which is consistent with the approach used for the adopted Local Plan and this results in the trip rates by development type as shown in Tables 3-1 to 3-4.

3.2.4 The sectoring was undertaken based on the geographical location of the Local Plan sites and utilised the “Revised Parking Standard and Design” document adopted by RBC in 2011 as reference to produce a sector level of trip rates. The four sectors set out are:

- Sector 1, Central Core Area – Primarily retail and commercial with the best transport hubs
- Sector 2, Primary Core Area – Areas directly surrounding the core area, well served by public transport.
- Sector 3, Secondary Core Area – Variety of land uses, with 400m walk of high frequency bus services.
- Sector 4, Wider Urban Area – Mostly open space and residential, some support by direct bus services and other less accessible by public transport. Areas are generally not with walking distance or a railway station.

3.2.5 Figure 3-1 illustrates the sector plan and the sites that fall into which sector.

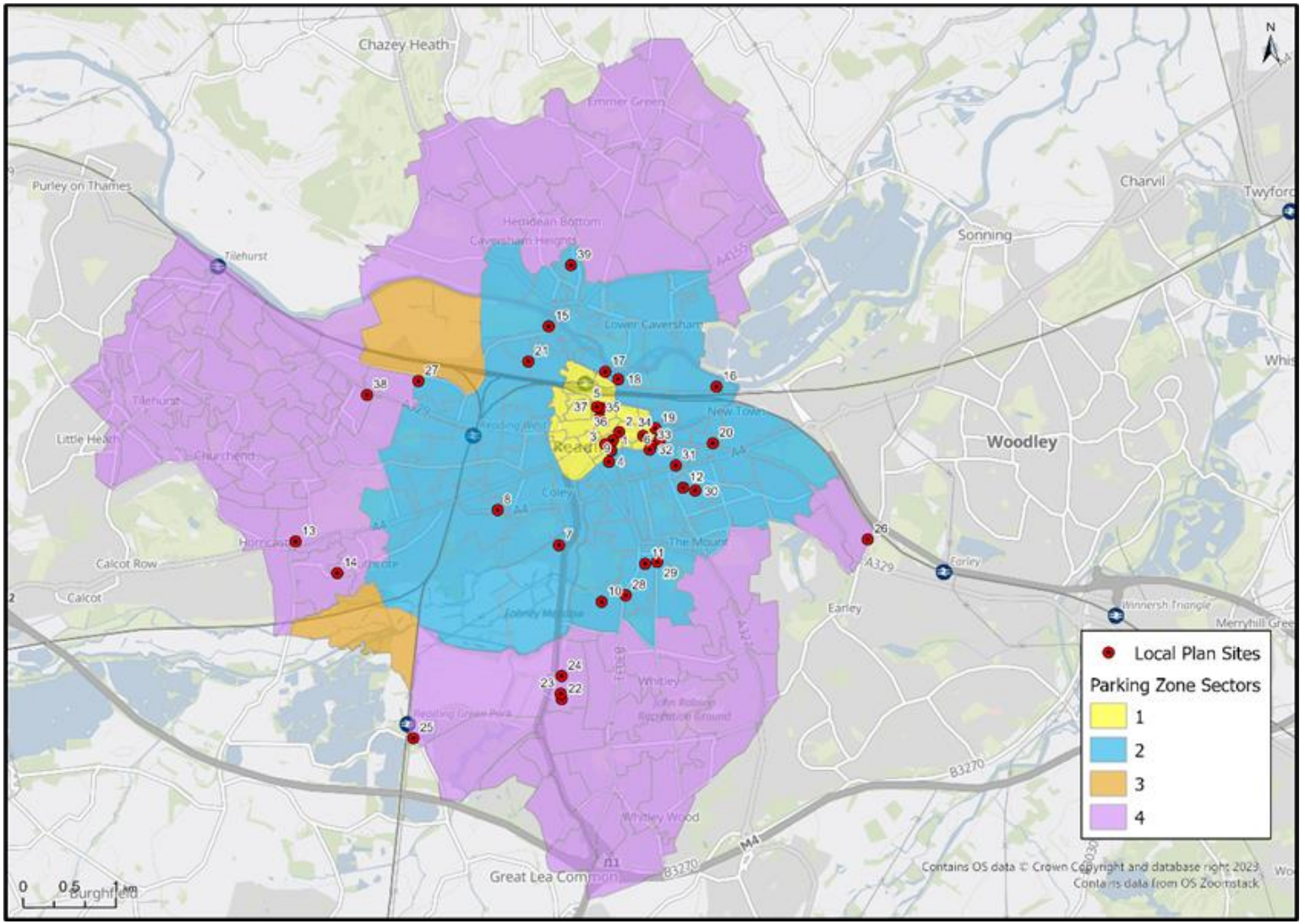


Figure 3-1: Sector System

Table 3-1: Sector 1 Car Trip Rates - Sector 1

| Land Use | Unit | AM in | AM out | PM in | PM out |
|---|---|---|---|---|---|
| Residential | Dwelling | 0.020 | 0.112 | 0.107 | 0.040 |
| Office | 100m$^2$ | 0.667 | 0.104 | 0.089 | 0.550 |
| Non-Food | 100m$^2$ | 0.164 | 0.078 | 0.162 | 0.316 |
| Leisure | 100m$^2$ | 0.104 | 0.082 | 0.200 | 0.204 |
| Warehousing | 100m$^2$ | N/A | N/A | N/A | N/A |
| Hotel | 100m$^2$ | 0.301 | 0.502 | 0.400 | 0.219 |
| Hospital | 100m$^2$ | 0.741 | 0.258 | 0.240 | 0.602 |
| Theatre | 100m$^2$ | N/A | N/A | N/A | N/A |

Table 3-2: Sector 1 OGV Trip Rates – Sector 1

| Land Use | Unit | AM in | AM out | PM in | PM out |
|---|---|---|---|---|---|
| Residential | Dwelling | 0.000 | 0.001 | 0.000 | 0.000 |
| Office | 100m$^2$ | 0.003 | 0.003 | 0.000 | 0.000 |
| Non-Food | 100m$^2$ | 0.002 | 0.003 | 0.002 | 0.002 |
