REPORT

WELLINGTON
TRANSPORT
ANALYTICS UNIT

Hutt Aimsun Model:
TN6: Model Refinement and Recalibration

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CONTENTS

1.   Introduction

The Hutt Aimsun Model (HAM) was updated in May 2025 by the Wellington Transport Analytics Unit (WTAU) to a new base year of 2024 for use on upcoming projects in the Lower Hutt area on behalf of Hutt City Council (HCC) and Waka Kotahi (NZTA). While generally the updated HAM was considered an improvement on the previous model and was appropriate for use on the upcoming projects in the area, there were a number of calibration measurements that were below the Transport Model Development Guidelines (TMDG) targets. Review comments provided by Arc Advisory (Arc), Flow Transportation Specialists (Flow) and the NZ Transport Agency (NZTA), along with feedback from the Riverlink Alliance also suggested some areas for improvement. To address these identified issues, further refinement of HAM has been undertaken to increase confidence in upcoming option testing.

This report documents the results of the calibration and validation of the latest 2024 base year model. In the report, "the previous model" means the base year model completed in May 2025, and the "the latest model" means the base year model completed in September 2025.

Similar to the previous model reporting, the latest model has been compared against the TMDG Category C criteria with:

- Hybrid Layer screenline and individual link comparisons
- Hybrid Layer individual turn comparisons
- Modelled vs Observed scatter plots and statistical comparisons
- Travel time validation comparisons

The latest model is also compared throughout this report with the previous model results to highlight the generally improved model calibration and validation.

2. Model and Data Improvements

This section outlines the model coding improvements and data refinement implemented as part of this update. These improvements are based on both observations from using the new model in option testing and also the feedback from the various reviews and the Riverlink Alliance. Areas of improvement include:

- Representation of roundabout costs,
- Review and update of the vehicle lookahead distances, both at localised coding adjustments and the overall,
- A range of localised coding refinements to improve the route choice and representation of delays,
- Zone splits and zone connector review, and
- Review and additional data cleaning of the observed count set.

2.1 Roundabout costs

The static turn cost function used in HAM matches that used in the other two Aimsun models in the Wellington Regions, those being the Porirua Traffic Model (PTM) and the Ngauranga to Airport Model (N2AM). The Hutt model area differs from the other model areas in that there is a much higher proportion of roundabouts in the model area.

Through use of the current model in modelling the Riverlink scheme, there appeared to be an imbalance in static turn costs between signals and roundabouts. The Riverlink scheme adds signals to the Lower Hutt CBD which was unattractive to traffic when assigning the option. Further investigation found that the signals are generating appropriate costs, in proportion to the amount of green time provided, while the roundabouts are understating turn costs.

The current roundabout cost methodology is based on the Akcelik delay function. The intercept and slope inputs to the cost equation are set is based on the approach lanes, showing in Table 1.

Table 1: Updated intercept and slope for roundabout approach lanes

Approach lanes	Intercept	Slope
1	1,200	0.69
2	2,500	0.78
3	3,100	0.78

This approach-based methodology has an issue when not all the approach lanes make the turn. In Figure 1, the approach from the left has both a left and a through movement. Both turns will be treated as two lane approaches, when the through is effectively a one lane turn, resulting in understated delays for this movement.
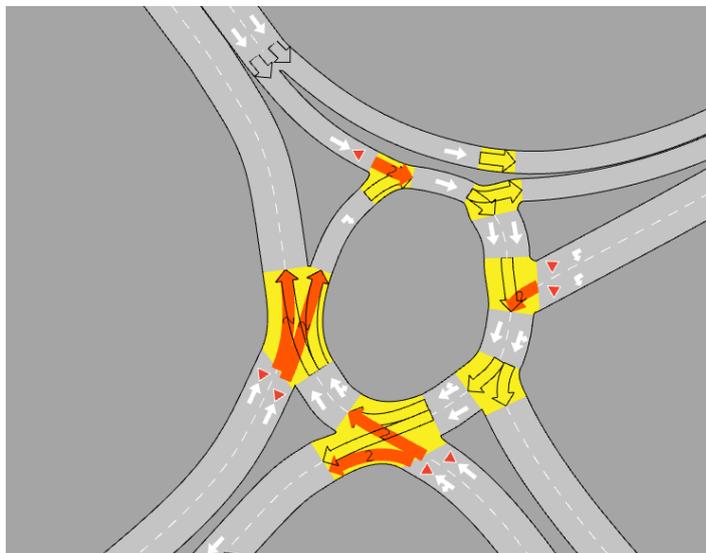
Figure 1: Example of roundabout approach lanes

