# Upper Hutt Futures Deficiency Analysis

## Technical Note

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|---|---|
| **Prepared for** | Upper Hutt City Council |
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# 1. Introduction

Upper Hutt City Council (UHCC) commissioned Ableyin 2023 to update the existing Upper Hutt Transportation Model from 2006 to a base year of 2022 using the latest census data. The updated model is a tool that may be used to assess future roading requirements. The previous update in 2006 developed future models for 2016 and 2026 as well as the base model. The base model update was completed in June 2023, and subsequently UHCC has requested future year models to be built.

# 2. Assessment Methodology

This report compares the new 2022 baseline model to 2033, 2043 and 2053 future year models and presents a deficiency analysis of each future year model.

Each future year has three potential development scenarios, resulting in nine future models for each of the three modelled periods (morning peak (AM), interpeak (IP) and evening peak (PM)), making for a total of 27 models.  This report focuses exclusively on AM and PM results, as these are the periods when travel demand is highest, and in there were no obvious network deficiencies arising from the interpeak model results.

### 2.1 Summary of development scenarios

A map of the greenfield (GF) land parcels is shown in Figure 2.1. A breakdown of the phasing of the GF areas in each year and scenario is given in Table 2.1. A description of the number of additional GF and infill residential lots, and employment (in jobs) is given for each year and scenario in Table 2.2.

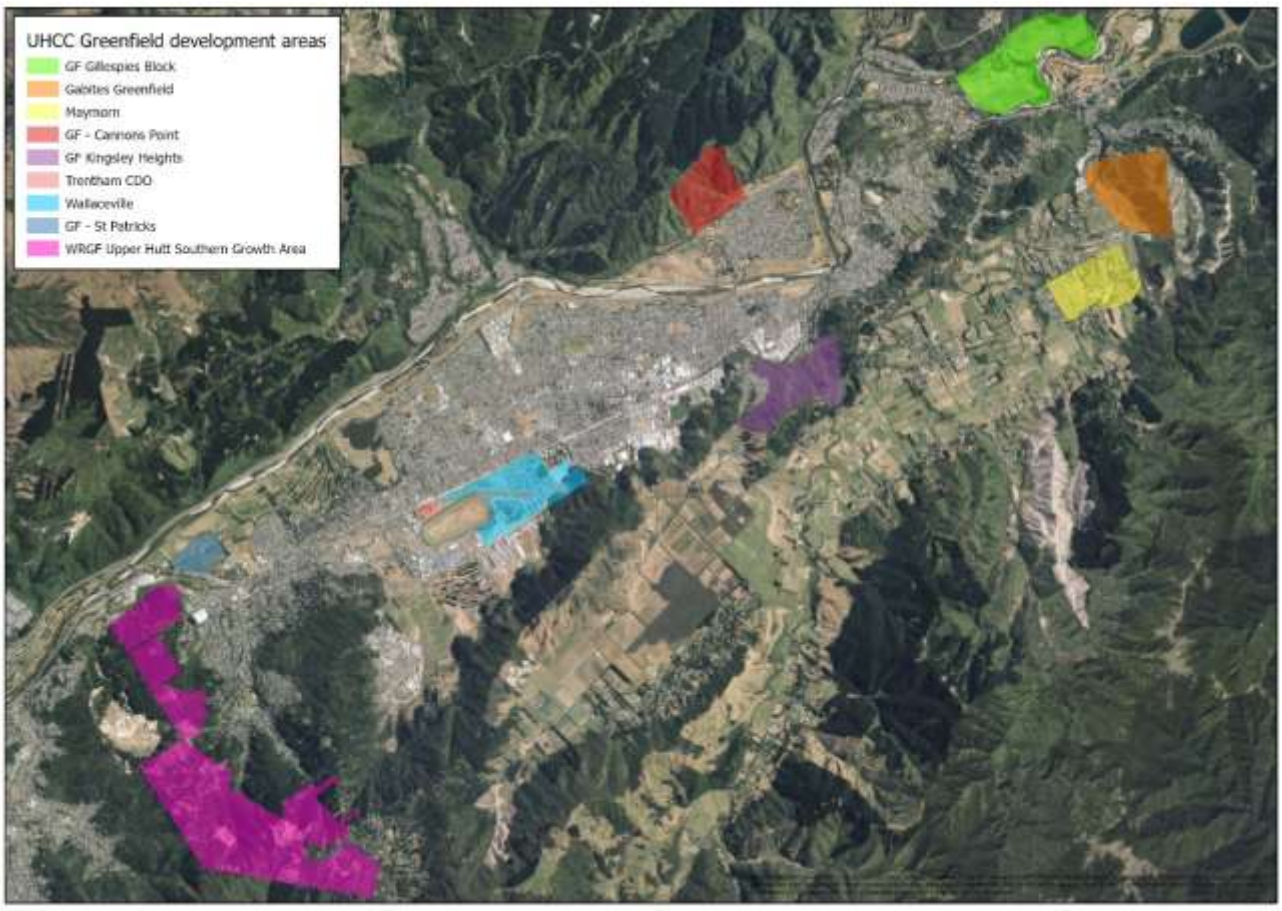



**Figure 2.1 Land Parcels for Greenfield Development**

**Table 2.1 Phasing of GF Areas**

| Year | 2033 | | | 2043 | | | 2053 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Scenario** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** |
| Totara Park | 250 | 250 | 250 | 400 | 400 | 400 | 400 | 400 | 400 |
| Mangaroa | 200 | 200 | 200 | 220 | 220 | 220 | 220 | 220 | 220 |
| Trentham South | 860 | 860 | 860 | 860 | 860 | 860 | 860 | 860 | 860 |
| Pinehaven | 0 | 130 | 270 | 0 | 480 | 620 | 0 | 750 | 750 |
| Silverstream | 290 | 290 | 600 | 600 | 600 | 600 | 600 | 600 | 600 |
| Birchville-Brown Owl | 0 | 0 | 0 | 0 | 500 | 500 | 0 | 1000 | 1000 |
| Silverstream | 0 | 130 | 270 | 0 | 480 | 620 | 0 | 750 | 750 |
| Upper Hutt Central | 100 | 100 | 100 | 250 | 250 | 250 | 250 | 250 | 250 |

**Table 2.2 Summary of Scenarios**

| Year | Additional | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|---|
| 2033 | GF Households | 1700 | 1960 | 2550 |

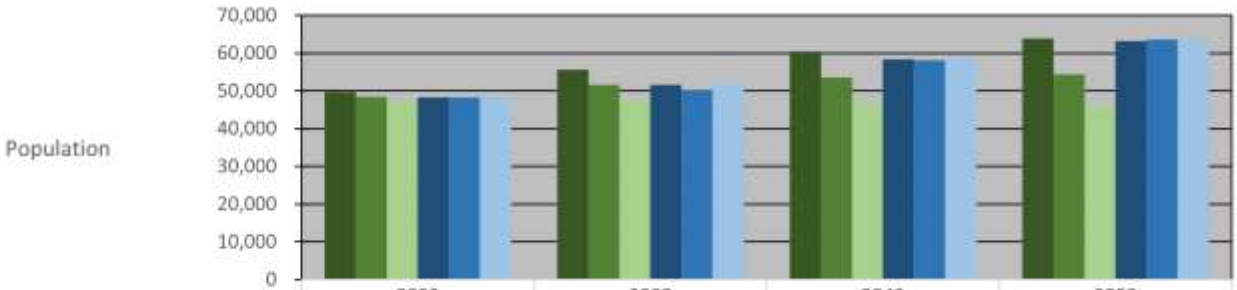
| Year | Additional | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|---|
| | Infill Households | 1864 | 1054 | 1038 |
| | Number of Jobs | 1647 | 1647 | 1647 |
| 2043 | GF Households | 2330 | 3790 | 4070 |
| | Infill Households | 3731 | 2081 | 2065 |
| | Number of Jobs | 3105 | 3105 | 3105 |
| 2053 | GF Households | 2330 | 4830 | 4830 |
| | Infill Households | 5601 | 3101 | 3101 |
| | Number of Jobs | 3461 | 3461 | 3461 |

Key differences and similarities between the scenarios are as follows:

- Scenario 1 has the largest proportion of infill households
- Scenarios 2 and 3 have the same land use by 2053, the difference is the phasing of key development areas in 2033 and 2043
- Employment is the same across all scenarios.
- It is also useful to note that scenario 1 is the current preferred FDS. Comparisons throughout this report are compared back against scenario 1.

When analysing the 2053 year, only scenarios 1 and 2 are presented as 3 is identical to scenario 2. The amalgamated scenario is referred to as “2053 scenario 2/3”.

It is noted that total population across scenarios varies as growth is derived from the number of households with the average people per household remaining unchanged between scenarios. A summary of population growth, as well as the Statistics New Zealand (Stats NZ) projections are given in Figure 2.2. It is noted that Council (and the wider Wellington Region) do not use Stats NZ projections but instead apply 50$^{th}$ percentile projections prepared by Sense Partners.




| | 2023 | 2033 | 2043 | 2053 |
|---|---|---|---|---|
| Stats NZ Projections: High | 49,700 | 55,600 | 60,500 | 63,913 |
| Stats NZ Projections: Medium | 48,500 | 51,600 | 53,600 | 54,342 |
| Stats NZ Projections: Low | 47,200 | 47,700 | 46,800 | 46,000 |
| Model Projections: Sc1 | 48,300 | 51,627 | 58,337 | 63,251 |
| Model Projections: Sc2 | 48,300 | 50,235 | 58,089 | 63,670 |
| Model Projections: Sc3 | 48,300 | 51,860 | 58,837 | 63,670 |

**Figure 2.2 Population growth summary**

There is relatively good alignment in growth between the scenarios, with the largest difference coming in 2033 with the Sc2 projections being lower but still within the range of the Stats NZ projections. In 2053, the model population projections are closer to the high Stats NZ projections, but still within the forecast range.

## 2.2 Level of Service

The assessment methodology is consistent with that undertaken in the November 2008 report including the application of the same Level Of Service (LOS) criteria. This study focuses on LOS F, E, and D with the LOS boundaries used in the Study described in Table 2.3.

Figure 2.3 shows how Link LOS varies depending on link type. It shows that the higher the vehicle volume and the lower the free speed the worse the LOS becomes. Link types are defined as follows:

- Link type 1 equates to road speeds of 10km/hr
- Link type 2 and 12 equate to road speeds of 20km/hr and 25km/hr
- Link type 3 and 13 equate to road speeds of 30km/hr and 35km/hr
- Link type 4 and 14 equate to road speeds of 40km/hr and 45km/hr
- Link type 5 and 15 equate to road speeds of 50km/hr and 55km/hr
- Link type 6 and 16 equate to road speeds of 60km/hr and 65km/hr
- Link type 7 and 17 equate to road speeds of 70km/hr and 75km/hr
- Link type 8 and 18 equate to road speeds of 80km/hr and 85km/hr
- Link type 9 and 19 equate to road speeds of 90km/hr and 95km/hr
- Link type 10 and 11 equate to road speeds of 100km/hr and 110km/hr
- Link type 20 equates to road speeds of 105km/hr

Intersection LOS is based on the delay values as given in Table 2.3.

**Table 2.3 Level of Service definitions and criteria**

| Definitions Of LOS | | | | |
|---|---|---|---|---|
| **LOS** | **Description** | **Upper Hutt Traffic Model LOS criteria** | | |
| | | **Link (vehicles per hour)** | **Intersection (delay/veh)** | |
| | | | **Priority** | **Signal/Rotary** |
| **LOS F** | Forced flow. The amount of traffic approaching a point exceeds that which can pass it. Flow break-downs occur, and queuing and delays occur. | In excess of **900-1700** depending on link type | 50 sec | 80 sec |
| **LOS E** | Traffic volumes are at or close to *capacity and there is virtually no freedom* to select desired speed and to manoeuvre within the traffic stream. Flow is unstable and *minor disturbances within the traffic stream will cause break-downs in operation*. | Between **720-1360** depending on link type | 35 sec | 55 sec |
| **LOS D** | Approaching unstable flow where *all drivers are severely restricted* in their freedom to select desired speed and to manoeuvre within the traffic stream. The general level of *comfort and convenience is poor* and small increases in traffic flow will cause operational problems. | Between **585-1105** depending on link type | 25 sec | 35 sec |
| **LOS C** | Stable flow but most drivers *are restricted to some extent* in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of *comfort and convenience has declined noticeably*. | Between **450-850** depending on link type | 15 sec | 20 sec |
| **LOS B** | Stable flow where drivers still *have reasonable freedom* to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is less than LOS A. | Not Applicable | Not Applicable | |
| **LOS A** | Free flow in which drivers are *virtually unaffected* by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high and the general level of *comfort and convenience is excellent*. | | | |

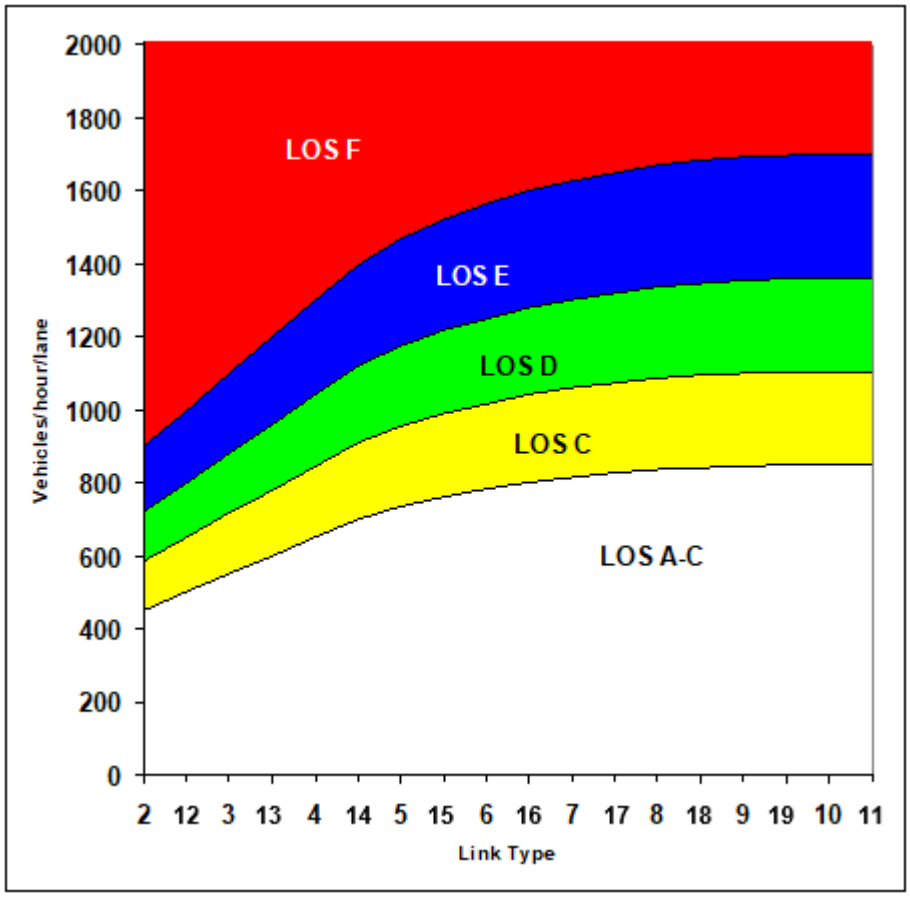



**Figure 2.3 Upper Hutt Transportation Model Link LOS Criteria (Vehicles per Lane per Hour)**

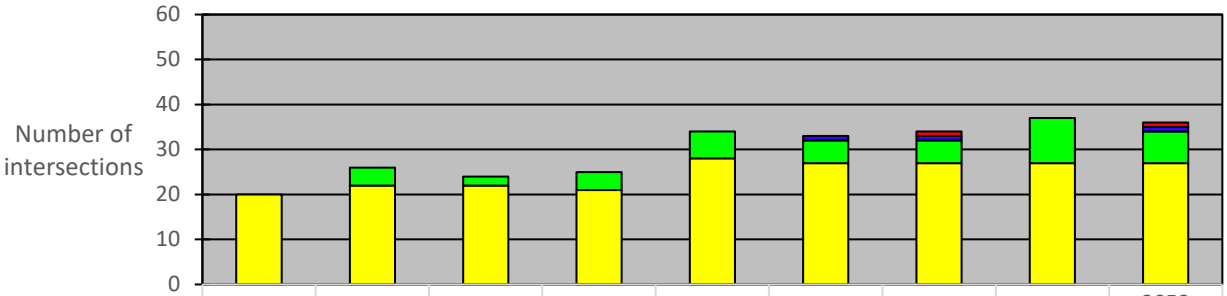
The deficiency analysis includes the following outputs for each model scenario and period:

- Network-wide travel totals including:
  - Kilometres of road affected by each LoS category C-F
  - Number of intersections by each LoS category C-F
  - Number of trips
  - Total km travelled
  - Total minutes travelled
- LoS plots of the network
- Volume plots on the road network including volumes at key locations

# 3. Deficiency Analysis

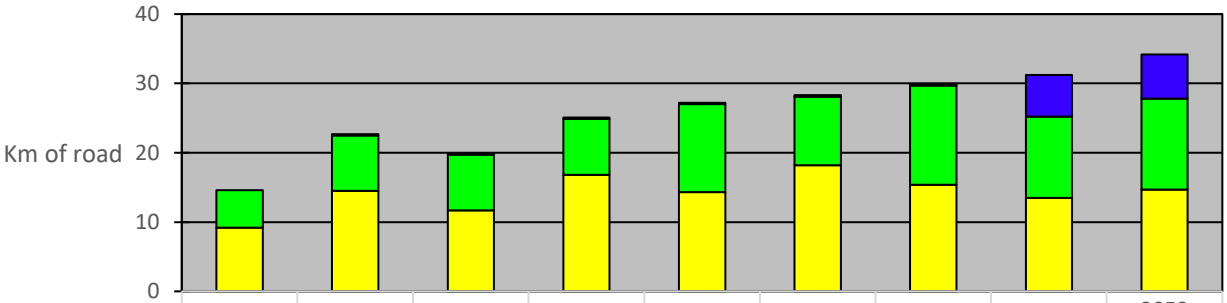
## 3.1 Travel totals all years

All results are presented in the order of AM (8am-9am) then PM (5pm-6pm), with reporting for each modelled year presented in each sub-section.



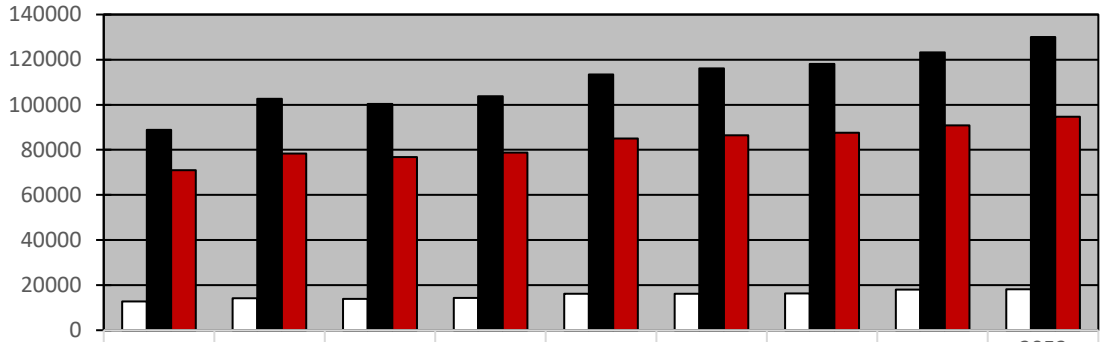

| | 2022 | 2033 Sc1 | 2033 Sc2 | 2033 Sc3 | 2043 Sc1 | 2043 Sc2 | 2043 Sc3 | 2053 Sc1 | 2053 Sc2/3 |
|---|---|---|---|---|---|---|---|---|---|
| Los F | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| LoS E | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| LoS D | 0 | 4 | 2 | 4 | 6 | 5 | 5 | 10 | 7 |
| LoS C | 20 | 22 | 22 | 21 | 28 | 27 | 27 | 27 | 27 |

**Figure 3.1 LoS by number of intersections AM**



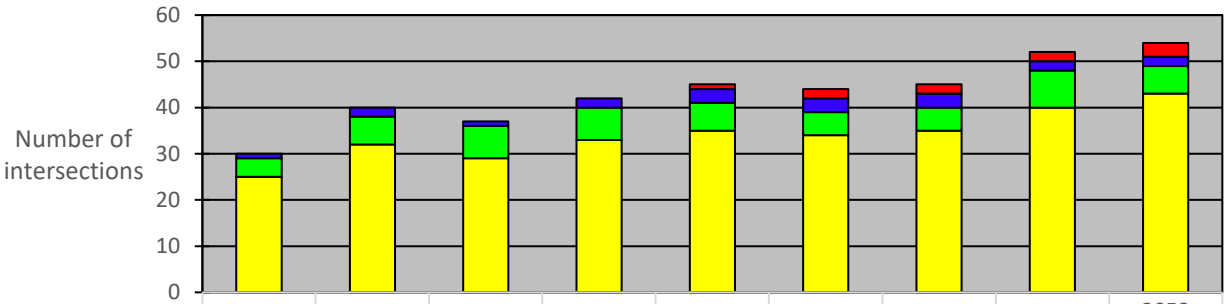

| | 2022 | 2033 Sc1 | 2033 Sc2 | 2033 Sc3 | 2043 Sc1 | 2043 Sc2 | 2043 Sc3 | 2053 Sc1 | 2053 Sc2/3 |
|---|---|---|---|---|---|---|---|---|---|
| Los F | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LoS E | 0 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 6 | 6.4 |
| LoS D | 5.4 | 8 | 8 | 8.1 | 12.7 | 9.9 | 14.3 | 11.7 | 13.1 |
| LoS C | 9.2 | 14.5 | 11.7 | 16.8 | 14.3 | 18.2 | 15.4 | 13.5 | 14.7 |

**Figure 3.2 LoS by Km AM**



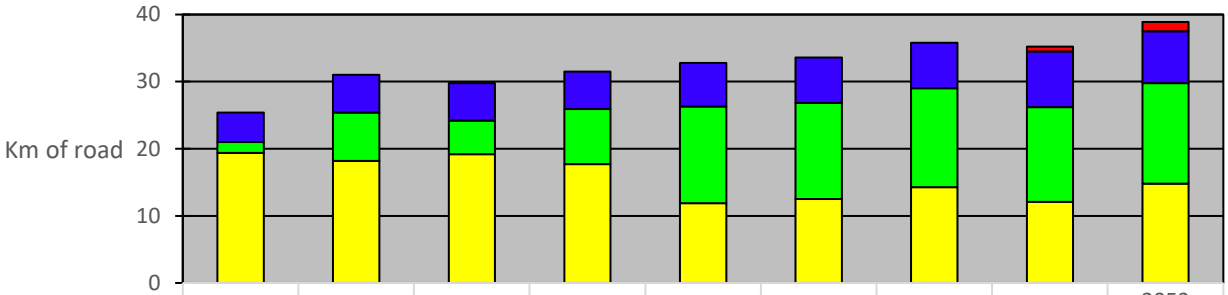

| | 2022 | 2033 Sc1 | 2033 Sc2 | 2033 Sc3 | 2043 Sc1 | 2043 Sc2 | 2043 Sc3 | 2053 Sc1 | 2053 Sc2/3 |
|---|---|---|---|---|---|---|---|---|---|
| Trip Total | 12796 | 14232 | 13915 | 14319 | 16186 | 16173 | 16355 | 18023 | 18177 |
| Vehicle Minutes | 88914 | 102565 | 100391 | 103795 | 113375 | 116090 | 118034 | 123202 | 129968 |
| Vehicle Kilometres | 70973 | 78348 | 76743 | 78790 | 84992 | 86487 | 87601 | 90908 | 94613 |