| Leisure | 100m$^2$ | 0.002 | 0.002 | 0.000 | 0.000 |
| Warehousing | 100m$^2$ | N/A | N/A | N/A | N/A |
| Hotel | 100m$^2$ | 0.010 | 0.010 | 0.000 | 0.000 |
| Hospital | 100m$^2$ | 0.006 | 0.005 | 0.002 | 0.002 |
| Theatre | 100m$^2$ | N/A | N/A | N/A | N/A |

Table 3-3: Sectors 2,3 and 4 Car Trip Rates – Sectors 2,3, 4

| Land Use | Unit | AM in | AM out | PM in | PM out |
|---|---|---|---|---|---|
| Residential | Dwelling | 0.104 | 0.230 | 0.224 | 0.126 |
| Office | 100m$^2$ | 1.296 | 0.215 | 0.156 | 1.168 |
| Non-Food | 100m$^2$ | 3.684 | 3.301 | 4.649 | 4.967 |
| Leisure | 100m$^2$ | 0.202 | 0.167 | 0.446 | 0.444 |
| Warehousing | 100m$^2$ | 0.458 | 0.223 | 0.106 | 0.394 |
| Hotel | 100m$^2$ | 0.346 | 0.553 | 0.398 | 0.229 |
| Hospital | 100m$^2$ | N/A | N/A | N/A | N/A |
| Theatre | 100m$^2$ | 0.000 | 0.000 | 0.855 | 0.823 |

Table 3-4: Sectors 2,3 and 4 OGV Trip Rates – Sectors 2, 3, 4

| Land Use | Unit | AM in | AM out | PM in | PM out |
|---|---|---|---|---|---|
| Residential | Dwelling | 0.000 | 0.001 | 0.000 | 0.000 |
| Office | 100m$^2$ | 0.006 | 0.004 | 0.001 | 0.002 |
| Non-Food | 100m$^2$ | 0.106 | 0.078 | 0.018 | 0.023 |
| Leisure | 100m$^2$ | 0.002 | 0.002 | 0.000 | 0.001 |
| Warehousing | 100m$^2$ | 0.019 | 0.021 | 0.006 | 0.008 |
| Hotel | 100m$^2$ | 0.004 | 0.004 | 0.002 | 0.002 |
| Hospital | 100m$^2$ | N/A | N/A | N/A | N/A |
| Theatre | 100m$^2$ | 0.000 | 0.000 | 0.000 | 0.000 |

3.2.6 It should be noted that given the small scale of the developments, they have been added to existing zones in the model and not new zones. Distribution of the trips to and from each proposed Local Plan site has been determined utilising distribution data associated with their respective zone within the 2015 Reading Transport Model. The zones within model are deemed to have similar characteristics in terms of land use and location, and therefore the trip distribution is considered an appropriate proxy.