To address this issue, additional turn types were added to the model:

- Turn type 2.1 sets the turn to the 1 turn lane parameters
- Turn type 2.2 similarly sets the turn to 2 lane parameters
- Turn type 2 remains in the model as the default for roundabouts

Figure 2 below shows all of the locations where the 2 or more lane factor has been applied. They have been checked and updated with the new turn types as appropriate.

Figure 2: Locations of roundabout requiring updates

2.2   Look-ahead distance review

2.2.1   Localised Look-ahead Distances

Various turns appear to have had the look-ahead and critical look-ahead values overwritten with 0 distance. This has been observed to cause problems where vehicles are unaware of the correct lane to use and become "missed turns" in the model. This creates additional and unrealistic traffic on the network and in some cases causes vehicles to continuously loop around an area of the network.

Figure 3 below shows the locations where the look-ahead distances have been reviewed, red being the locations with zero lookahead and orange with low look-ahead values. These have been reset to the road type defaults in the first instance, with localised changes having been implemented where deemed appropriate.

Figure 3: Locations require updates with look-ahead distances

2.2.2   Road type look ahead

More generally the model look-ahead distances are set by the road type. The look-ahead distance at the micro simulation level has two values:

- Look ahead is when drivers become aware of an upcoming turn so should consider changing lanes.
- Critical look ahead is the last moment they have to change lanes.
- Where these match, drivers must change lanes for an upcoming turn the moment they become aware of it. This is generally not how drivers behave.

The reviews picked up that many of the road types have matching look-ahead and critical look-ahead distances which causes problems as vehicles are forced to change lanes as soon as they become aware of an upcoming turn. A general rule is that the critical look-ahead should be about half of the look ahead value. This is the case in N2AM, but is not in PTM, from which the HAM road types have been imported from. A similar update should be considered for PTM at next update.

Table 2 below compares the HAM and N2AM lookahead values. These have been reviewed as part of this update and generally should match the N2AM values.

Table 2: Comparisons of look-ahead distances between HAM and N2AM

Name	Look-ahead		Critical Look-ahead		Difference	
	HAM	N2AM	HAM	N2AM	HAM	N2AM
CBD/Shopping - high friction Cost = 2.5	200	200	40	40	160	160
CBD/Shopping - low friction Cost = 1.6	200	200	40	40	160	160
CBD/Shopping - medium friction Cost = 1.8	200	200	40	40	160	160
Collector - high friction / poor alignment Cost = 1.3	300	300	300	100	0	200
Collector - low friction / good alignment Cost = 1.2	300	300	300	100	0	200
Expressway / Motorway - low speed Cost = 0.9	500	1000	500	500	0	500
Hill / Curve Sections Cost = 2.0	200	300	200	100	0	200
Local Access Road Cost = 2.5	200	300	200	40	0	260
Local High Speed Street Cost = 1.6	200	300	200	200	0	100
Motorway Cost = 0.80	350	1000	250	500	100	500
On / Off Ramps Cost = 1.1	300	1000	300	500	0	500
Rural - restricted speed Cost = 1.2	300	300	300	200	0	100
Rural - unrestricted speed Cost = 1.2	300	300	300	200	0	100
Rural state highway Cost = 1.0	500	300	500	200	0	100
Urban Arterial - low speed Cost = 1.0	200	300	100	200	100	100
Urban arterial - high speed Cost = 1.0	800	300	500	200	300	100
Urban arterial - medium speed Cost = 1.0	300	300	250	250	50	50
Motorway - Merge Section	500	-	500	-	0	-
Local Access Road Cost, medium friction = 2.0	200	300	200	40	0	260
SH58 80kph section Cost = 1.3	500	-	500	-	0	-
Traffic Calmed Road Cost = 2.0	200	-	200	-	0	-
Railway	200	-	200	-	0	-
Round-about 25km/h	300	-	250	-	50	-
Round-about 15km/h	300	-	250	-	50	-
Local High Speed / Low Cost = 1.4	200	-	200	-	0	-
Harcourt Werry	300	-	250	-	50	-
Speed 70 Cost = 0.9	500	-	500	-	0	-
Speed 80 Cost = 0.9	500	-	500	-	0	-
Pseudo Roundabout approach	300	-	250	-	50	-