**Figure 3.3 Trip Totals AM**



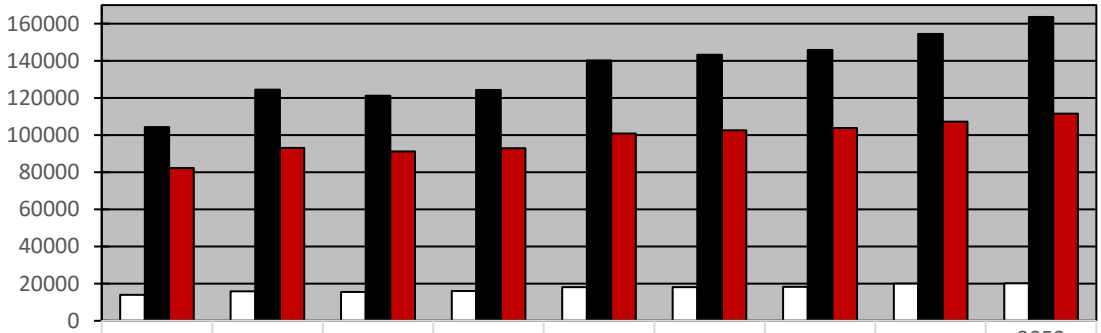

| | 2022 | 2033 Sc1 | 2033 Sc2 | 2033 Sc3 | 2043 Sc1 | 2043 Sc2 | 2043 Sc3 | 2053 Sc1 | 2053 Sc2/3 |
|---|---|---|---|---|---|---|---|---|---|
| Los F | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 2 | 3 |
| LoS E | 1 | 2 | 1 | 2 | 3 | 3 | 3 | 2 | 2 |
| LoS D | 4 | 6 | 7 | 7 | 6 | 5 | 5 | 8 | 6 |
| LoS C | 25 | 32 | 29 | 33 | 35 | 34 | 35 | 40 | 43 |

**Figure 3.4 LoS number of intersections PM**




| | 2022 | 2033 Sc1 | 2033 Sc2 | 2033 Sc3 | 2043 Sc1 | 2043 Sc2 | 2043 Sc3 | 2053 Sc1 | 2053 Sc2/3 |
|---|---|---|---|---|---|---|---|---|---|
| Los F | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.7 | 1.4 |
| LoS E | 4.4 | 5.6 | 5.6 | 5.6 | 6.5 | 6.8 | 6.8 | 8.3 | 7.7 |
| LoS D | 1.6 | 7.2 | 5 | 8.2 | 14.4 | 14.3 | 14.7 | 14.1 | 15 |
| LoS C | 19.4 | 18.2 | 19.2 | 17.7 | 11.9 | 12.5 | 14.3 | 12.1 | 14.8 |

**Figure 3.5 LoS by Km PM**




| | 2022 | 2033 Sc1 | 2033 Sc2 | 2033 Sc3 | 2043 Sc1 | 2043 Sc2 | 2043 Sc3 | 2053 Sc1 | 2053 Sc2/3 |
|---|---|---|---|---|---|---|---|---|---|
| Trip Total | 14034 | 15953 | 15581 | 16052 | 18055 | 18040 | 18252 | 19955 | 20137 |
| Vehicle Minutes | 104236 | 124525 | 121208 | 124269 | 140129 | 143291 | 145922 | 154478 | 163571 |
| Vehicle Kilometres | 82227 | 93150 | 91243 | 92966 | 100903 | 102628 | 103876 | 107196 | 111517 |

**Figure 3.6 Trip Totals PM**

## 3.2 2033 Traffic volumes and LOS

**Table 3.1 2033 Volumes in key locations**

| Peak | Road | Scenario 1 | | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|---|---|---|
| 8am-9am | | Eastbound | Westbound | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 1007 | 1259 | 976 | 1218 | 994 | 1234 |
| | Fergusson Dr West | 1075 | 1332 | 1051 | 1297 | 1090 | 1354 |
| | SH2 Central | 755 | 868 | 730 | 840 | 746 | 845 |
| | Fergusson Dr Central | 790 | 847 | 781 | 834 | 810 | 835 |

| Peak | Road | Scenario 1 | | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|---|---|---|
| | SH2 East | 571 | 1131 | 553 | 1102 | 564 | 1101 |
| 5pm-6pm | | Eastbound | Westbound | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 1512 | 1013 | 1453 | 984 | 1477 | 1002 |
| | Fergusson Dr West | 1357 | 1012 | 1333 | 988 | 1390 | 1027 |
| | SH2 Central | 1133 | 752 | 1082 | 731 | 1105 | 746 |
| | Fergusson Dr Central | 911 | 1025 | 904 | 1018 | 892 | 1031 |
| | SH2 East | 1424 | 725 | 1392 | 707 | 1400 | 718 |

**Table 3.2 Differences from scenario 1 for 2033 volumes in key locations**

| Peak | Scenario 2 | | | Scenario 3 | |
|---|---|---|---|---|---|
| | | Eastbound | Westbound | Eastbound | Westbound |
| 8am-9am | SH2 West | -31 (-3.1%) | -41 (-3.3%) | -13 (-1.3%) | -25 (-2%) |
| | Fergusson Dr West | -24 (-2.2%) | -35 (-2.6%) | 15 (1.4%) | 22 (1.7%) |
| | SH2 Central | -25 (-3.3%) | -28 (-3.2%) | -9 (-1.2%) | -23 (-2.6%) |
| | Fergusson Dr Central | -9 (-1.1%) | -13 (-1.5%) | 20 (2.5%) | -12 (-1.4%) |
| | SH2 East | -18 (-3.2%) | -29 (-2.6%) | -7 (-1.2%) | -30 (-2.7%) |
| 5pm-6pm | | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | -59 (-3.9%) | -29 (-2.9%) | -35 (-2.3%) | -11 (-1.1%) |
| | Fergusson Dr West | -24 (-1.8%) | -24 (-2.4%) | 33 (2.4%) | 15 (1.5%) |
| | SH2 Central | -51 (-4.5%) | -21 (-2.8%) | -28 (-2.5%) | -6 (-0.8%) |
| | Fergusson Dr Central | -7 (-0.8%) | -7 (-0.7%) | -19 (-2.1%) | 6 (0.6%) |
| | SH2 East | -32 (-2.2%) | -18 (-2.5%) | -24 (-1.7%) | -7 (-1%) |

## Key Changes

### AM Peak

- Scenario 2 generally has less traffic than Scenario 1 on each key corridor in each direction. This is a reflection of a higher level of overall households in Scenario 1 compared to Scenario 2.
- The only location and directions in Scenario 3 which has higher traffic volumes compared to Scenario 1 is Fergusson Dr (West) in both peak periods (both directions) and Fergusson Dr

Central Eastbound. This is likely due to a faster uptake of development in the Southern Growth Area.

- SH2 has less traffic in Scenario 2 and Scenario 3 compared to Scenario 1, with a larger decrease in Scenario 2.

**PM Peak**

- Scenario 2 has less traffic than Scenario 1 on all key corridors.
- The only location and directions in Scenario 3 which has more traffic than Scenario 1 is Fergusson Dr (West) in both peak periods (both directions) and Fergusson Dr Central Westbound. This is likely due to a faster uptake of development in the Southern Growth Area.
- SH2 has less traffic in Scenario 2 and Scenario 3 compared to Scenario 1, with a larger decrease in Scenario 2.

## 2033 Deficiency Analysis Summary

This analysis highlights the portions of the network where LOS E and F is experienced noting any changes from the previous modelled year as well as key changes between scenarios. The 2033 summary for the AM and PM peak can be found in Figure 3.7 and Figure 3.8 respectively. The base plots for all of the deficiency analysis summaries is the Scenario 3 Level of Service plot for the given year, as this typically has the worst performing intersections and links.

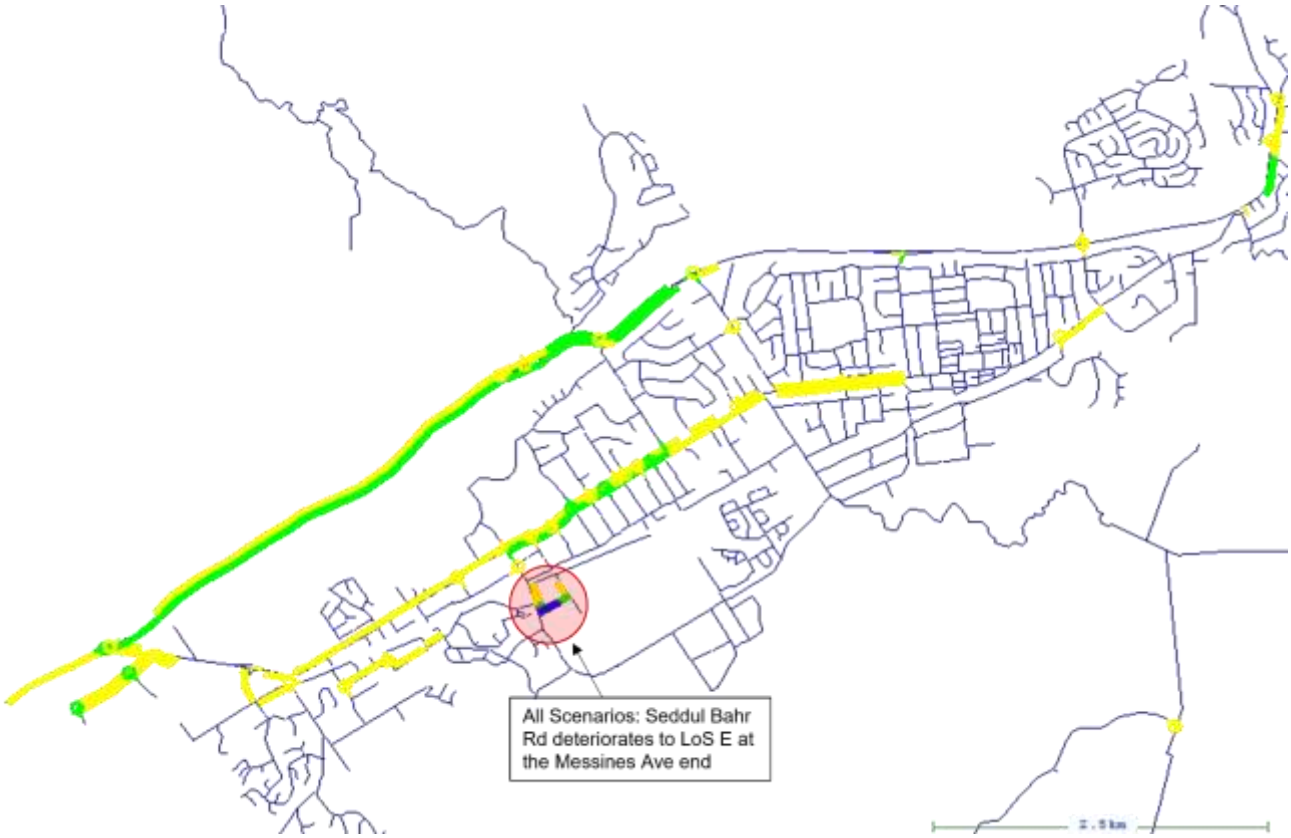



**Figure 3.7 2033 Deficiency Analysis AM Peak**

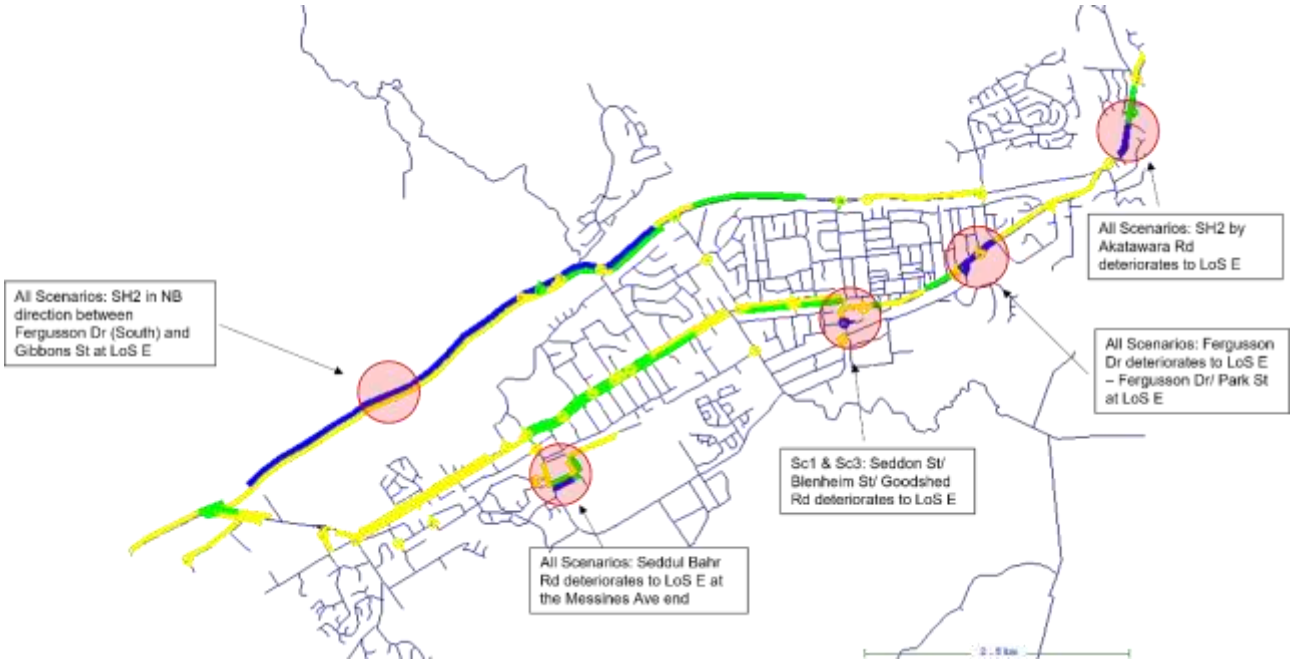



**Figure 3.8 2033 Deficiency Analysis PM Peak**

## 3.3 2043 Traffic Volumes and LOS

Volumes at key locations are presented below.

**Table 3.3 2043 volumes in key locations**

| Peak | Road | Scenario 1 | | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|---|---|---|
| 8am-9am | | Eastbound | Westbound | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 1103 | 1324 | 1098 | 1300 | 1111 | 1308 |
| | Fergusson Dr West | 1122 | 1344 | 1117 | 1349 | 1130 | 1375 |
| | SH2 Central | 847 | 904 | 848 | 907 | 861 | 906 |
| | Fergusson Dr Central | 986 | 933 | 983 | 925 | 990 | 928 |
| | SH2 East | 598 | 1199 | 616 | 1291 | 621 | 1292 |
| 5pm-6pm | | Eastbound | Westbound | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 1585 | 1112 | 1565 | 1106 | 1572 | 1123 |
| | Fergusson Dr West | 1389 | 1028 | 1392 | 1029 | 1423 | 1041 |
| | SH2 Central | 1205 | 847 | 1202 | 848 | 1201 | 859 |
| | Fergusson Dr Central | 1007 | 1164 | 1004 | 1167 | 1013 | 1176 |
| | SH2 East | 1492 | 752 | 1578 | 779 | 1581 | 782 |

**Table 3.4 Difference from scenario 1 for 2043 volumes in key locations**

| Peak | Location | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|---|
| 8am-9am | | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | -5 (-0.5%) | -24 (-1.8%) | 8 (0.7%) | -16 (-1.2%) |
| | Fergusson Dr West | -5 (-0.4%) | 5 (0.4%) | 8 (0.7%) | 31 (2.3%) |
| | SH2 Central | 1 (0.1%) | 3 (0.3%) | 14 (1.7%) | 2 (0.2%) |
| | Fergusson Dr Central | -3 (-0.3%) | -8 (-0.9%) | 4 (0.4%) | -5 (-0.5%) |
| | SH2 East | 18 (3%) | 92 (7.7%) | 23 (3.8%) | 93 (7.8%) |
| 5pm-6pm | | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | -20 (-1.3%) | -6 (-0.5%) | -13 (-0.8%) | 11 (1%) |
| | Fergusson Dr West | 3 (0.2%) | 1 (0.1%) | 34 (2.4%) | 13 (1.3%) |
| | SH2 Central | -3 (-0.2%) | 1 (0.1%) | -4 (-0.3%) | 12 (1.4%) |
| | Fergusson Dr Central | -3 (-0.3%) | 3 (0.3%) | 6 (0.6%) | 12 (1%) |
| | SH2 East | 86 (5.8%) | 27 (3.6%) | 89 (6%) | 30 (4%) |

**Table 3.5 Difference from 2033 volumes in key areas**

| Peak | Road | Scenario 1 | | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|---|---|---|
| 8am-9am | | Eastbound | Westbound | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 96 (9.5%) | 65 (5.2%) | 122 (12.5%) | 82 (6.7%) | 117 (11.8%) | 74 (6%) |
| | Fergusson Dr West | 47 (4.4%) | 12 (0.9%) | 66 (6.3%) | 52 (4%) | 40 (3.7%) | 21 (1.6%) |
| | SH2 Central | 92 (12.2%) | 36 (4.1%) | 118 (16.2%) | 67 (8%) | 115 (15.4%) | 61 (7.2%) |
| | Fergusson Dr Central | 196 (24.8%) | 86 (10.2%) | 202 (25.9%) | 91 (10.9%) | 180 (22.2%) | 93 (11.1%) |
| | SH2 East | 27 (4.7%) | 68 (6%) | 63 (11.4%) | 189 (17.2%) | 57 (10.1%) | 191 (17.3%) |
| 5pm-6pm | | Eastbound | Westbound | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 73 (4.8%) | 99 (9.8%) | 112 (7.7%) | 122 (12.4%) | 95 (6.4%) | 121 (12.1%) |
| | Fergusson Dr West | 32 (2.4%) | 16 (1.6%) | 59 (4.4%) | 41 (4.1%) | 33 (2.4%) | 14 (1.4%) |
| | SH2 Central | 72 (6.4%) | 95 (12.6%) | 120 (11.1%) | 117 (16%) | 96 (8.7%) | 113 (15.1%) |
| | Fergusson Dr Central | 96 (10.5%) | 139 (13.6%) | 100 (11.1%) | 149 (14.6%) | 121 (13.6%) | 145 (14.1%) |
| | SH2 East | 68 (4.8%) | 27 (3.7%) | 186 (13.4%) | 72 (10.2%) | 181 (12.9%) | 64 (8.9%) |

## Key Changes

### AM Peak

- Eastbound traffic (from Wellington) has greater increases than westbound traffic (towards Wellington) in all locations apart from SH2 East in all scenarios compared to 2033.
- Fergusson Dr Central has the largest increases in traffic (up to + 24.8%) across all scenarios compared to 2033.
- All locations in all scenarios have increases in traffic compared to 2033.
- Fergusson Dr West Eastbound has a greater increase in traffic in Scenario 2 and Scenario 3 compared to Scenario 1. Scenario 3 has the largest increase.
- SH2 East Westbound has a greater increase in traffic in Scenario 2 and Scenario 3 compared to Scenario 1. The increase is similar in both scenarios as is the case for SH2 East Eastbound, albeit at a lower rate.

### PM Peak

- Westbound traffic (towards Wellington) has greater increases than eastbound traffic (from Wellington) at all locations apart from SH2 East in all scenarios compared to 2033 (with the exception of Sc3 Ferg Dr Central & Sc1 Ferg Dr West where increases/ decreases are similar in both directions).
- Fergusson Dr Central & SH2 Central have the largest increases in traffic (up to + 14.6% and 16% respectively) across all scenarios compared to 2033.
- Increases in traffic compared to 2033 are lesser than in the AM Peak
- As expected, all locations in all scenarios have increases in traffic compared to 2033.
- Fergusson Dr West westbound has a large increase in traffic in Scenario 2 and Scenario 3 compared to Scenario 1. Scenario 3 has the largest increase.
- SH2 East eastbound has a large increase in traffic in Scenario 2 and Scenario 3 compared to Scenario 1. The increase is similar in both Scenarios as is the case for SH2 East Westbound, albeit at a lower rate.
- These observations are generally the same as the AM peak results but in opposite directions.

## 2043 Deficiency Analysis Summary

The 2043 deficiency analysis summary for the AM and PM peaks can be found in Figure 3.9 and Figure 3.10 respectively.