## 3.3 Reference Case Developments

3.3.1 The developments included in the Reference Case are those that have permission or are included in the current adopted LP. These are developments that are highly likely to be built irrespective of the LP.

3.3.2 Details of committed development likely to come forward has been used to development Reference Case matrices and these are shown in Appendix A.

3.3.3 Outside of Reading, DfT National Trip End Model version 8 (NTEM) growth has been used to represent growth in traffic. Background heavy vehicle traffic growth has been calculated using DfT National Road Traffic Forecasts (NRTF).

## 3.4 Local Plan Developments

3.4.1 Local Plan developments are shown in Appendix B. It should be noted that there are a number of Local Plan residential developments which were previously office developments or some other land use. These details are also provided within the appendix where relevant.

3.4.2 Trips for Local Plan developments have been derived from using trip rates which were detailed in Section 3-2.

3.4.3 Where for example, office-based developments have been replaced by residential, trips have been removed based on previous land use and replaced by trips based on the new land use.

## 3.5 Royal Berkshire Hospital

3.5.1 There are potential plans to relocate the Royal Berkshire Hospital (RBH) and redevelop the existing site. However, the development is likely to be towards the end of the plan period, with the Government recently announcing that the redevelopment is unlikely to take place commence until 2037 to 2039.

3.5.2 Given the timescale for development and the uncertainty around potential sites for relocation this has not been included within the modelling. Any transport implications would be tested as part of the planning application.

## 3.6 Trip Matrix Sizes

3.6.1 The resultant trip matrix sizes are shown in Table 3-5. Base model matrices have been shown for comparative purposes.

Table 3-5: Matrix Sizes

| SCENARIO | AM | AM % Increase from Base | PM | PM % Increase from Base |
|---|---|---|---|---|
| **2024 BASE** | 68952 | - | 73277 | - |
| **2041 BACKGROUND** | 72804 | 6% | 76951 | 5% |
| **2041 REFERENCE CASE** | 76162 | 10% | 80018 | 9% |
| **2041 LOCAL PLAN** | 76356 | 11% | 80256 | 10% |

3.6.2 The Table above shows the matrix totals for the following scenarios:

- 2024 Base
- 2041 Background – This is the base matrix with TEMPro growth applied
- 2041 Reference Case – This is the background matrix plus committed developments
- 2041 Local Plan – This is the Reference Case matrix plus the proposed Local Plan developments.

3.6.3 The Local Plan matrices show only a very small increase over the Reference Case due to a lot of the development replacing existing development. This means where an office is being converted to residential the removal of the trips associated with the office are similar to those associated with the residential resulting in only a small overall change however there will be a change in trip patterns.

# 4 Model Outputs

## 4.1 Overview

4.1.1 A series of model outputs have been produced to demonstrate the impact of the Local Plan on the Reading Highway network, as well as on the network in neighbouring authorities and on the Strategic Road Network.

4.1.2 The outputs include

- Flow Difference Plots
- Over Capacity Junction Analysis

## 4.2 Flow Differences

4.2.1 Flow differences between the Reference Case and the Local Plan scenarios are shown on Figures 4-1 and 4-2 for the AM peak and PM peak respectively. The green bandwidths represent an increase in flow in the Local Plan model and the blue a decrease. The width of the bandwidth is relative to the size of the change in flow.

4.2.2 The red annotations represent the reference case on links where increase in flows are seen on the network. This shows that the flow increases are very low when considered against the forecast traffic flows without the Local Plan.

4.2.3 Appendix C shows the actual flows at the M4 Junctions 10, 11 and 12 for both 2041 Reference Case and 2041 Local Plan scenarios.

4.2.4 The plots demonstrate that the Local Plan impacts within Reading as well as cross border within South Oxfordshire, West Berkshire, and Wokingham are relatively minor.