2.3　Localised coding refinements

2.3.1　Section capacity

Similar to the roundabout cost, some sections in the modelled network also understate the costs. For example, some turning lane is long and broken into different sections with the through lanes, the section immediately approaching to the intersection has higher capacity of that extra lane. Therefore, the simulation would assign higher volumes than should be for that section but the actual maximum capacity is lower.

Hence, the aforementioned approach-based method has been used by applying Attribute Override of the actual capacity to the key locations, rather than all the sections needed especially the ones among local roads. As not all the approach lanes make a certain turn, the applied capacity only takes account of the movement with the highest number of lanes used. In Figure 4, the approach from the left has both two through movements and a right turn movement. The highlighted section is separate from the upstream section where has the right turn as a short lane, thus it is considered as a full lane in the model and the default capacity takes 3 lanes. However, only the through movement has the highest number of lanes which is 2 lanes, therefore the effective capacity should take only 2 lanes which is consistent with the upstream lane that the short lane does not contribute to the capacity.
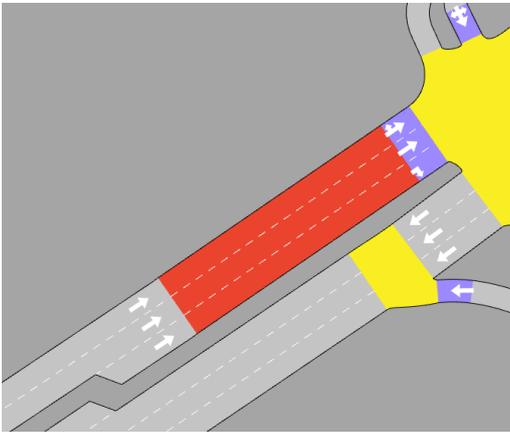
Figure 4: Example of lane capacity adjustment

The locations of the reduced capacity applied as listed as follows:

- SH2 at the Melling interchange and Kennedy Good Bridge interchange
- Harcourt Werry Drive northbound right turn into off-ramp
- Melling Link near the Rutherford Street roundabout and the High Street roundabout
- Queens Drive northbound between Railway Avenue and High Street