**Figure 3.9 2043 Exception Analysis AM Peak**

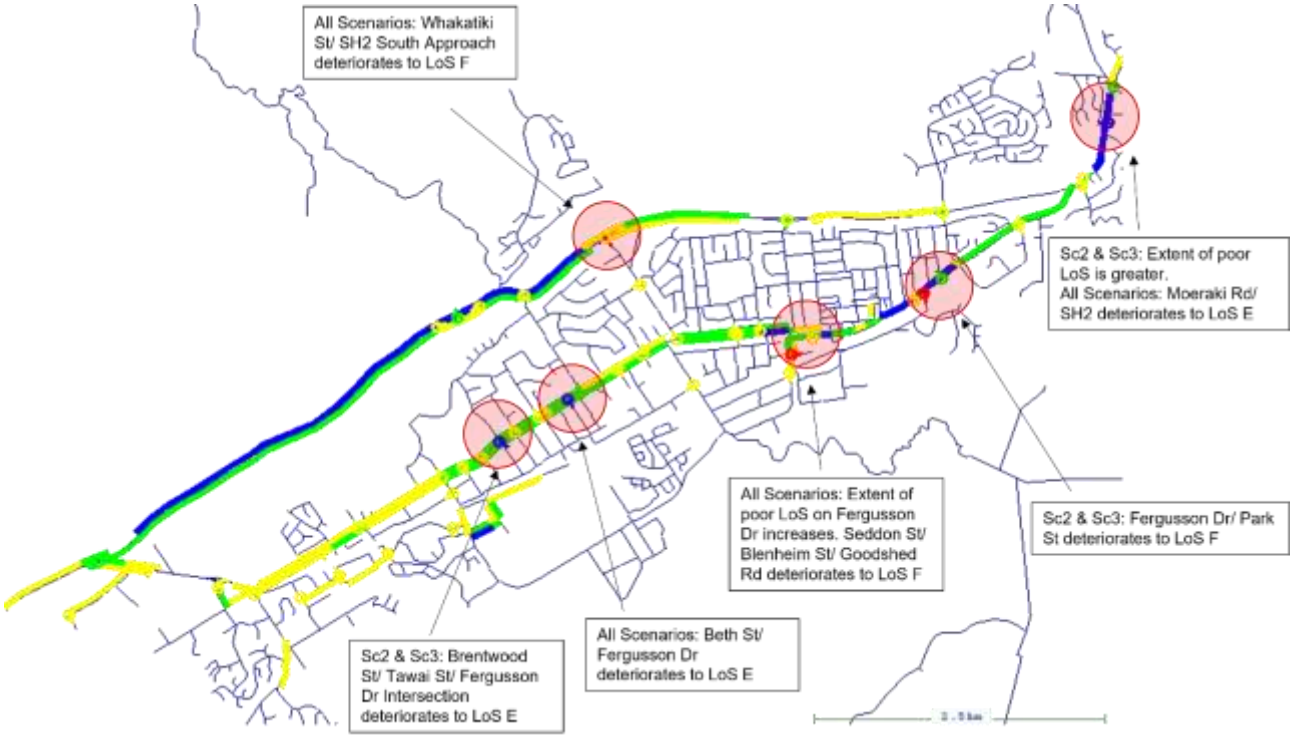



**Figure 3.10 2043 Exception Analysis PM Peak**

## 3.4 2053 Traffic volumes and LOS

**Table 3.6 2053 volumes in key locations**

| Peak | Road | Scenario 1 | | Scenario 2/3 | |
|---|---|---|---|---|---|
| 8am-9am | | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 1216 | 1398 | 1241 | 1383 |
| | Fergusson Dr West | 1164 | 1352 | 1152 | 1375 |
| | SH2 Central | 972 | 927 | 992 | 952 |
| | Fergusson Dr Central | 1125 | 1004 | 1120 | 1004 |
| | SH2 East | 617 | 1265 | 647 | 1470 |
| 5pm-6pm | | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 1645 | 1235 | 1643 | 1258 |
| | Fergusson Dr West | 1435 | 1026 | 1450 | 1021 |
| | SH2 Central | 1253 | 911 | 1269 | 924 |
| | Fergusson Dr Central | 1121 | 1273 | 1115 | 1275 |
| | SH2 East | 1558 | 774 | 1737 | 829 |

**Table 3.7 Difference from scenario 1 in 2053 volumes in key locations**

| Peak | Location | Scenario 2/3 | |
|---|---|---|---|
| 8am-9am | | Eastbound | Westbound |
| | SH2 West | 25 (2.1%) | -15 (-1.1%) |
| | Fergusson Dr West | -12 (-1%) | 23 (1.7%) |
| | SH2 Central | 20 (2.1%) | 25 (2.7%) |
| | Fergusson Dr Central | -5 (-0.4%) | 0 (0%) |
| | SH2 East | 30 (4.9%) | 205 (16.2%) |
| 5pm-6pm | | Eastbound | Westbound |
| | SH2 West | -2 (-0.1%) | 23 (1.9%) |
| | Fergusson Dr West | 15 (1%) | -5 (-0.5%) |
| | SH2 Central | 16 (1.3%) | 13 (1.4%) |
| | Fergusson Dr Central | -6 (-0.5%) | 2 (0.2%) |
| | SH2 East | 179 (11.5%) | 55 (7.1%) |

**Table 3.8 Difference from 2043 volumes in key locations**

| Peak | Road | Scenario 1 | | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|---|---|---|
| 8am-9am | | Eastbound | Westbound | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 113 (10.2%) | 74 (5.6%) | 143 (13%) | 83 (6.4%) | 130 (11.7%) | 75 (5.7%) |
| | Fergusson Dr West | 42 (3.7%) | 8 (0.6%) | 35 (3.1%) | 26 (1.9%) | 22 (1.9%) | 0 (0%) |
| | SH2 Central | 125 (14.8%) | 23 (2.5%) | 144 (17%) | 45 (5%) | 131 (15.2%) | 46 (5.1%) |
| | Fergusson Dr Central | 139 (14.1%) | 71 (7.6%) | 137 (13.9%) | 79 (8.5%) | 130 (13.1%) | 76 (8.2%) |
| | SH2 East | 19 (3.2%) | 66 (5.5%) | 31 (5%) | 179 (13.9%) | 26 (4.2%) | 178 (13.8%) |
| 5pm-6pm | | Eastbound | Westbound | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 60 (3.8%) | 123 (11.1%) | 78 (5%) | 152 (13.7%) | 71 (4.5%) | 135 (12%) |
| | Fergusson Dr West | 46 (3.3%) | -2 (-0.2%) | 58 (4.2%) | -8 (-0.8%) | 27 (1.9%) | -20 (-1.9%) |
| | SH2 Central | 48 (4%) | 64 (7.6%) | 67 (5.6%) | 76 (9%) | 68 (5.7%) | 65 (7.6%) |
| | Fergusson Dr Central | 114 (11.3%) | 109 (9.4%) | 111 (11.1%) | 108 (9.3%) | 102 (10.1%) | 99 (8.4%) |
| | SH2 East | 66 (4.4%) | 22 (2.9%) | 159 (10.1%) | 50 (6.4%) | 156 (9.9%) | 47 (6%) |

**Table 3.9 Difference from 2033 volumes in key locations**

| Peak | Road | Scenario 1 | | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|---|---|---|
| 8am-9am | | Eastbound | Westbound | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 209 (20.8%) | 139 (11%) | 265 (27.2%) | 165 (13.5%) | 247 (24.8%) | 149 (12.1%) |
| | Fergusson Dr West | 89 (8.3%) | 20 (1.5%) | 101 (9.6%) | 78 (6%) | 62 (5.7%) | 21 (1.6%) |
| | SH2 Central | 217 (28.7%) | 59 (6.8%) | 262 (35.9%) | 112 (13.3%) | 246 (33%) | 107 (12.7%) |
| | Fergusson Dr Central | 335 (42.4%) | 157 (18.5%) | 339 (43.4%) | 170 (20.4%) | 310 (38.3%) | 169 (20.2%) |
| | SH2 East | 46 (8.1%) | 134 (11.8%) | 94 (17%) | 368 (33.4%) | 83 (14.7%) | 369 (33.5%) |
| 5pm-6pm | | Eastbound | Westbound | Eastbound | Westbound | Eastbound | Westbound |
| | SH2 West | 133 (8.8%) | 222 (21.9%) | 190 (13.1%) | 274 (27.8%) | 166 (11.2%) | 256 (25.5%) |
| | Fergusson Dr West | 78 (5.7%) | 14 (1.4%) | 117 (8.8%) | 33 (3.3%) | 60 (4.3%) | -6 (-0.6%) |
| | SH2 Central | 120 (10.6%) | 159 (21.1%) | 187 (17.3%) | 193 (26.4%) | 164 (14.8%) | 178 (23.9%) |
| | Fergusson Dr Central | 210 (23.1%) | 248 (24.2%) | 211 (23.3%) | 257 (25.2%) | 223 (25%) | 244 (23.7%) |
| | SH2 East | 134 (9.4%) | 49 (6.8%) | 345 (24.8%) | 122 (17.3%) | 337 (24.1%) | 111 (15.5%) |

## Key Changes

### AM Peak

- Eastbound traffic (from Wellington) has greater increases than westbound (towards Wellington) traffic at all locations other than SH2 east in all scenarios compared to 2033 and 2043.
- Overall, there have been greater increases in traffic at key locations in Scenario 2/3.
- SH2 east has the largest differences compared to Scenario 1, particularly in the westbound direction.

### PM Peak

- Westbound traffic (towards Wellington) has stronger increases than eastbound traffic (from Wellington) at most locations compared to 2033 and 2043. SH2 east is a notable exception.
- Overall there have been greater increases in traffic at the key locations in Scenario 2/3.
- SH2 east has the largest differences compared to Scenario 1, particularly in the eastbound direction.

## 2053 Deficiency Analysis Summary

The 2053 deficiency analysis summary for the AM and PM peaks can be found in Figure 3.11 and Figure 3.12 respectively.

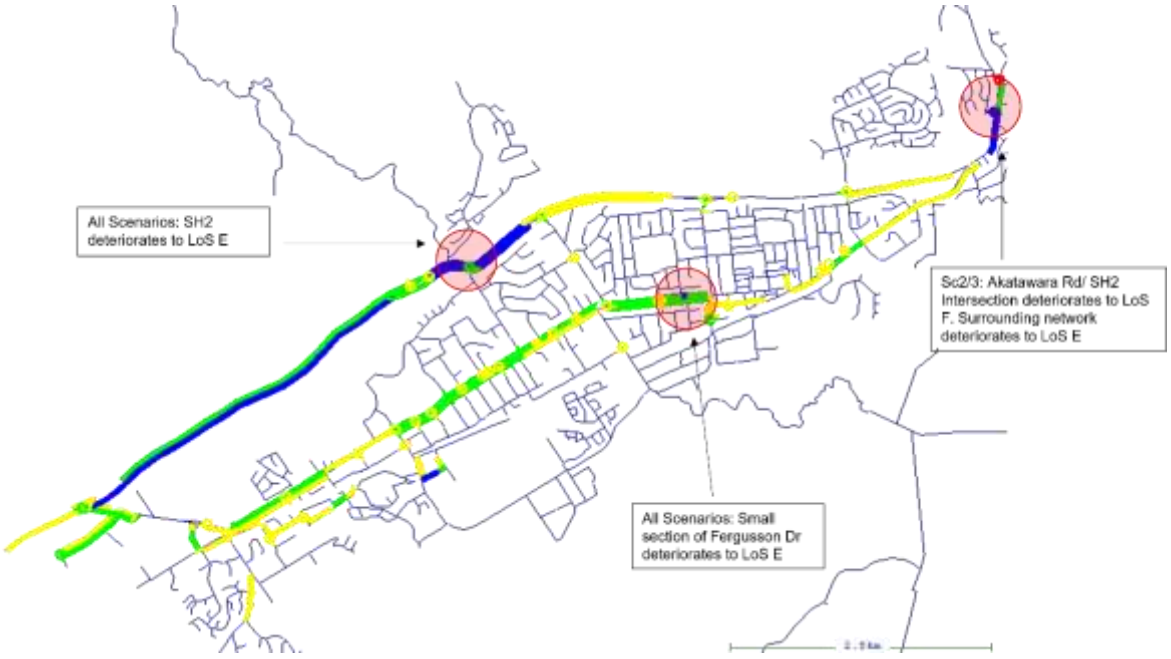



**Figure 3.11 2053 Exception Analysis AM**

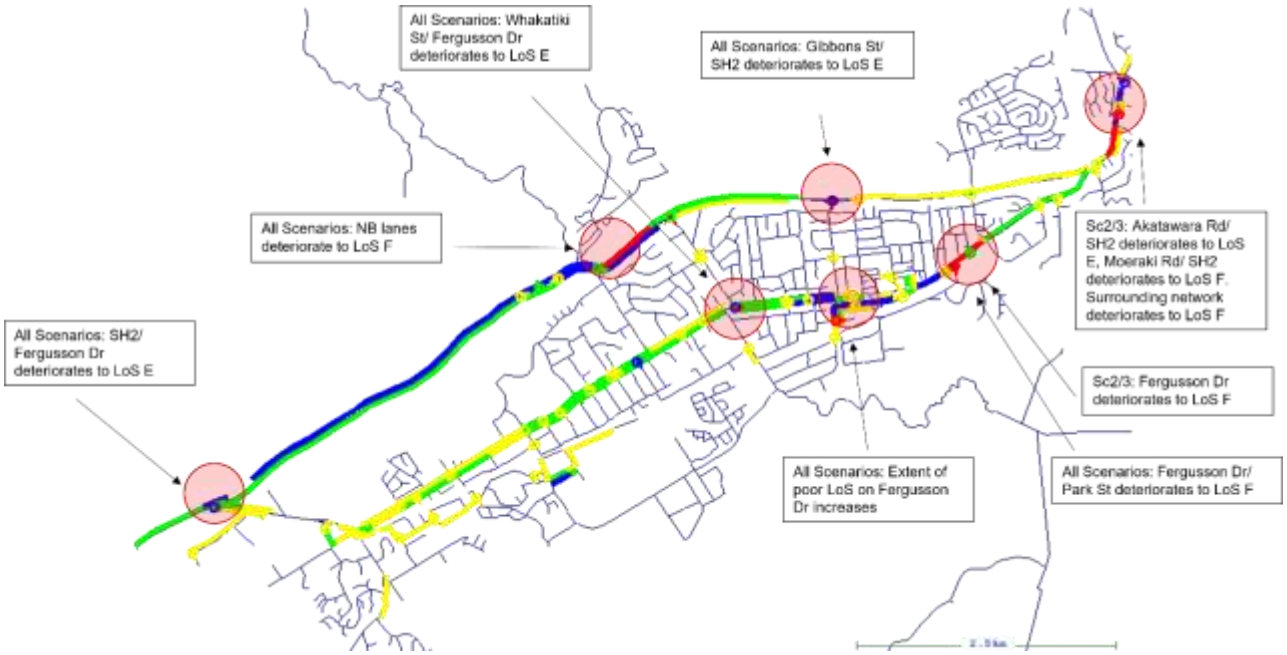



**Figure 3.12 2053 Exception Analysis PM**

# 4. Discussion/ Conclusions

Key areas with deficiencies are shown in Figure 4.1.

- Poor LoS on Seddul Bahr Road is due to an assumed 30 kph speed environment from the base model and the increase in traffic due to the Trentham Racecourse mixed use development. We note that this is going through a separate Plan Change process and it is recommended that the standard of Seddul Bahr Road be maintained to enable a design speed of 50 kph. This would resolve the poor LoS observed in the model runs.
- Population size varies across scenarios due to scenarios being built up based on number of households. The effects of this can be seen in the trip totals row of the summaries – the biggest difference is there being an additional 1625 people in 2033 Sc2 vs 2033 Sc3. This impacts the conclusions on VKT, and a per capita approach is recommended to comparing VKT across scenarios.
- Generally, trip lengths and therefore VKT is higher in Scenario 2 and Scenario 3. This worsens congestion and results in more LoS issues.
- SH2 between Fergusson Dr and Whakatiki St, Fergusson Dr by the Town Centre and SH2 by Akatarawa Road should be considered in more detail prior to 2053 regardless of the land use scenario, to ensure the safe and efficient operation of each as Upper Hutt grows.
- It is observed from the base year model deficiency analysis that the traffic model does not reflect the level of complexity, traffic behaviour (including lane weaving) and resultant level of service issues in the vicinity of the SH2 Silverstream intersection and Fergusson Drive / Eastern Hutt Road. Delays and LoS are therefore expected to be generally under-represented in future year scenarios also.