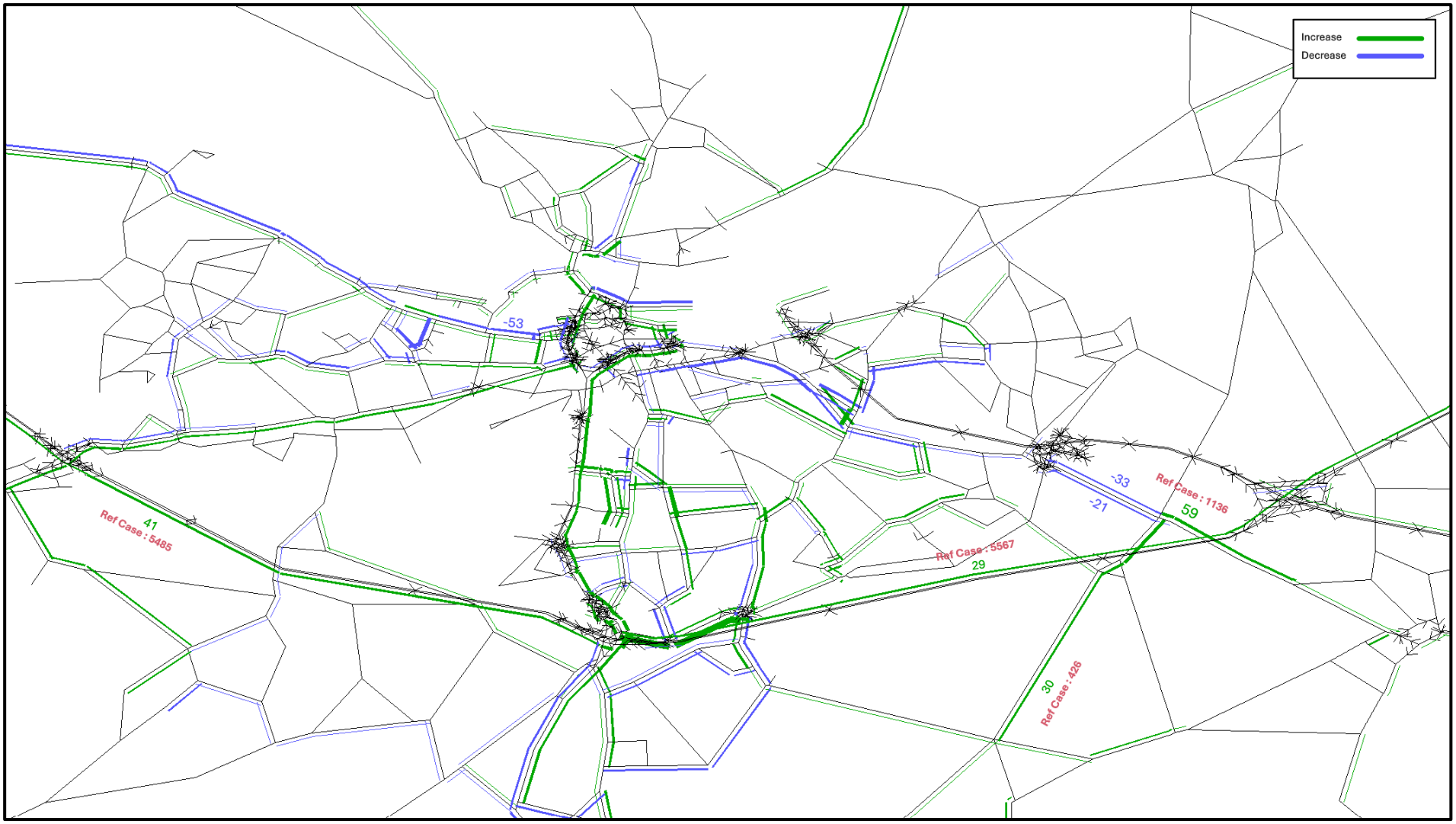


Figure 4-1: Actual Flow Difference Local Plan minus Reference Case AM

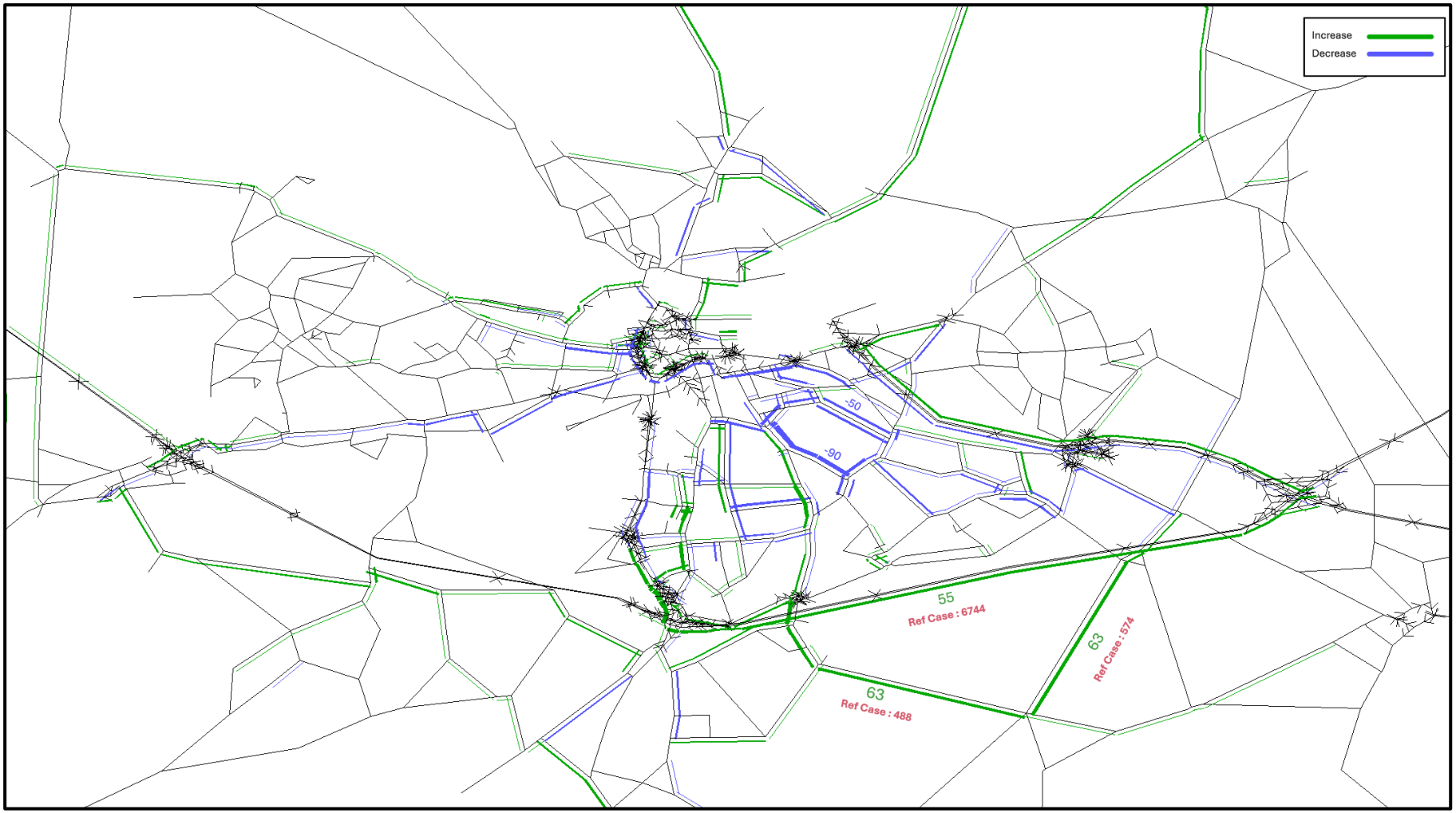


Figure 4-2: Actual Flow Difference Local Plan minus Reference Case PM

## 4.3 Overcapacity Junctions

4.3.1 Over capacity junctions are those that have a volume/capacity (V/C) ratio of greater than 100% in either the Reference Case or Local Plan Scenario. Where this is the case, this means that the flows through the junction are greater than its capacity and as flows increase, queues and delays will increase substantially.

4.3.2 Table 4-1 summarises the volume-capacity ratios of the overcapacity junctions in either the AM or PM peak periods. The locations of the junctions is shown on Figure 4-3.