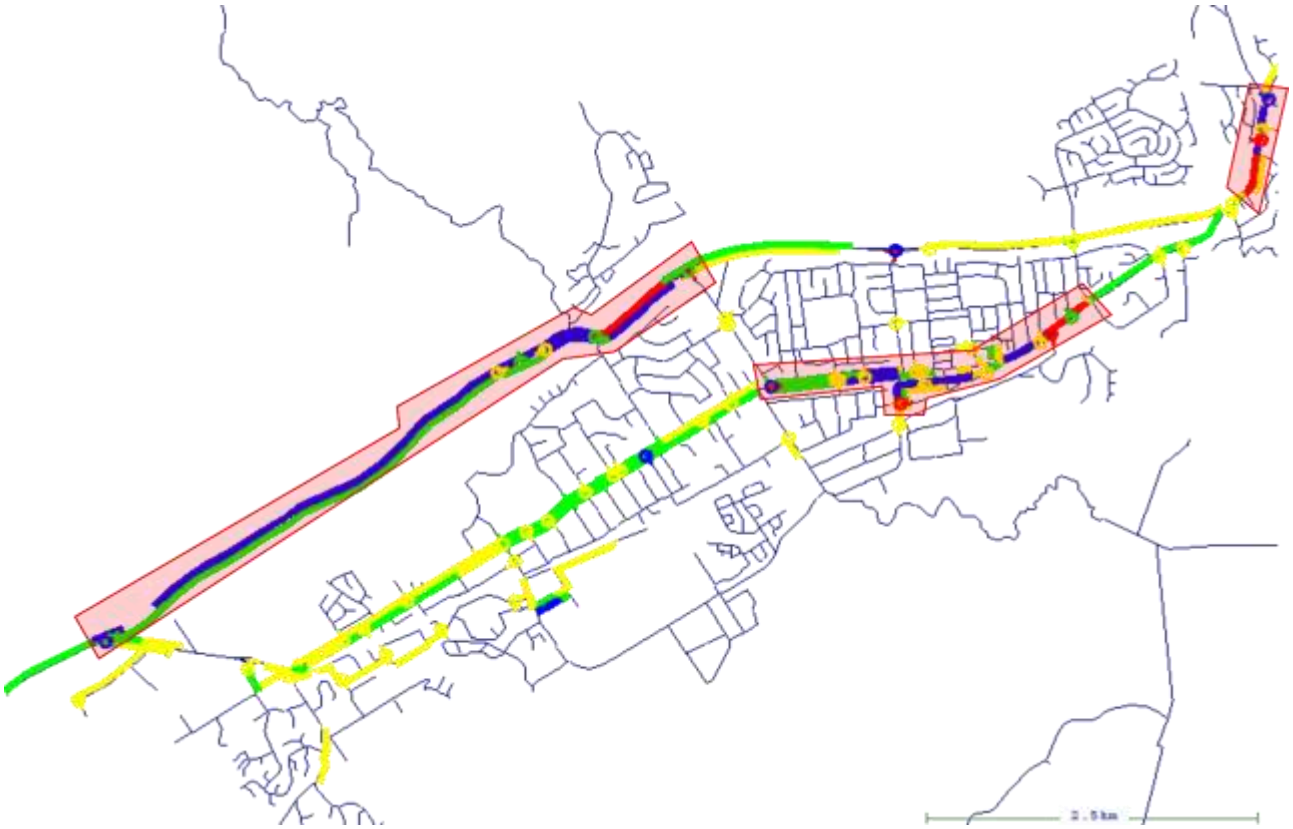


**Figure 4.1 Key areas with deficiencies**

# Appendix A.

## A1. Level of Service Plots

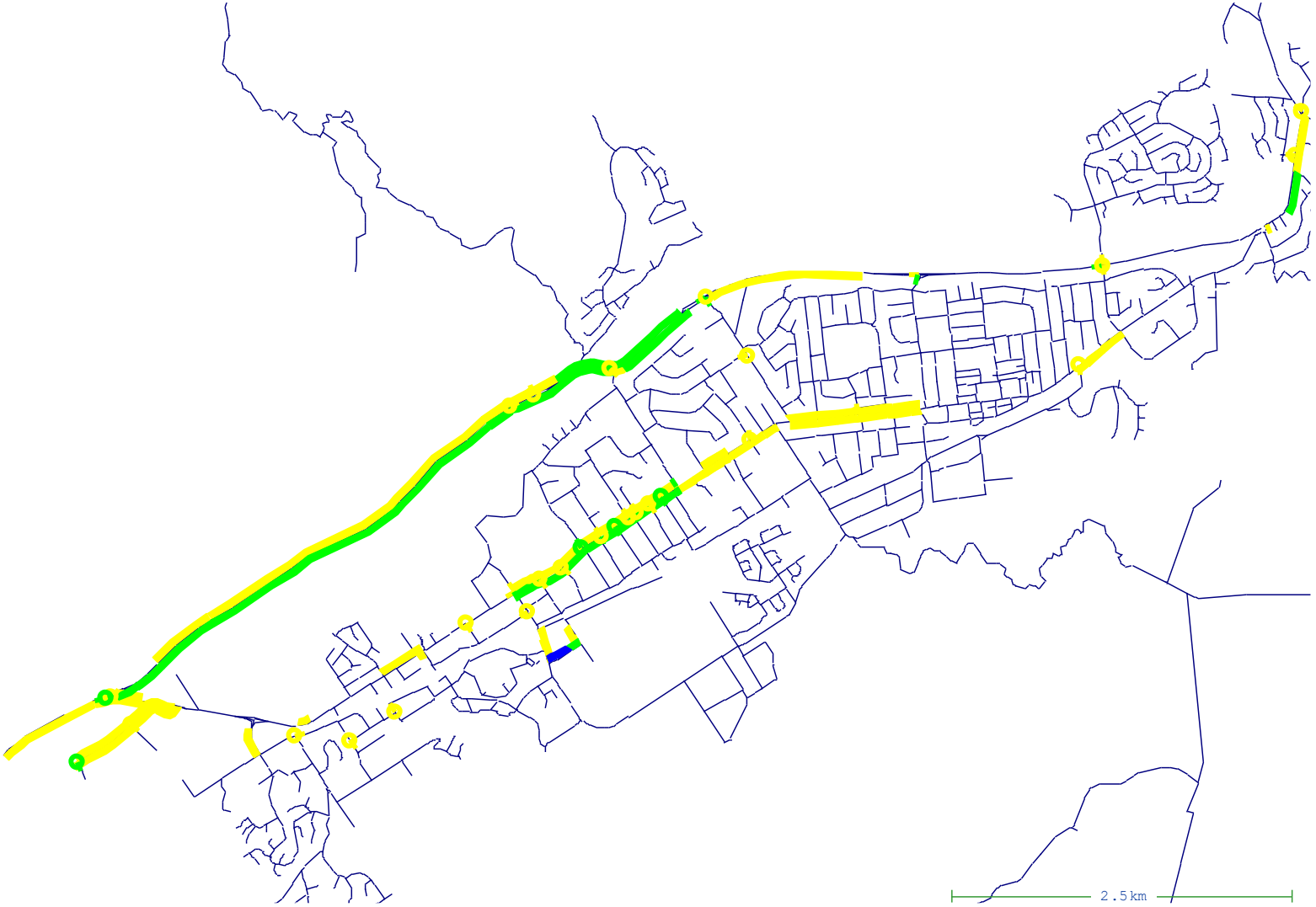



**Figure A1.1 2033 Sc1 AM LoS Plot**

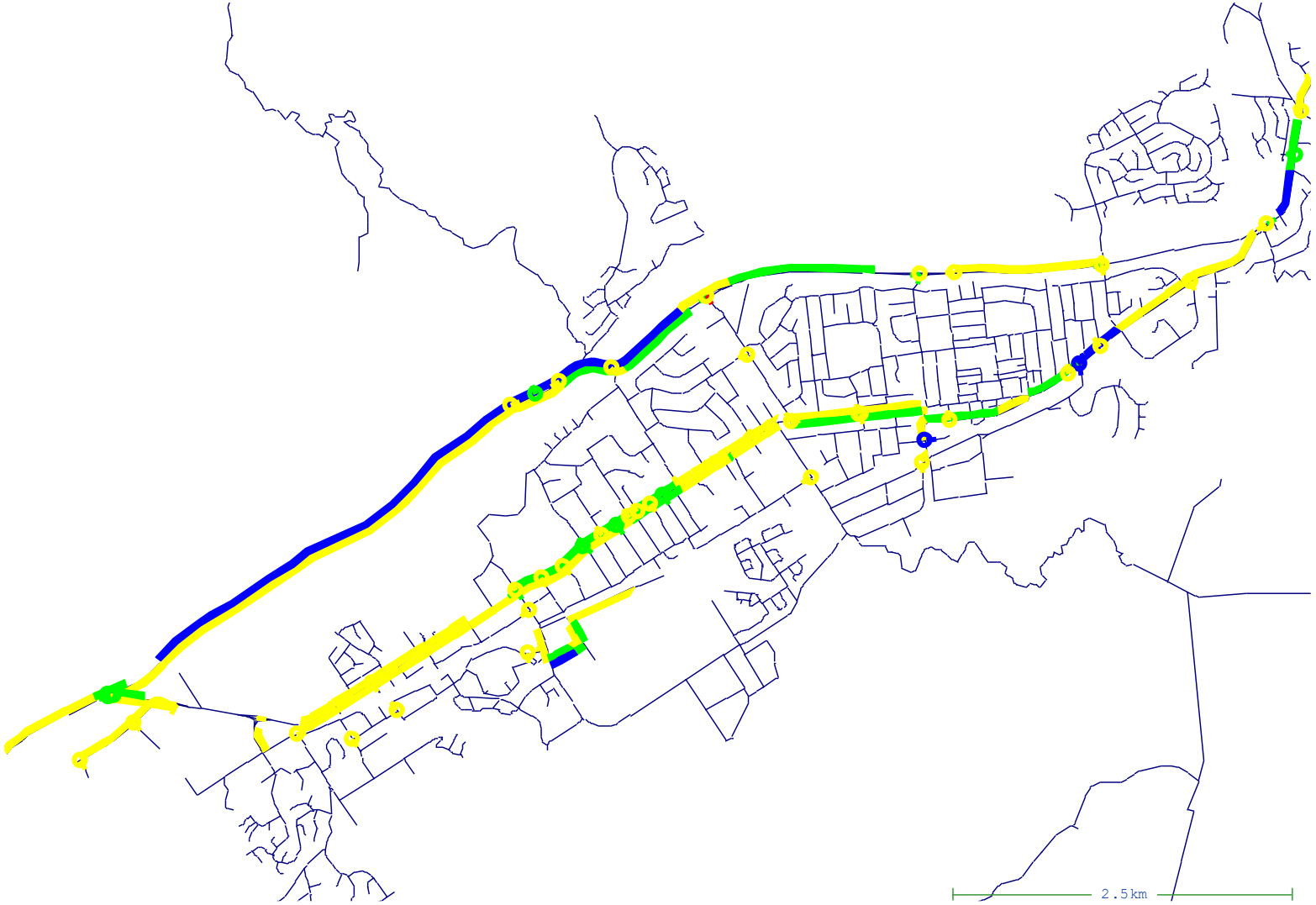



**Figure A1.2 2033 Sc1 PM LoS Plot**

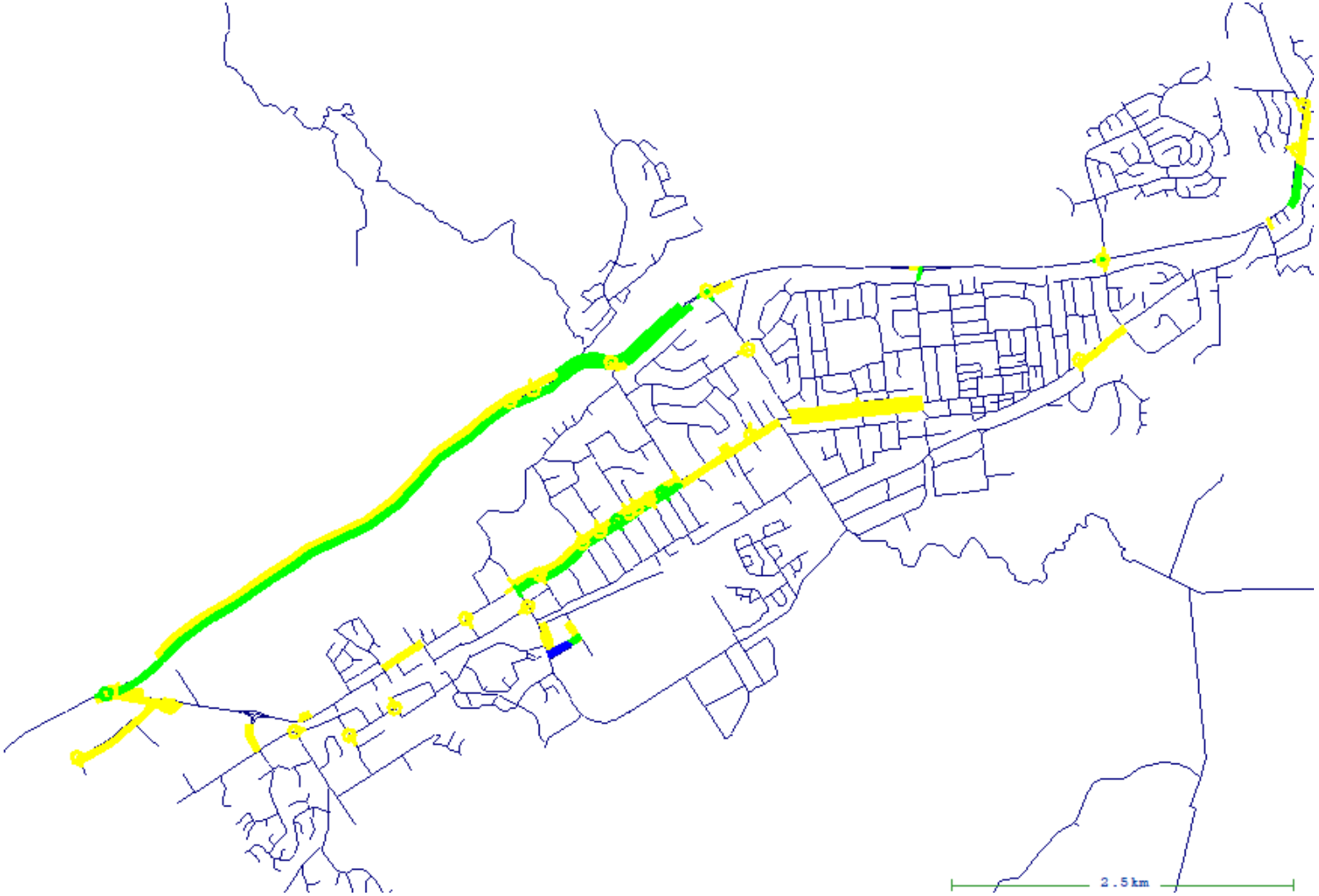



**Figure A1.3 2033 Sc2 AM LoS Plot**

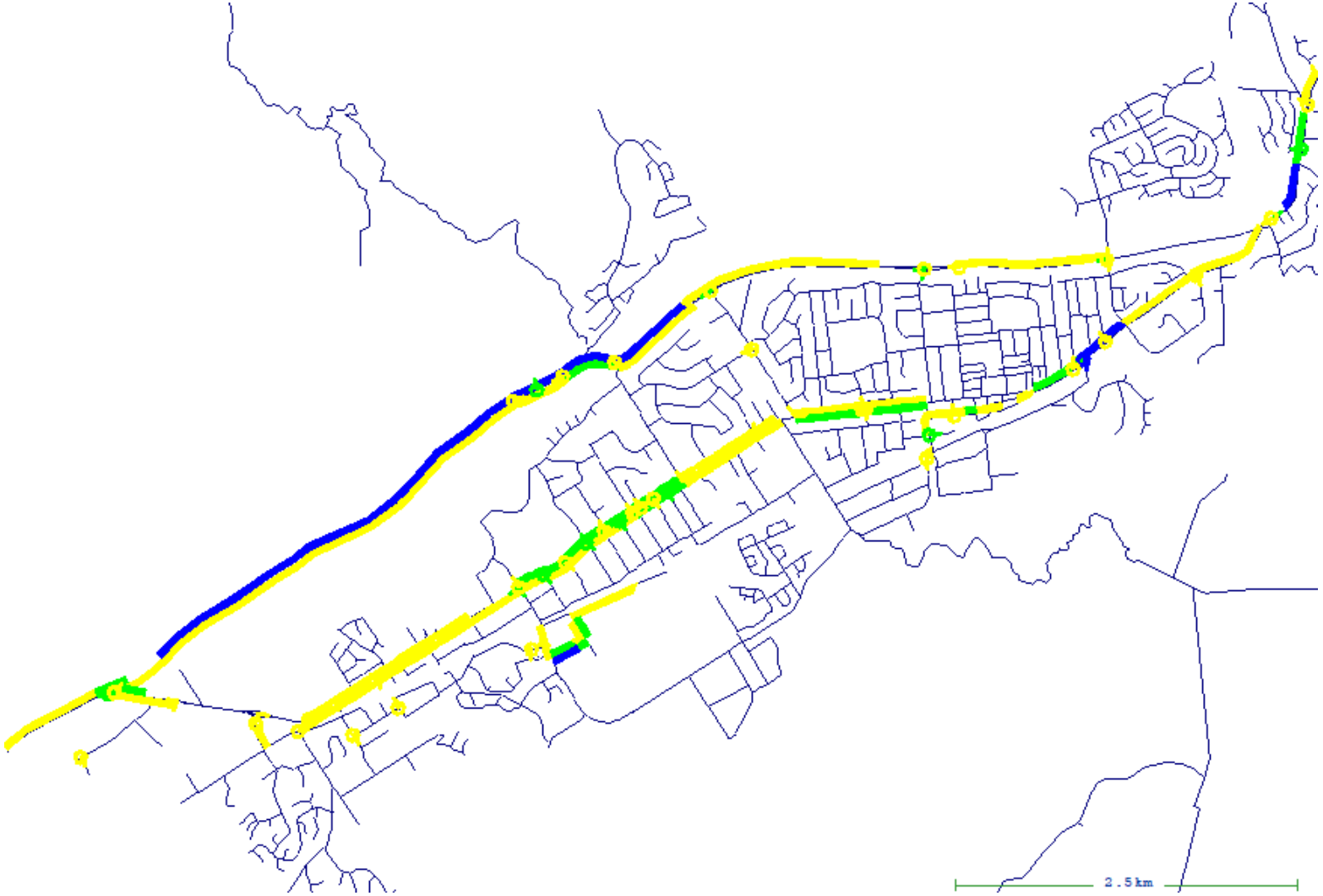



**Figure A1.4 2033 Sc2 PM LoS Plot**

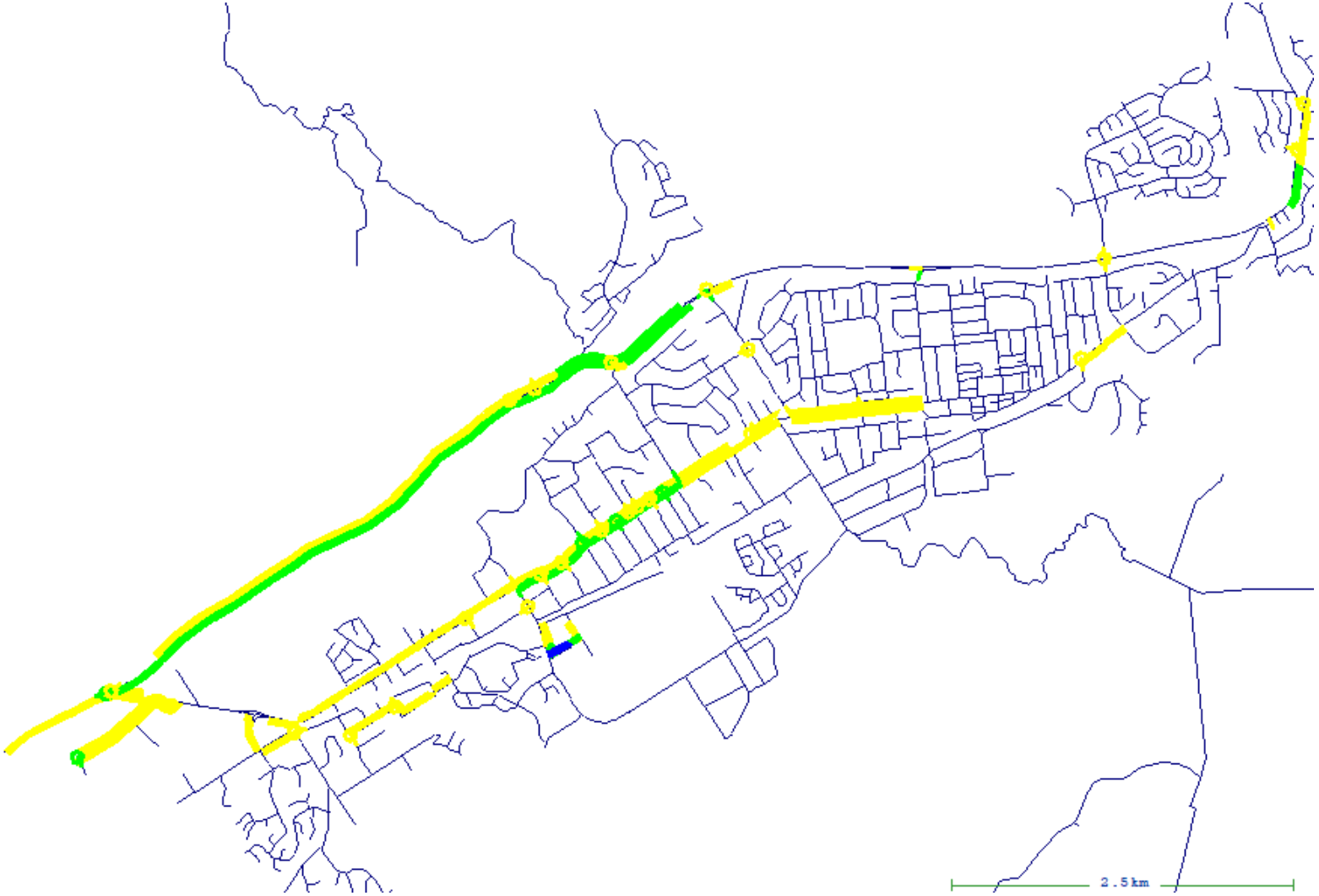



**Figure A1.5 2033 Sc3 AM LoS Plot**

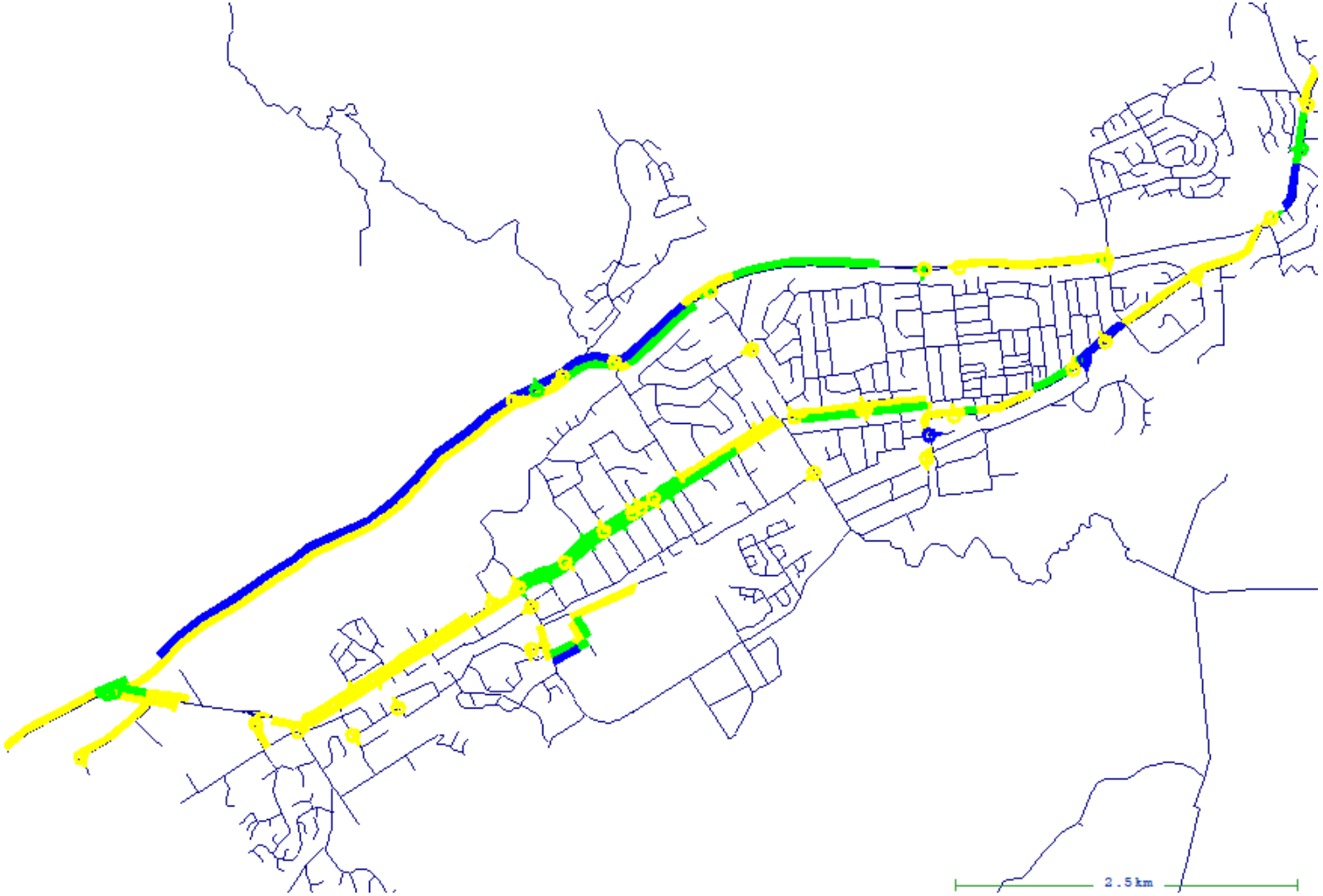



**Figure A1.6 2033 Sc3 PM LoS Plot**

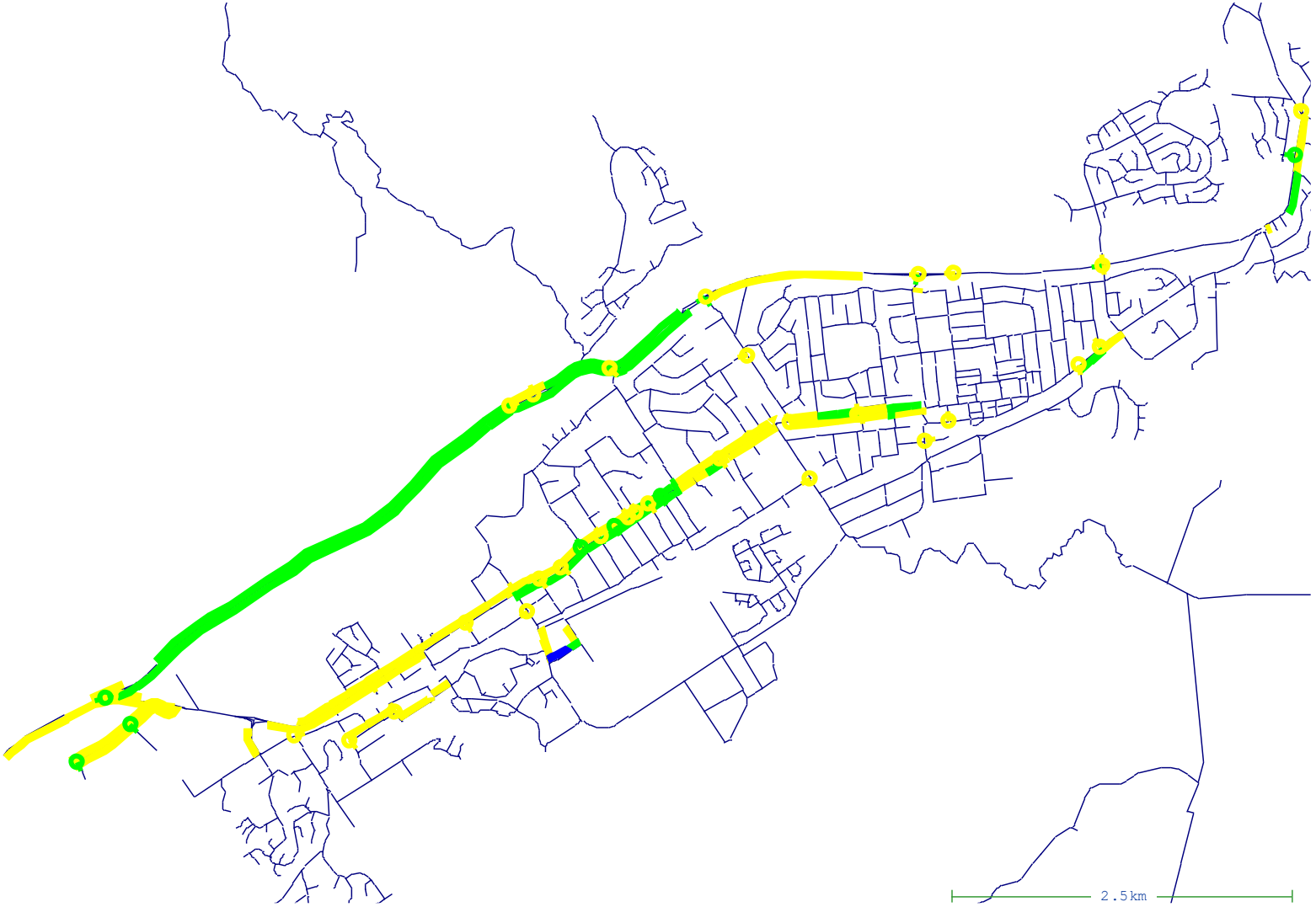



**Figure A1.7 2043 Sc1 AM LoS Plot**

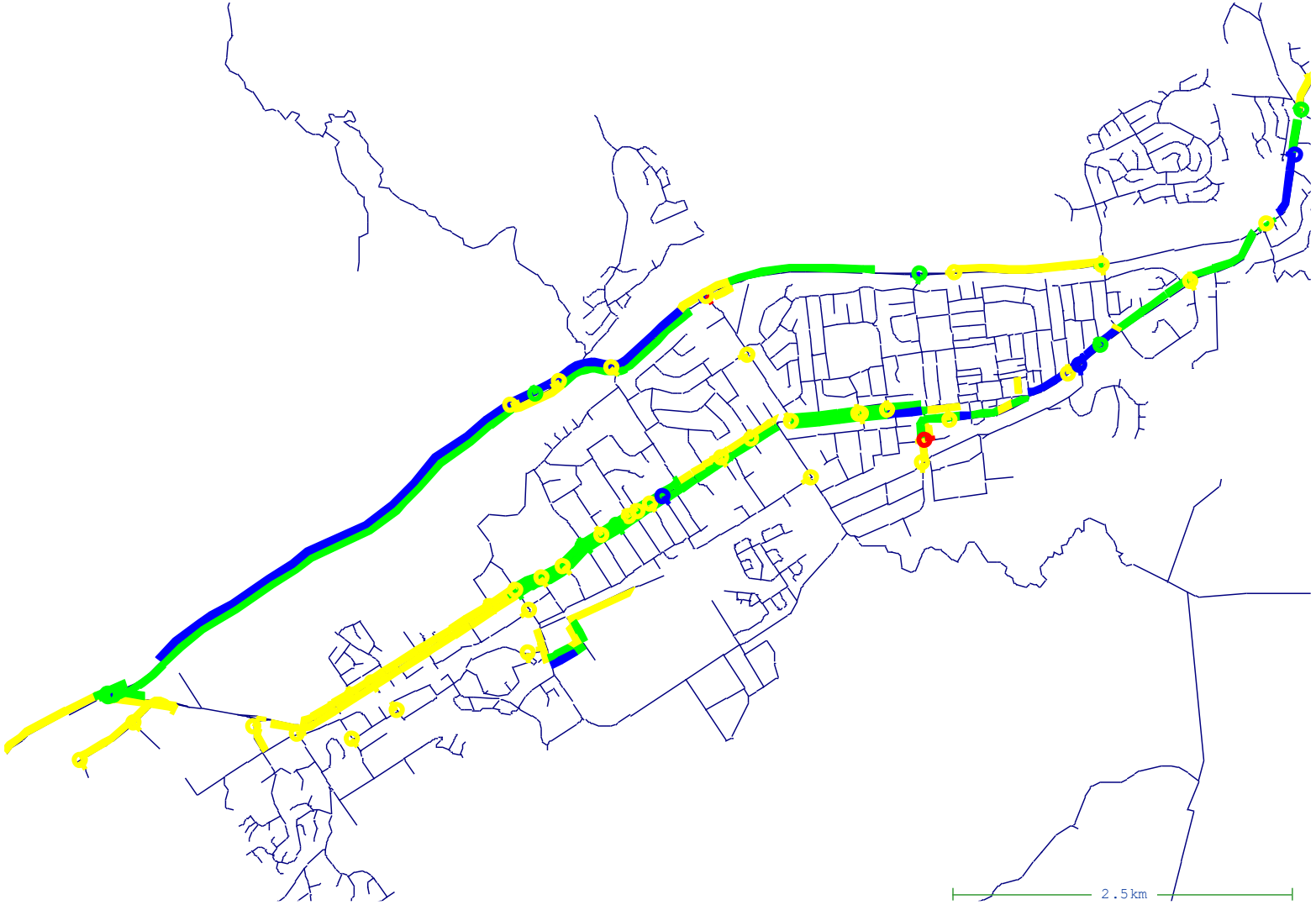



**Figure A1.8 2043 Sc1 PM LoS Plot**

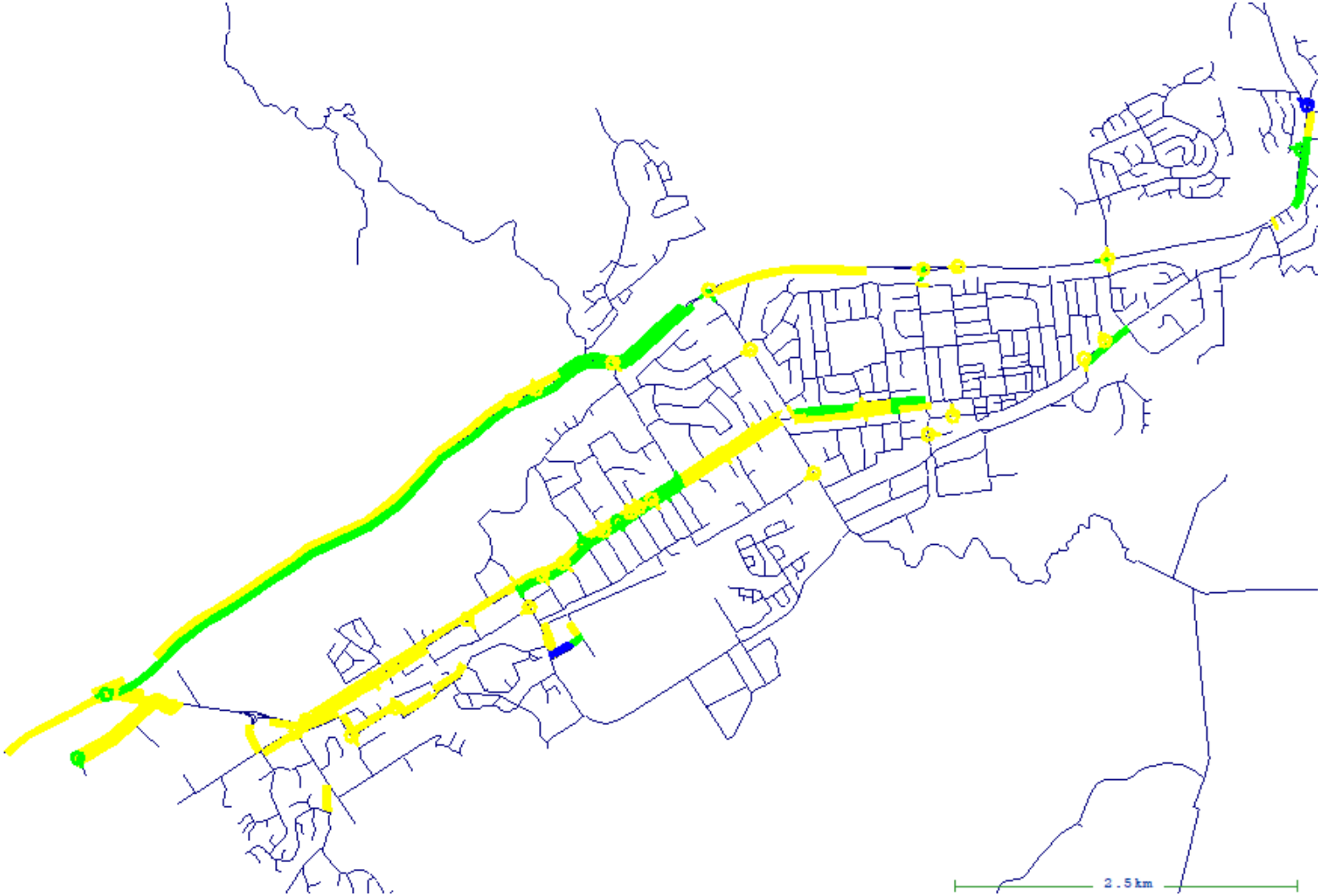



**Figure A1.9 2043 Sc2 AM LoS Plot**

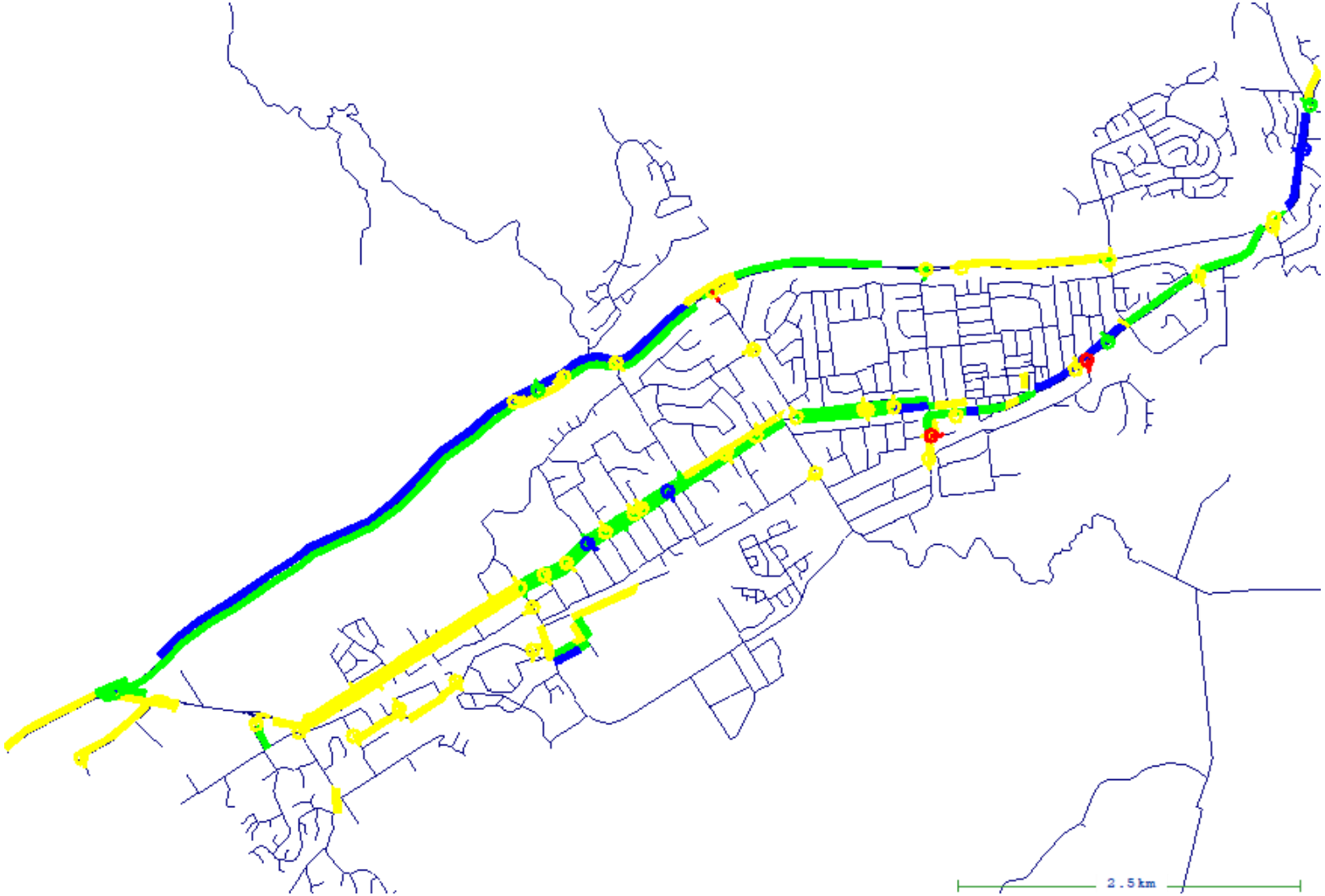



**Figure A1.10 2043 Sc2 PM LoS Plot**

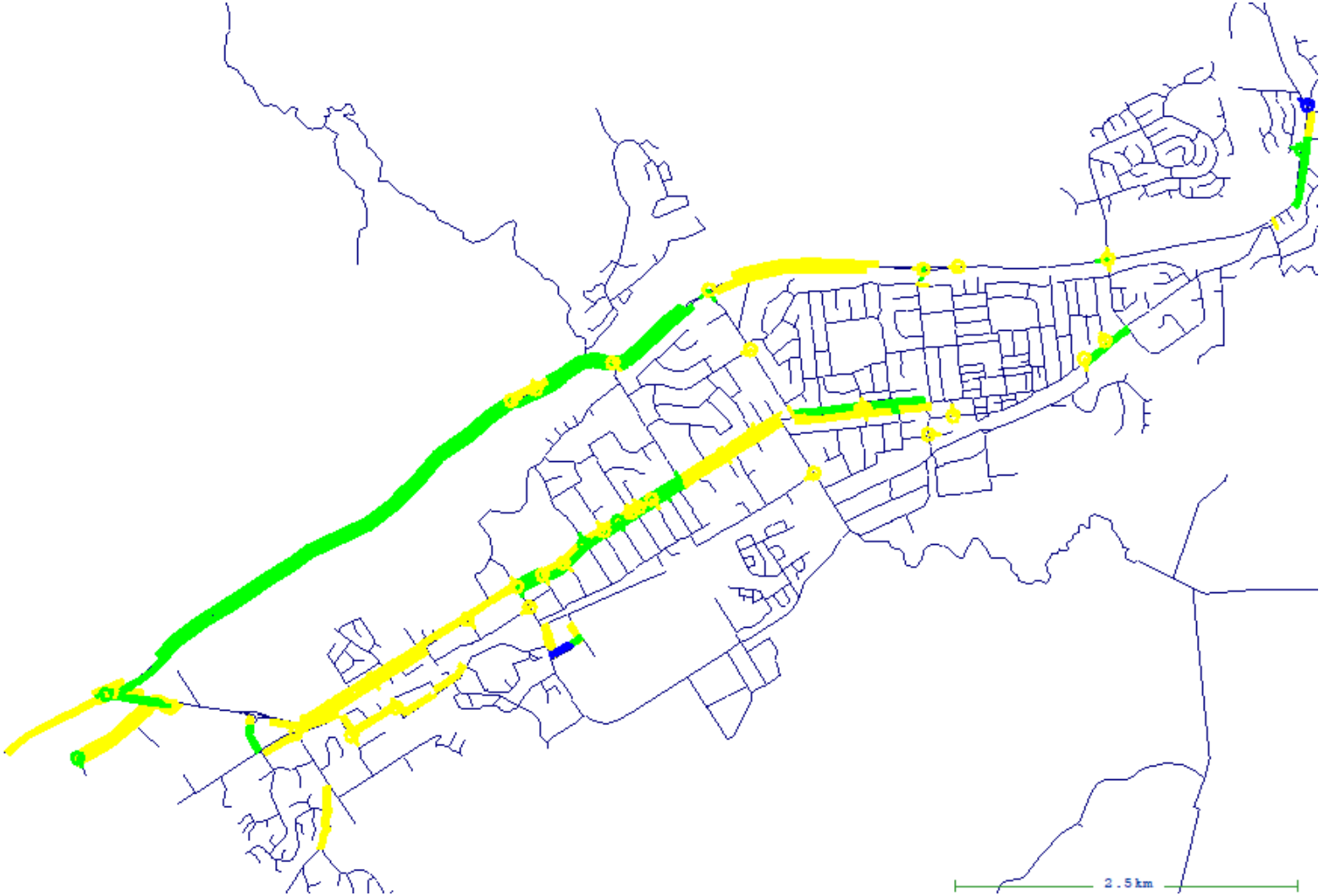



**Figure A1.11 2043 Sc3 AM LoS Plot**

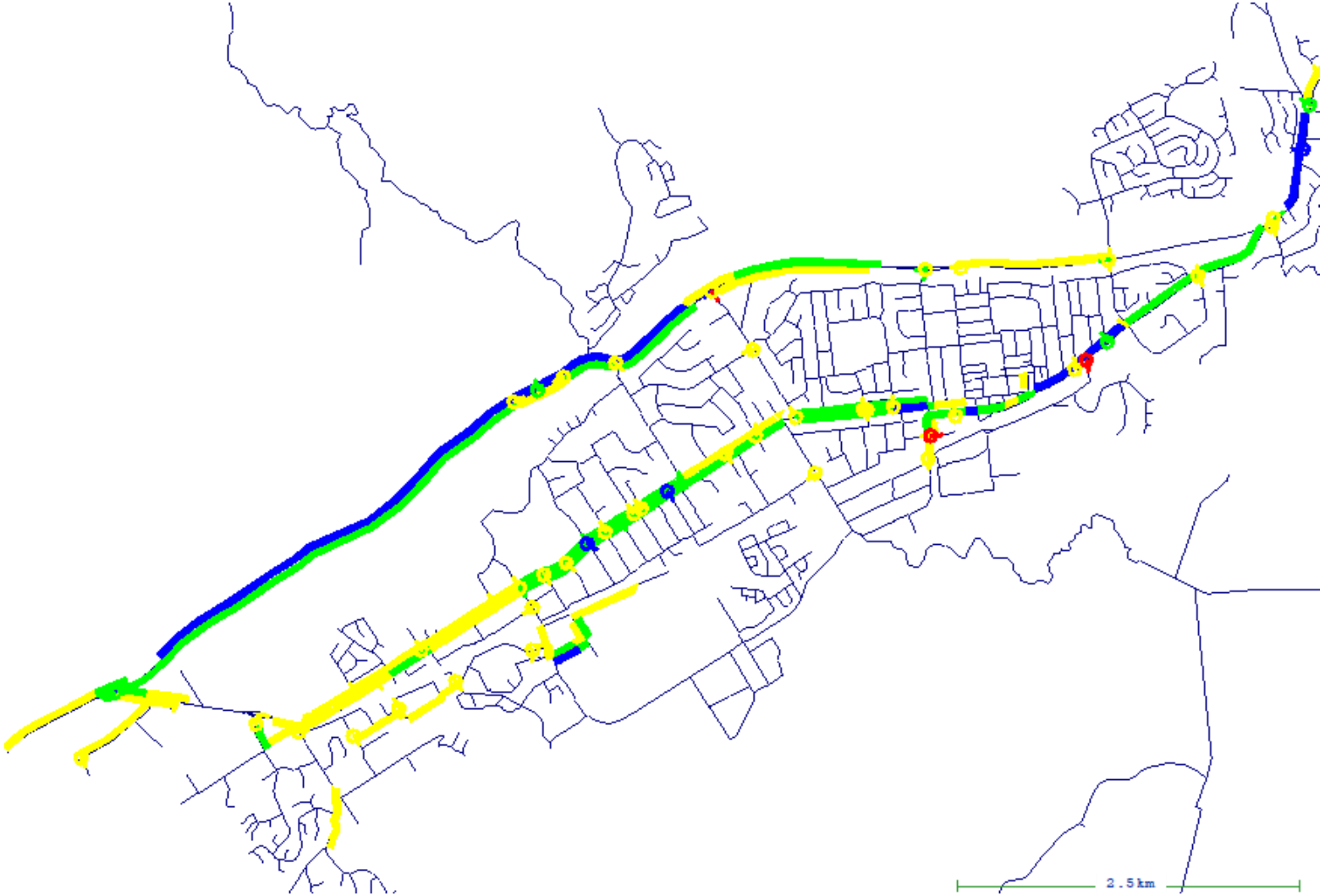



**Figure A1.12 2043 Sc3 PM LoS Plot**

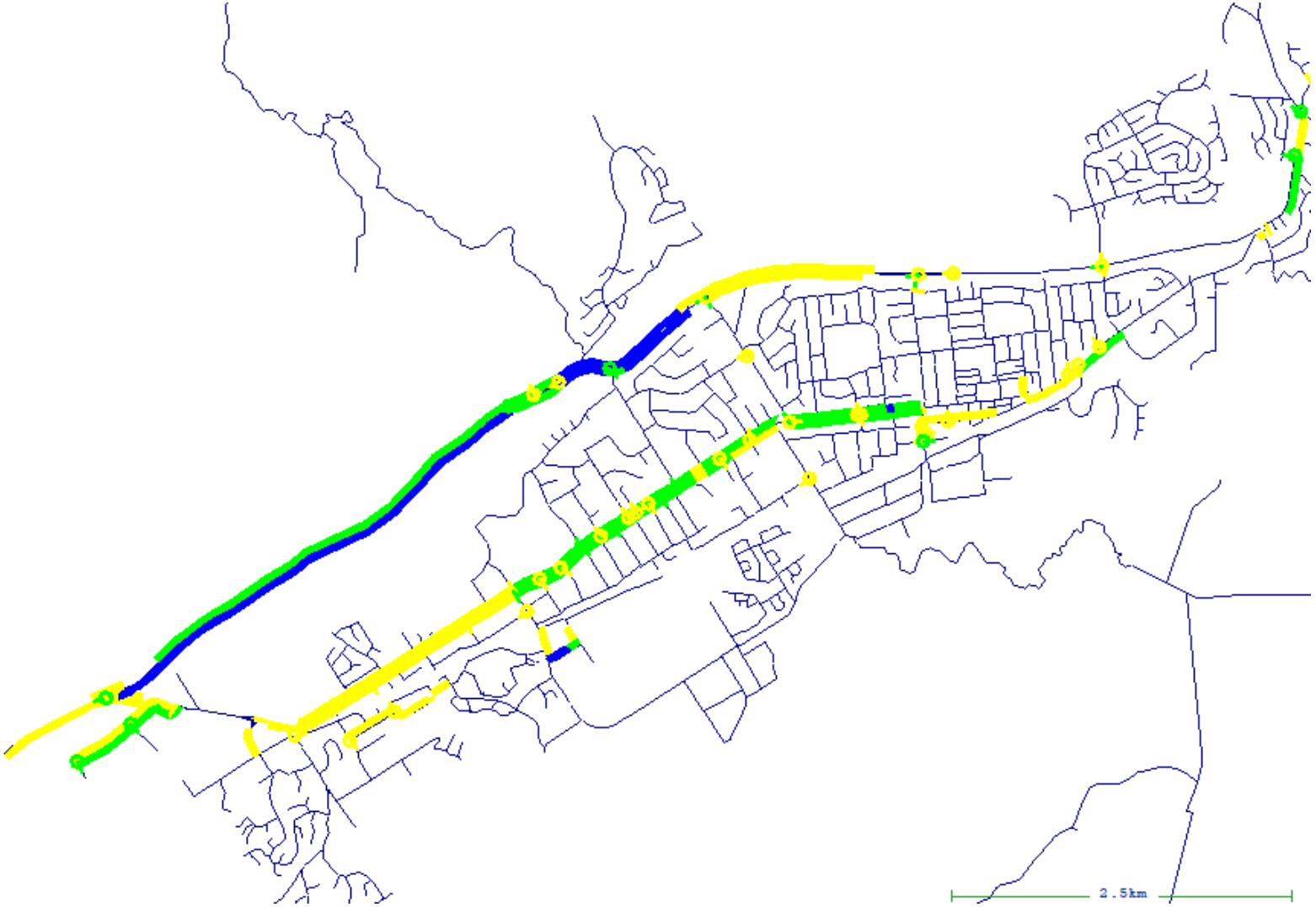



**Figure A1.13 2053 Sc1 AM LoS Plot**

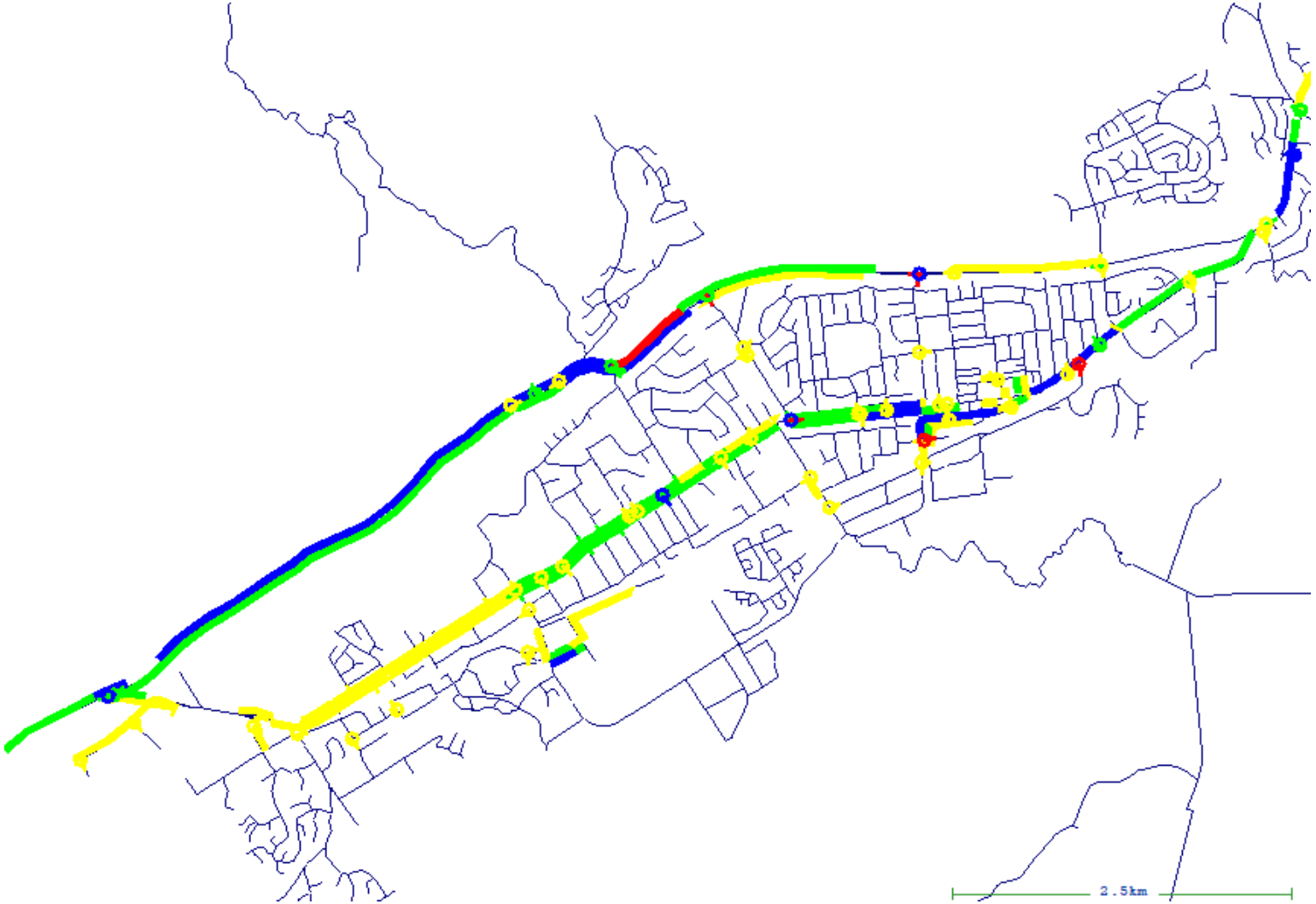