Table 4-1: Summary of Volume-Capacity Ratios of Overcapacity Junctions

| Junction ID | Junction Description | 2041 AM | | 2041 PM | |
|---|---|---|---|---|---|
| | | Reference Case | Local Plan | Reference Case | Local Plan |
| **1** | A4074/Church St/Bridge St | 102 | 103 | 104 | 104 |
| **2** | Gosbrook Rd/George St | 107 | 108 | 74 | 75 |
| **3** | Sonning Bridge | 119 | 120 | 133 | 134 |
| **4** | London Rd/ St Bartholomew's Rd | 101 | 102 | 101 | 101 |
| **5** | Betchworth Avenue/B3350 | 100 | 100 | 96 | 94 |
| **6** | Shinfield Rd/Wellington Ave/Pepper Lane | 91 | 91 | 104 | 98 |
| **7** | Shinfield Rd/ Elmhurst Rd/A327 | 100 | 101 | 104 | 112 |
| **8** | Basingstoke Rd/Whitley St/Christchurch Rd Rbt | 103 | 102 | 84 | 83 |
| **9** | London Rd/Redlands Rd | 105 | 107 | 108 | 108 |
| **10** | London Rd/Eldon Rd/Erleigh Rd | 96 | 93 | 128 | 129 |
| **11** | London Rd/ Sidmouth St | 104 | 103 | 97 | 101 |
| **12** | A329/King's Rd | 41 | 42 | 101 | 101 |
| **13** | King's Rd/Gas Works Rd | 58 | 58 | 104 | 104 |
| **14** | Burghfield Rd Bridge | 102 | 103 | 120 | 121 |
| **15** | M4 Junction 11 Westbound Onslip | 87 | 88 | 101 | 102 |
| **16** | A33/ Northern Way Exit Arm | 50 | 49 | 106 | 106 |
| **17** | A33/ Northern Way Approach Arm | 73 | 73 | 105 | 106 |
| **18** | Kennet St/ King's Rd | 36 | 37 | 104 | 104 |
| **19** | Whitchurch Bridge | 97 | 99 | 103 | 103 |
| **20** | London Rd/ St Annes Dr | 98 | 98 | 101 | 101 |
| **21** | Berkshire Way Eastbound Offslip | 100 | 100 | 81 | 81 |
| **22** | Shinfield Rd/Whiteley Wood Rd | 103 | 103 | 75 | 75 |
| **23** | Shinfield Rd/Elm Rd | 71 | 74 | 106 | 99 |
| **24** | Mill Lane Bridge | 96 | 97 | 102 | 101 |