**Figure A1.14 2053 Sc1 PM LoS Plot**

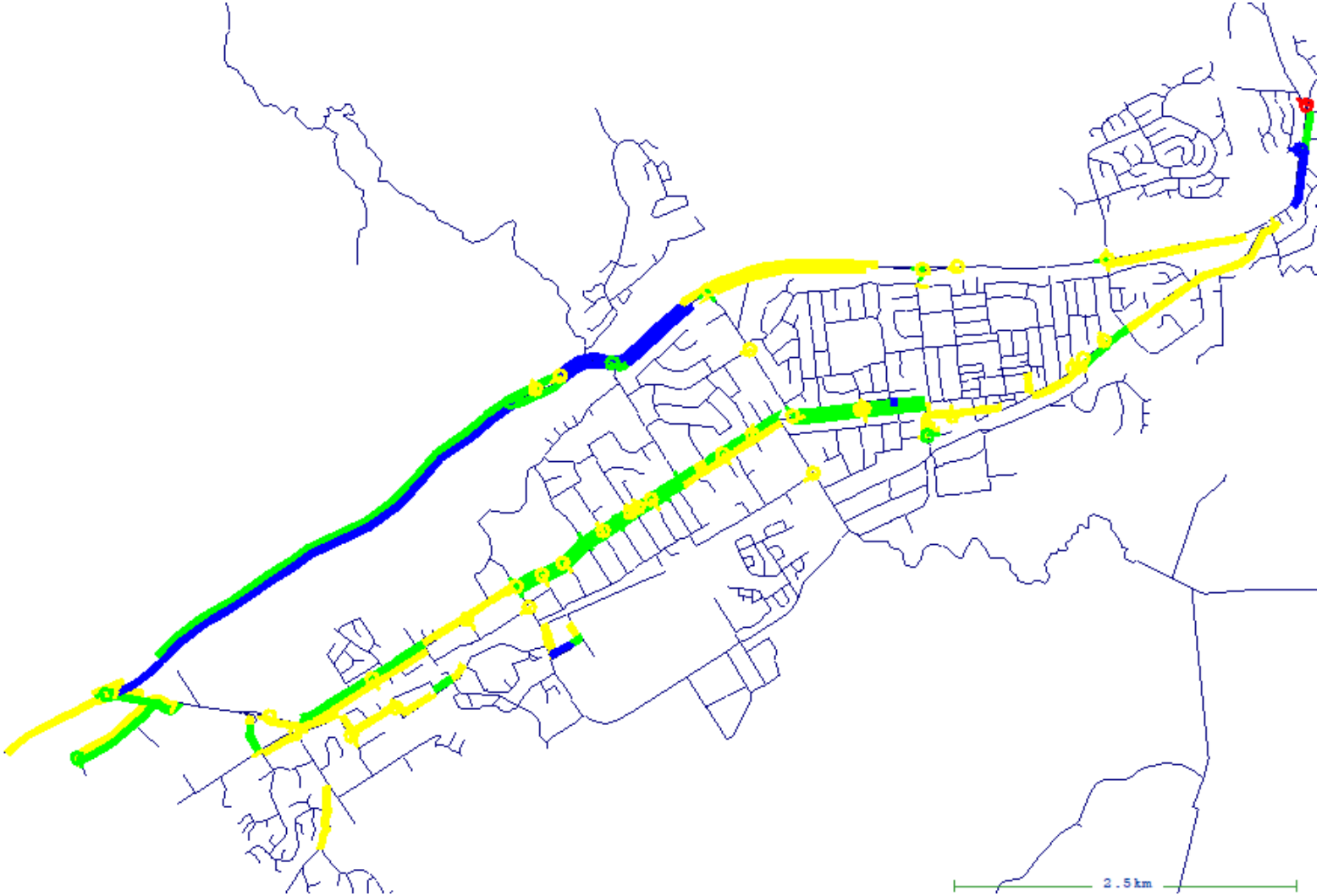



**Figure A1.15 2053 Sc2/3 AM LoS Plot**

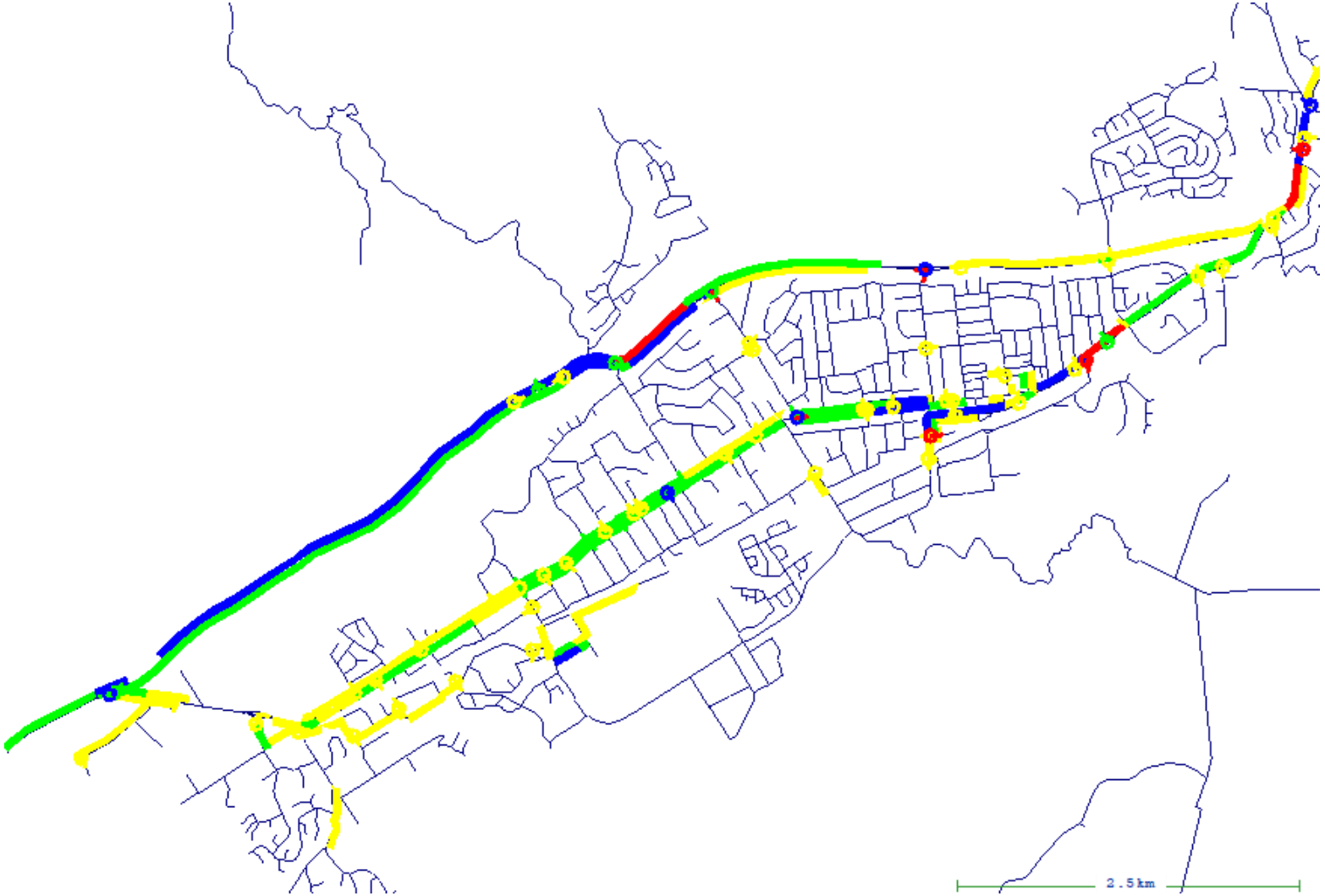



**Figure A1.16 2053 Sc2/3 PM LoS Plot**

# Appendix B.

## B1. Volume Plots

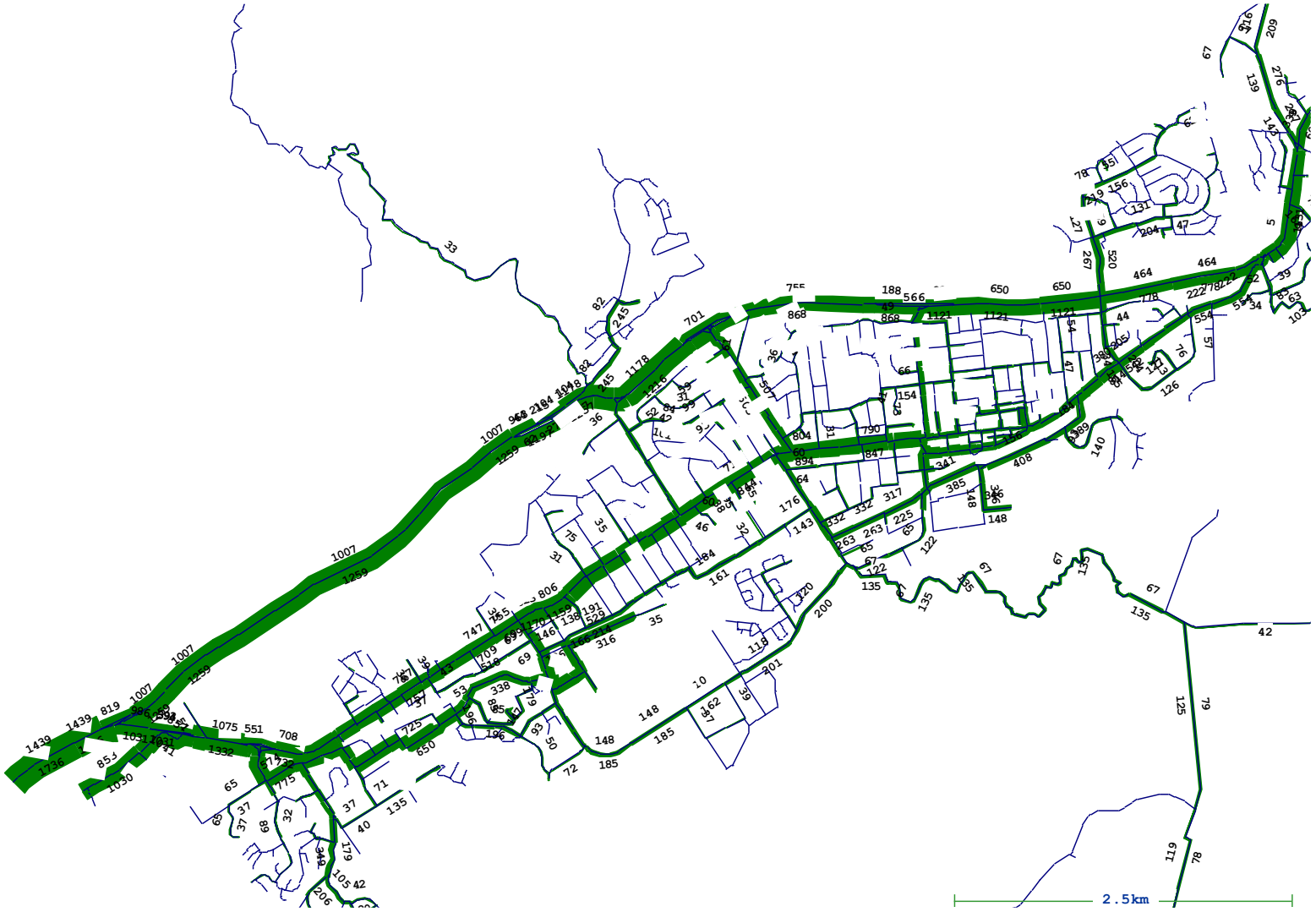



**Figure B1.1 2033 Sc 1 AM Vol Plot**

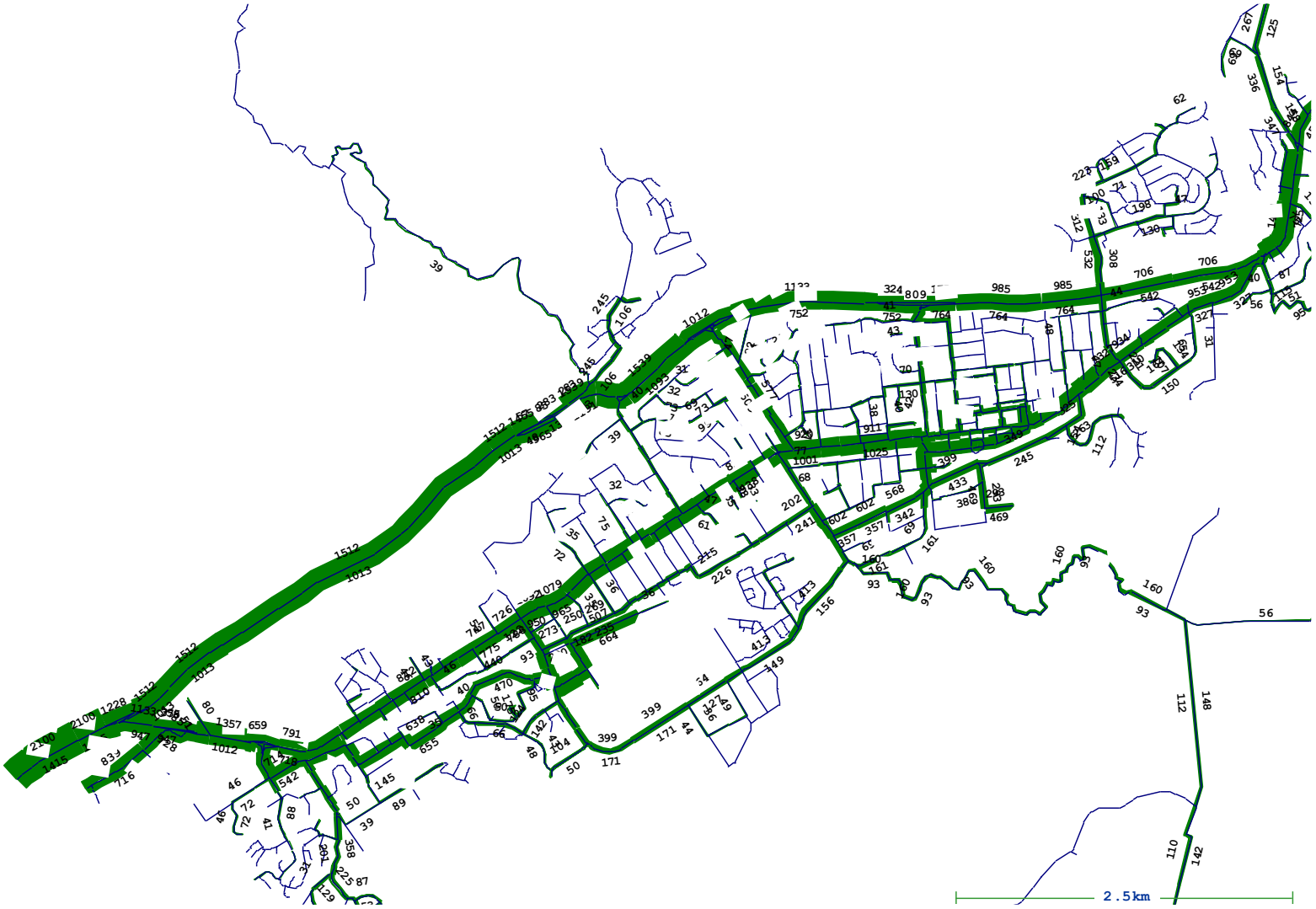



**Figure B1.2 2033 Sc1 PM Vol Plot**


**Figure B1.3 2033 Sc2 AM Vol Plot**

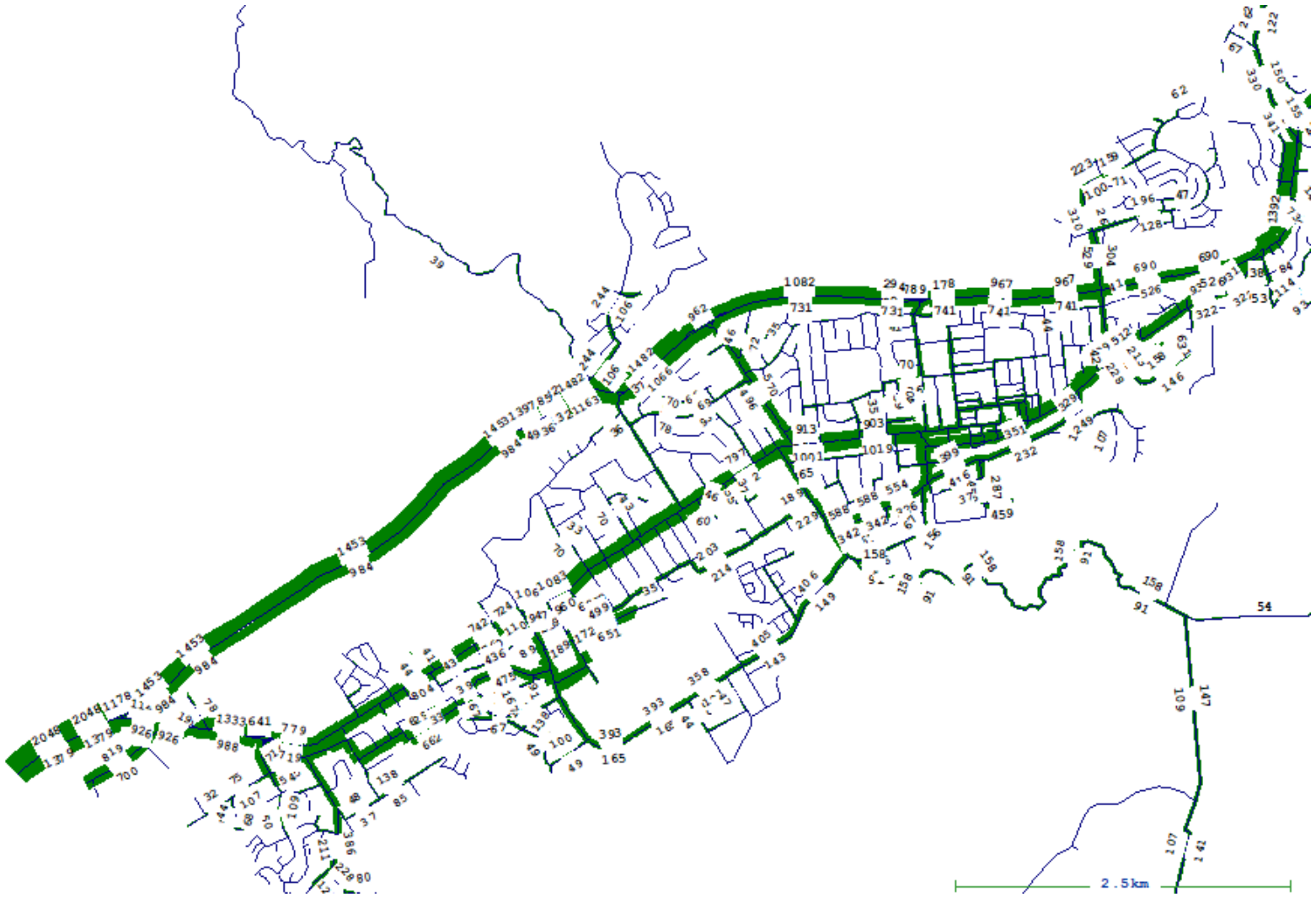



**Figure B1.4 2033 Sc2 PM Vol Plot**

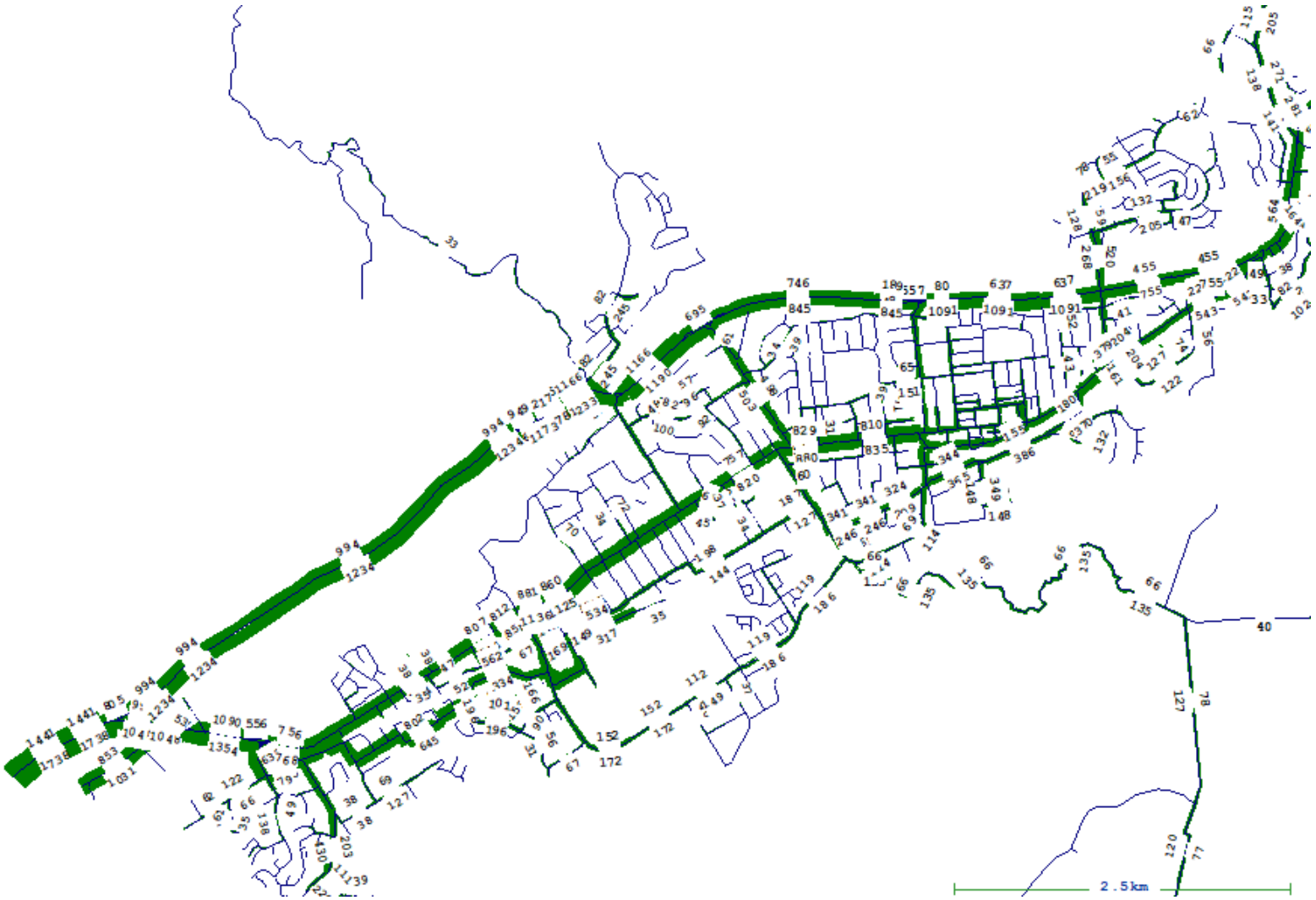