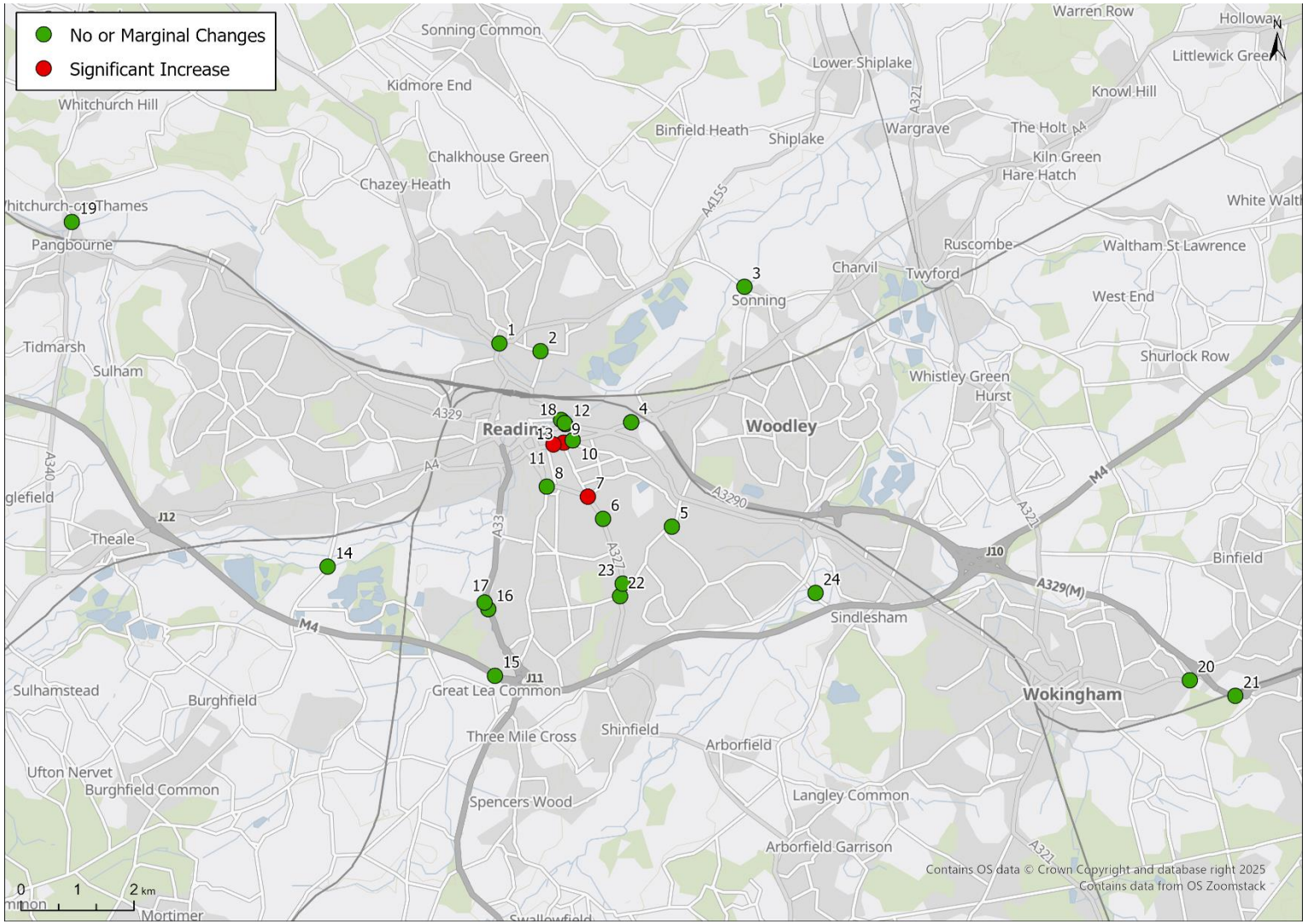


Figure 4-3: Overcapacity Junctions

4.3.3 During the AM peak hour, the vehicle-capacity ratio at London Road/Redlands Road junction (Junction 9) increases by 2% from a 105% due to the Local Plan development.

4.3.4 Vehicle-Capacity ratios at Whitchurch Bridge and Shinfield Road/Elm Road increase by 2% but remain under 100%.

4.3.5 Within the PM peak, vehicle-capacity ratios at Shinfield Road/ Elmhurst Road/A327 (Junction 7) and London Road/Sidmouth Street junctions (junction 11) are over-capacity increasing by 8% and 4% respectively.

4.3.6 Overall, there are marginal impacts from the Local Plan with most of the overcapacity junctions staying within ±1.5% of the Reference Case scenario as illustrated in Figure 4-3.

# 5 Conclusion

5.1.1 The highway modelling has been undertaken to inform the impact of the Local Plan generated trips on the Reading highway network and on roads within neighbouring authorities.

5.1.2 Many of the developments are of small scale and are in the main, located within or close to Reading town centre. This will result in lower car-based trip rates, was there are good quality public transport and active travel options that will be available, either with current services or through additional provision through BSIP and active travel fund schemes, which also align with RBC proposals set out within the Reading Local Transport Plan.

5.1.3 Whilst the model verification exercise shows that the model is not perfect, given the low number of trips generated and taking a proportionate view, the outputs are seen as a good indication of any likely impacts of the generated traffic.

5.1.4 The modelling shows that just three junctions are seen to have a V/C increase of more than 1.5%, these being:

- London Road/Redlands Road (AM Peak Only)
- Shinfield Road/ Elmhurst Road/A327 (PM Peak Only)
- London Road/Sidmouth Street (PM Peak Only)

5.1.5 All the above junctions are located within or close to the town centre, where it would be expected that any mitigation would be focused on sustainable transport modes, including bus priority and walking and cycling infrastructure.

5.1.6 The Local Plan does not have any negative impacts on roads within neighbouring authorities or on the Strategic Road Network.

# Appendix A Reference Case Developments

# Appendix B Local Plan Developments

# Appendix C Actual Flows at M4 Junctions