**Figure B1.5 2033 Sc3 AM Vol Plot**

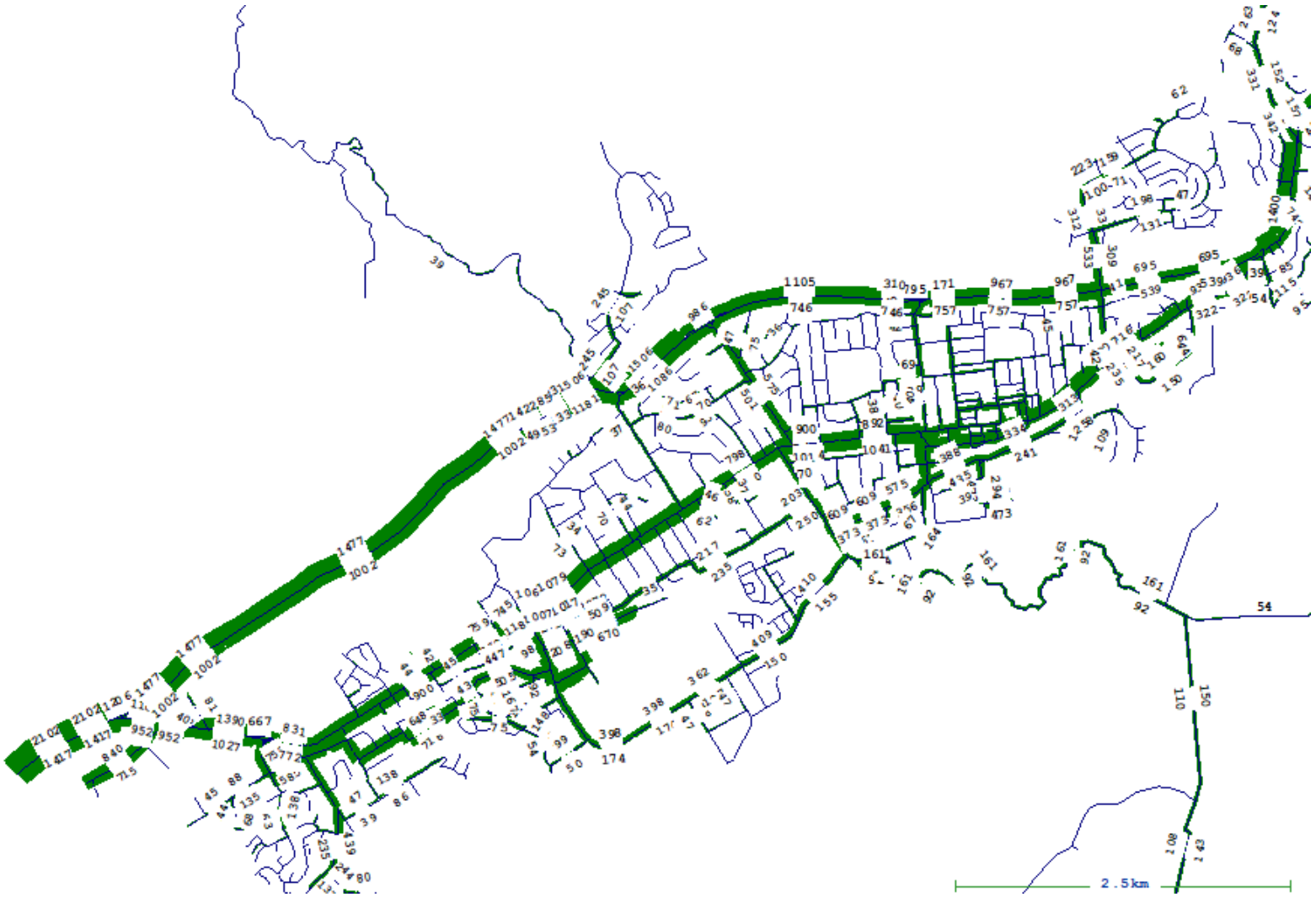



**Figure B1.6 2033 Sc3 PM Vol Plot**

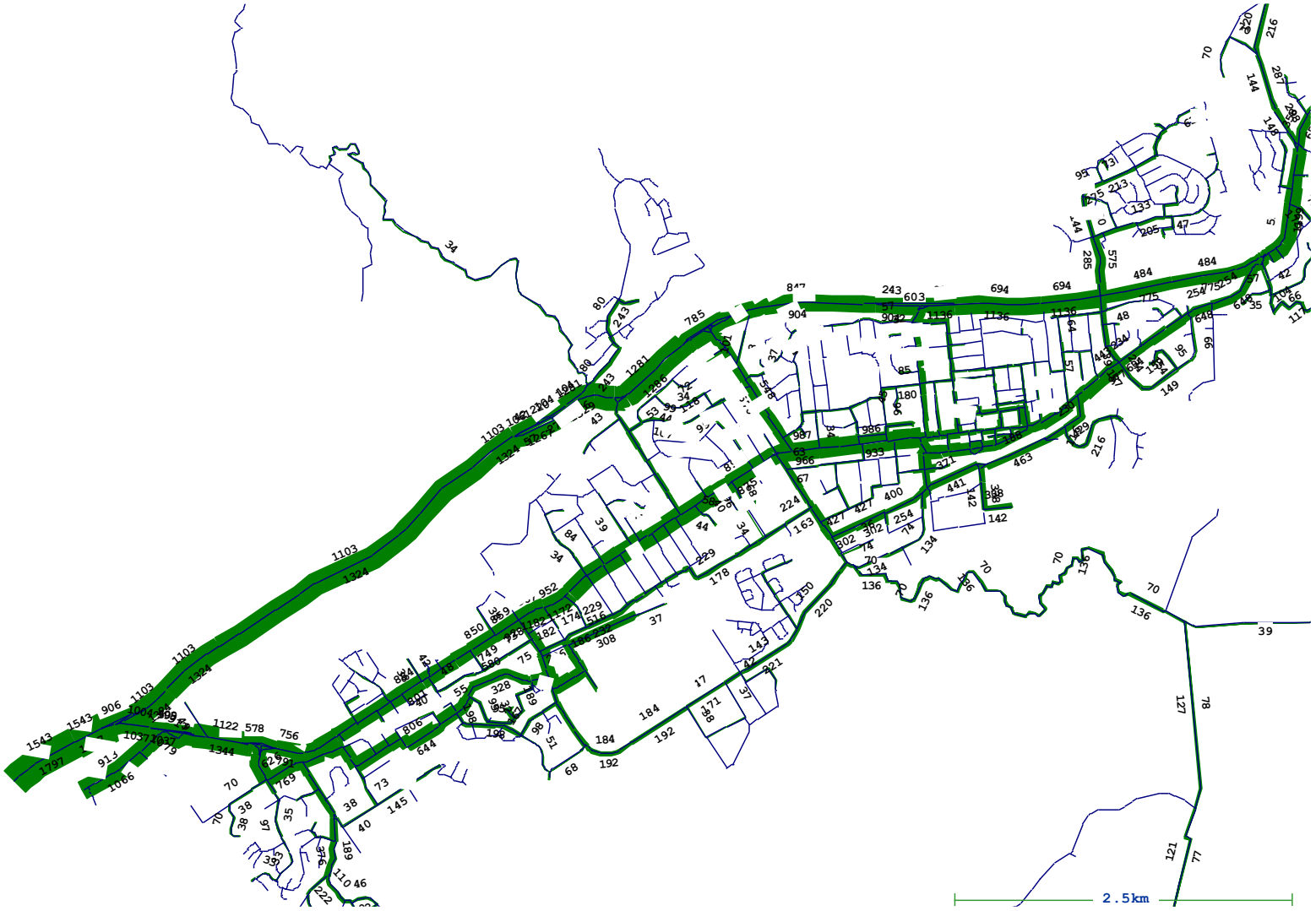



**Figure B1.7 2043 Sc1 AM Vol Plot**

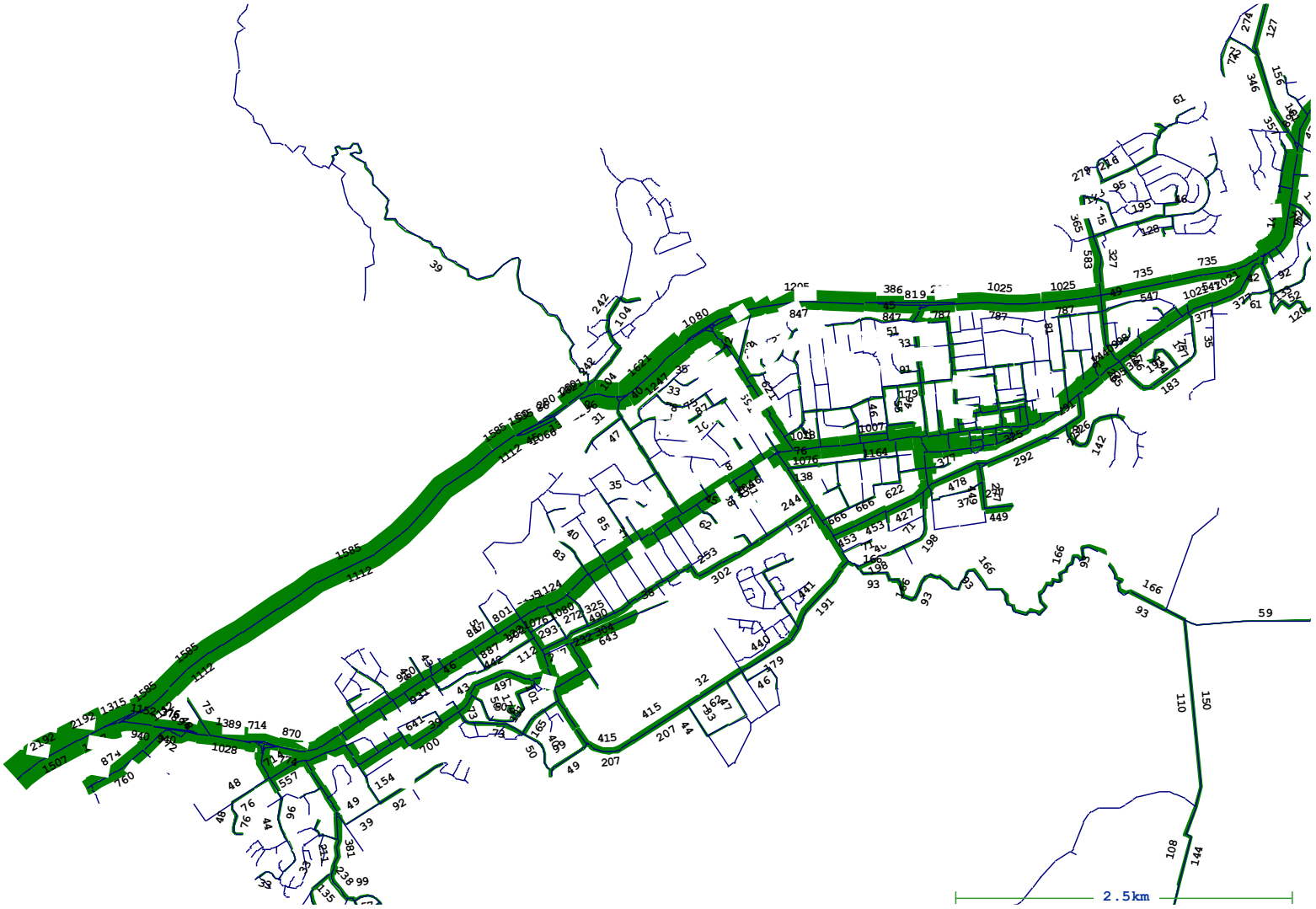



**Figure B1.8 2043 Sc1 PM Vol Plot**

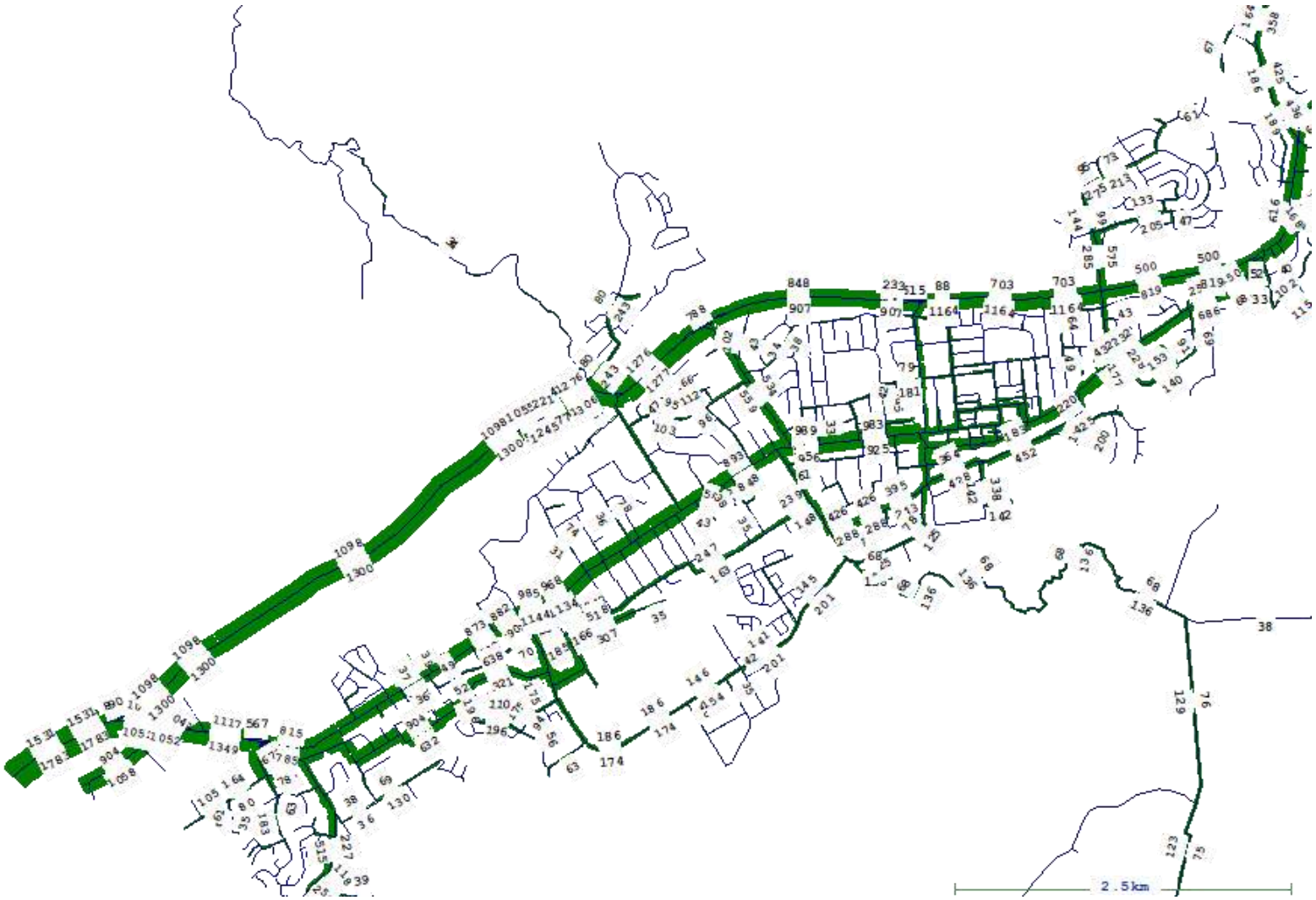



**Figure B1.9 2043 Sc2 AM Vol Plot**

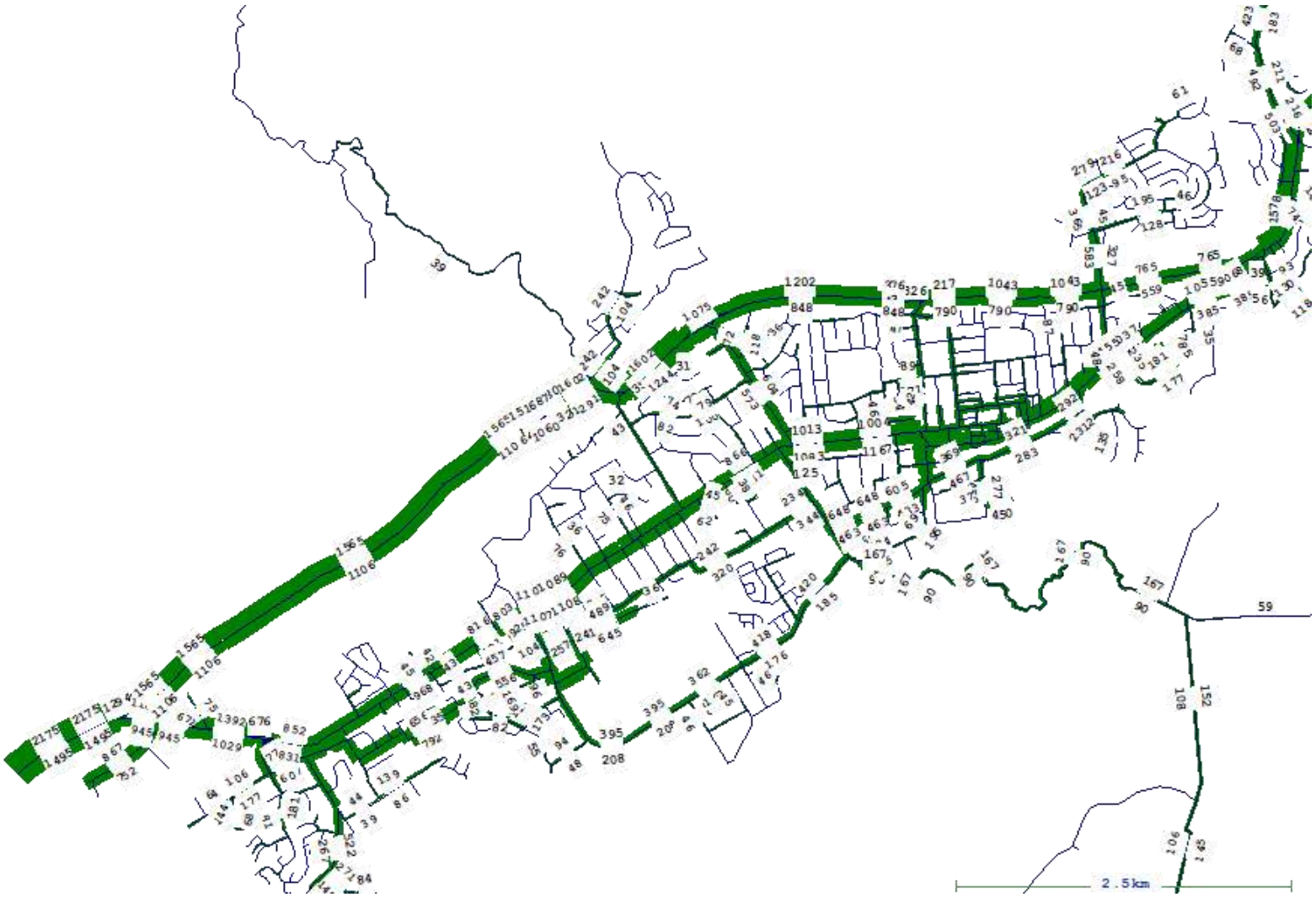



**Figure B1.10 2043 Sc2 PM Vol Plot**

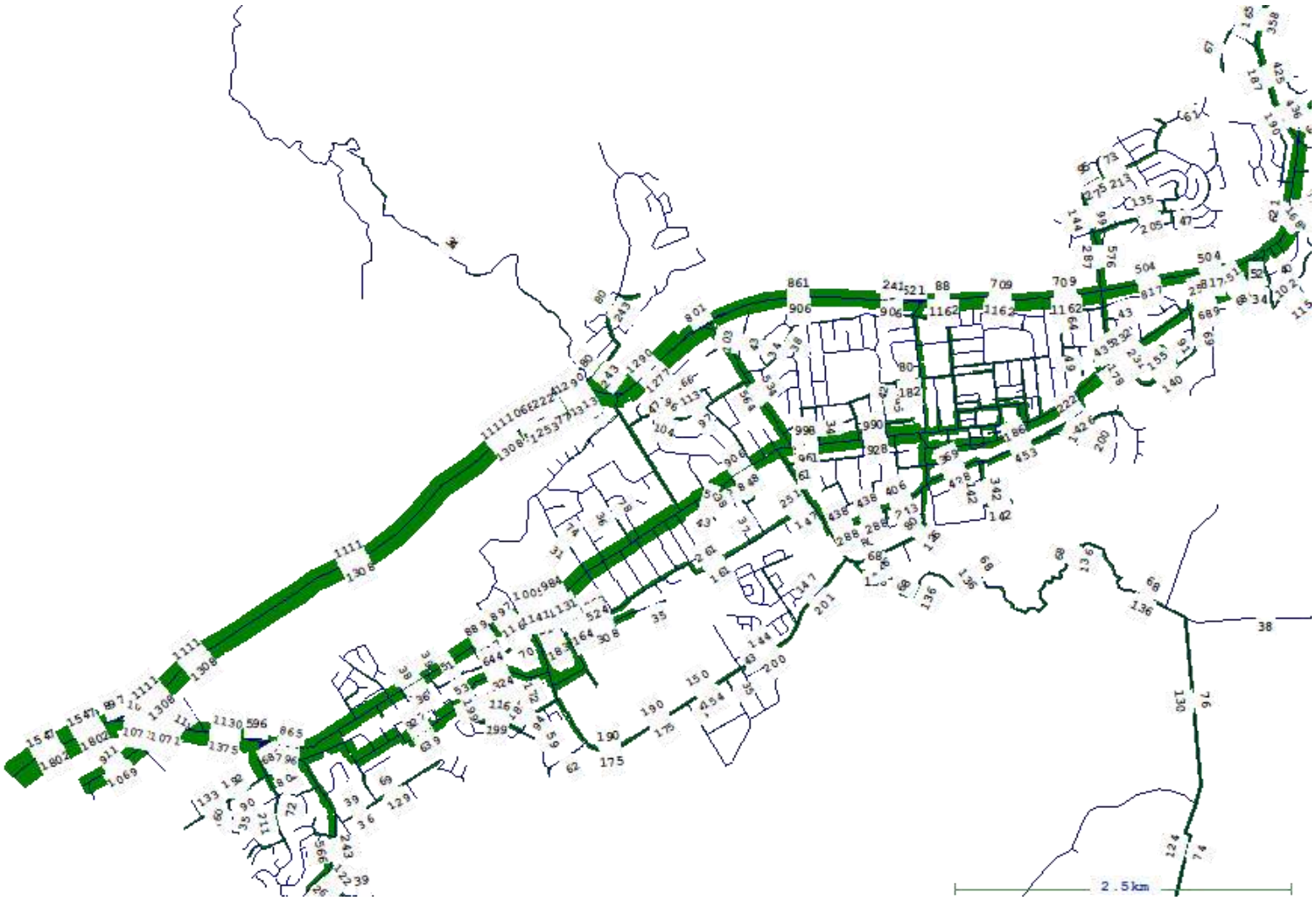



**Figure B1.11 2043 Sc3 AM Vol Plot**

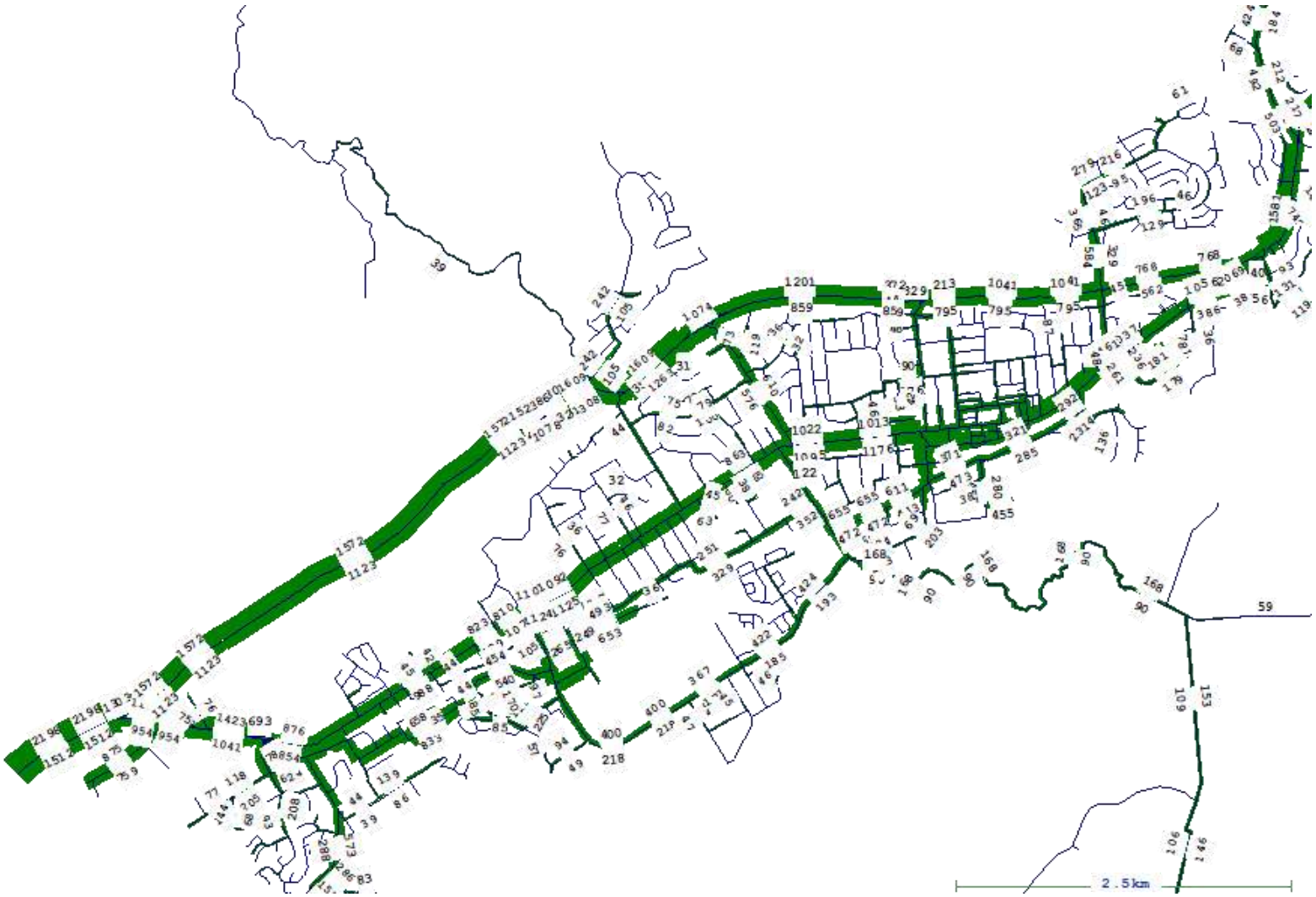



**Figure B1.12 2043 Sc3 PM Vol Plot**

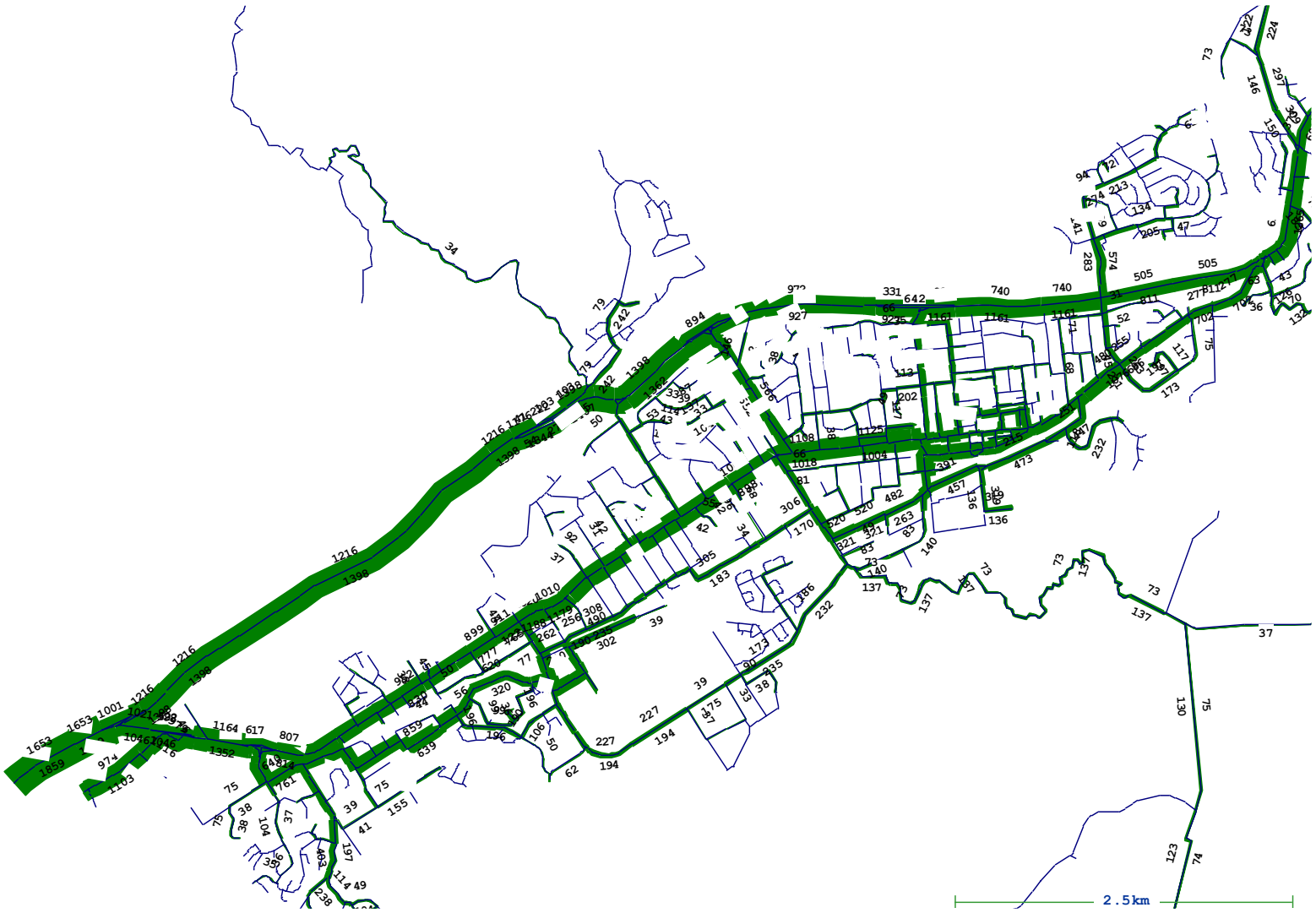



**Figure B1.13 2053 Sc1 AM Vol Plot**

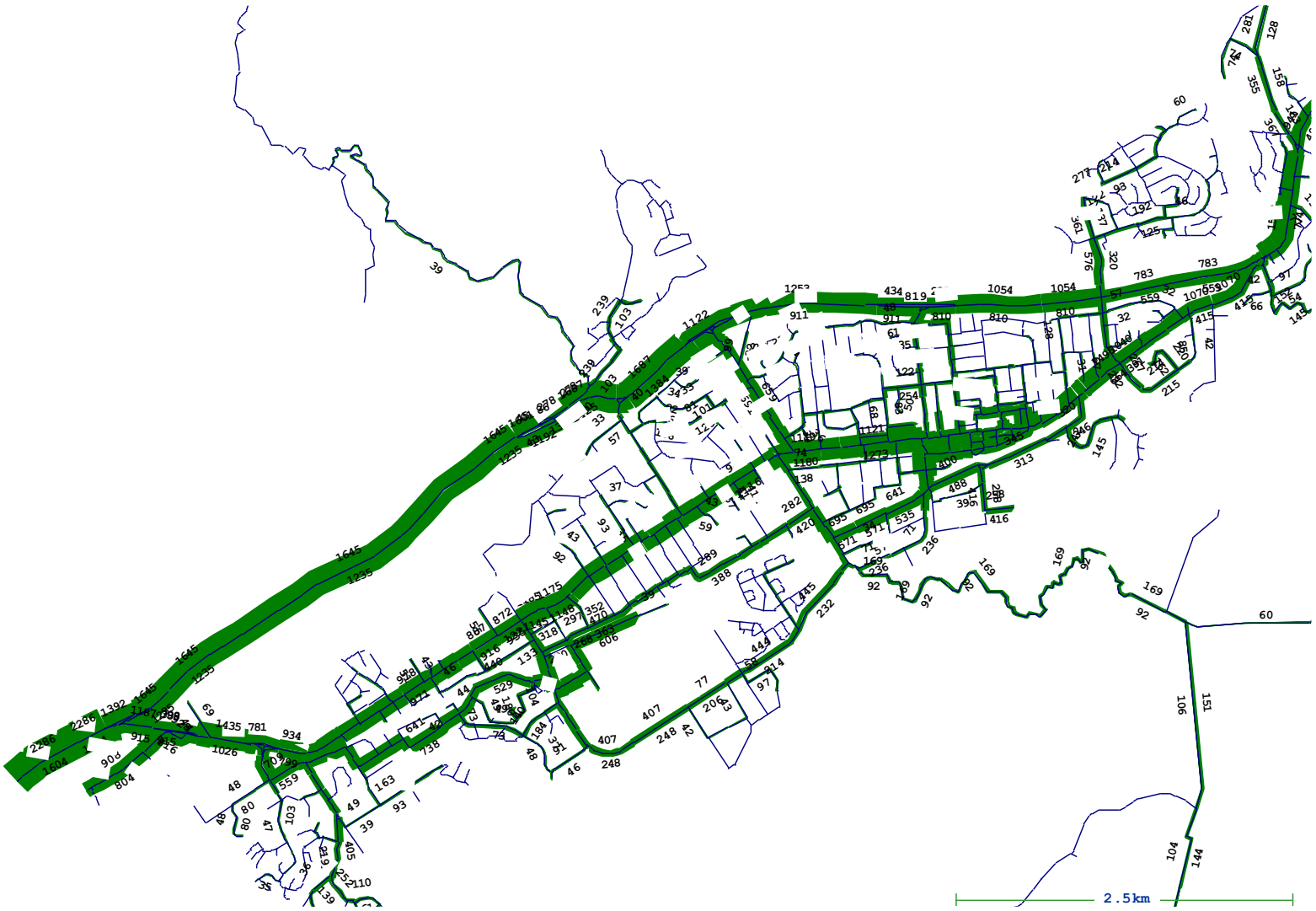



**Figure B1.14 2053 Sc1 PM Vol Plot**

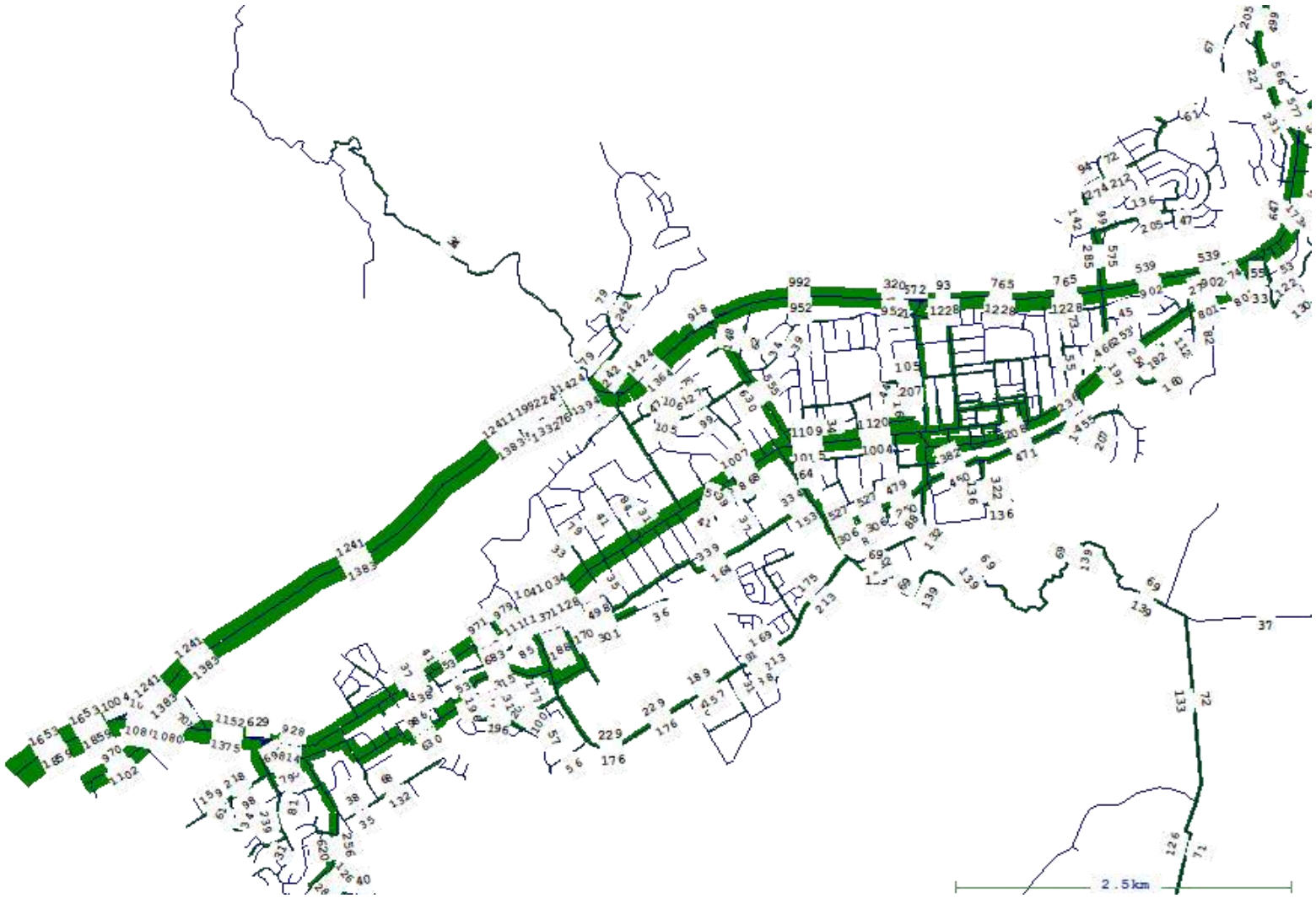



**Figure B1.15 2053 Sc2/3 AM Vol Plot**

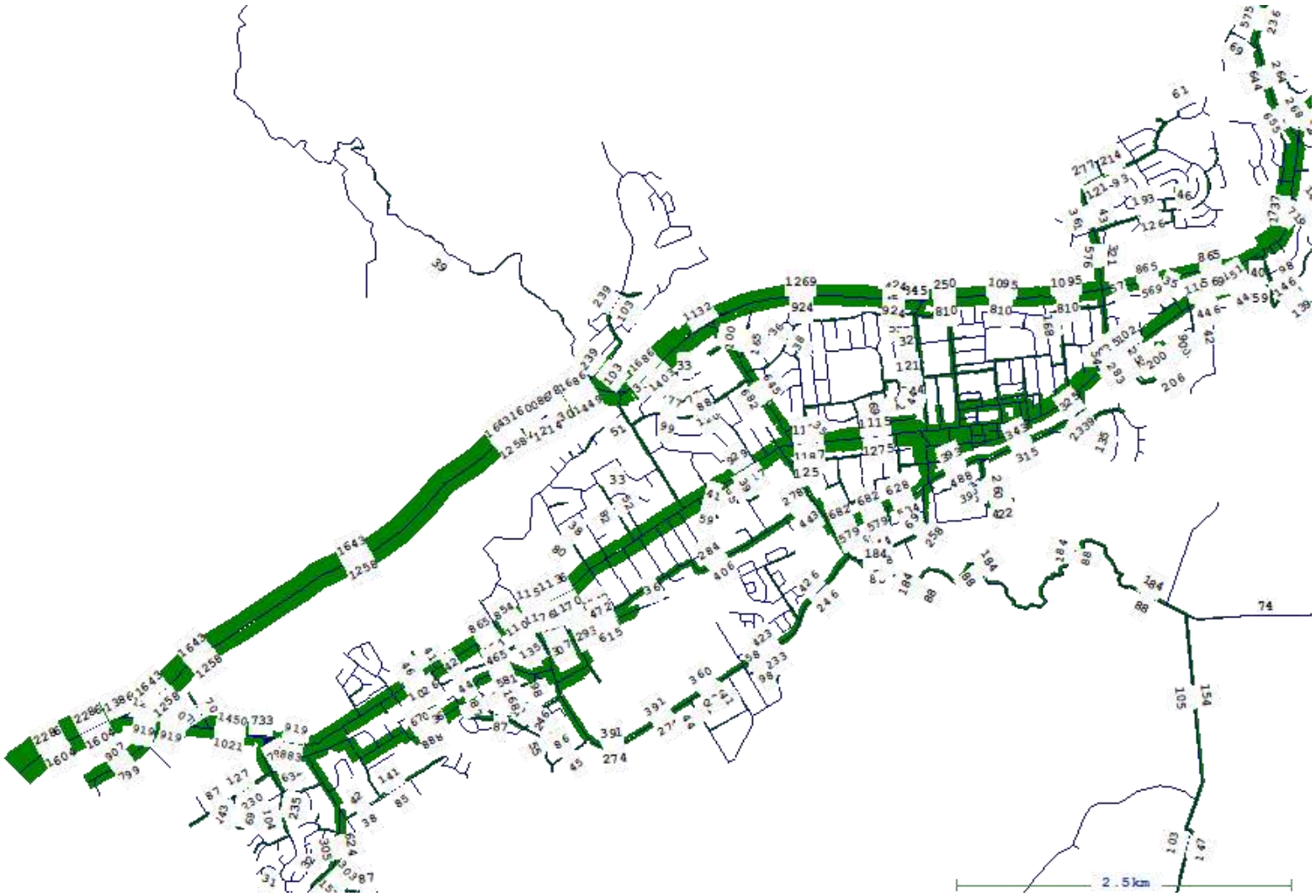



**Figure B1.16 2053 Sc2/3 PM Vol Plot**

**Auckland**
Level 1/70 Shortland Street
Auckland 1010
Aotearoa New Zealand

**Wellington**
Level 1/119-123 Featherston Street
Wellington 6011
Aotearoa New Zealand

**Christchurch**
Level 1/137 Victoria Street
PO Box 36446, Merivale
Christchurch 8146
Aotearoa New Zealand

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