2.3.2 Naenae Road/Seddon Street roundabout giveway

The Eastern approach of the Naenae Road/Seddon Street roundabout appears to not giveway correctly in the previous model, shown in Figure 5. This causes the southern approach to block back as they are waiting for these vehicles to go. It was unclear what the issue was with the roundabout node, however this has been fixed by re-making the roundabout.
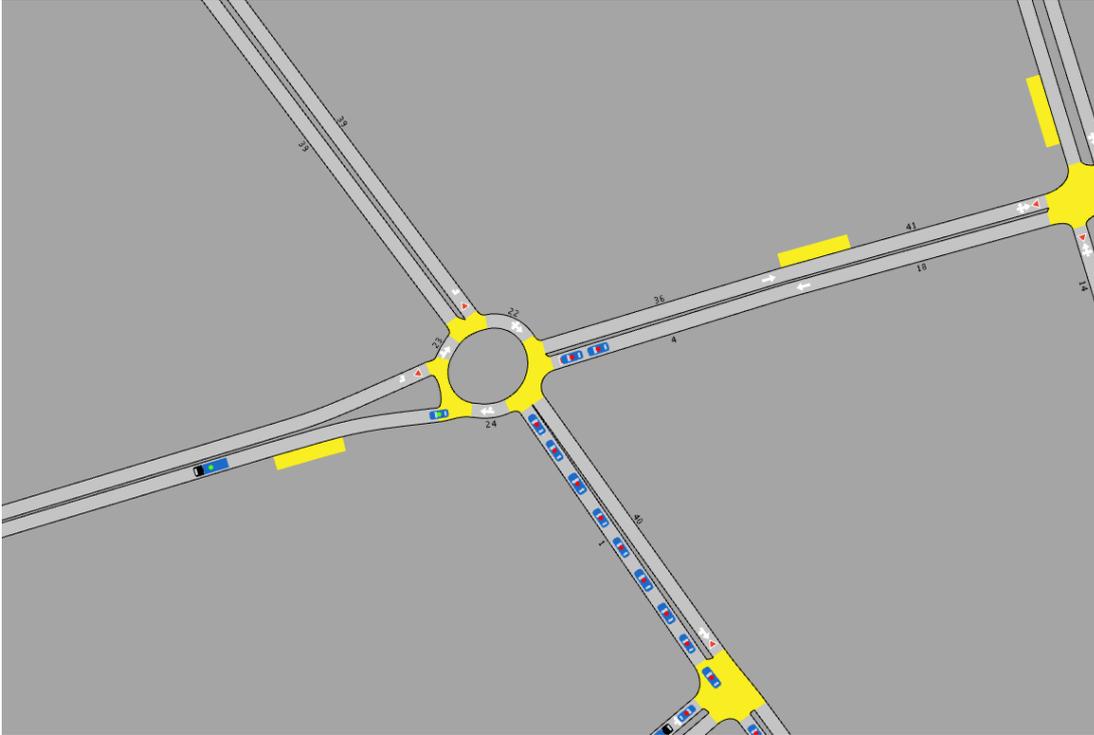
Figure 5: Layout of Naenae Road/Seddon Street roundabout in previous model

2.3.3 Jackson Street vs The Esplanade

Jackson street has shown low volumes compared to the count data in all periods of the previous model. Part of the issue was potentially due to the roundabout costs issue described in the previous section occurring at the Esplanade/Hutt Road roundabout. The signal timing of Jackson Street/Hutt Road is also contributing to the issue so this could be adjusted to improve the calibration.

The Esplanade also has an active bus lane in the AM peak. A static model override has been enabled to reduce capacity to one lane.

2.3.4 Motorway merges

Aimsun usually underestimates the traffic delays at the merge with the default parameters, especially at the motorway section where the on-ramp merges onto. Additionally, the behaviours in real life at these locations also vary a lot due to its geometry, gradient, lane arrangement, relative traffic flow and other factors. The locations that have been implemented with the changes with Attribute Overrides are as follows:

- Dowse southbound on-ramp
- Tawa southbound on-ramp
- Grenada southbound on-ramp
- Ngauranga northbound on-ramp onto SH2
- Newlands southbound on-ramp
- Johnsonville-Newlands southbound on-/off-ramps weaving section
- SH1 and 2 southbound merge in Ngauranga

To replicate the observed delays or queues at these locations, Lane-Changing Cooperation and Lane-Changing Aggressiveness are the core factors that have been adjusted. The value used for each location are different as traffic behaves differently. The common settings adjusted for all the locations are turning off the Side Lane Merge: First Vehicle On is First Vehicle Off (i.e. vehicle is able to merge into the motorway whenever they can, rather than at the end of ramp), and turning on the Consider Two-Lane Car-Following Model (i.e. vehicle already on the motorway considers to slow down while approaching to the on-ramp).

The southbound merge where SH1 and 2 meets near Ngauranga also have had some changes in the modelled layout (see the comparison in Figure 6). Generally, this merge works normally in the base model of the previous HAM. Coding was based on the same area in N2AM. In the forecast model however, congestion tends to be vastly overstated on the SH1 approach, and understated from the SH2 approach. Because the merge in the previous model was just a node connecting from 4 lanes to 3 lanes, a proper merging behaviour was not able to be implemented here. Therefore, the merging section has been separated into 3 individual parts aligned in parallel, with the middle part consisting of a full lane and a short lane to which the merging parameters can be applied.
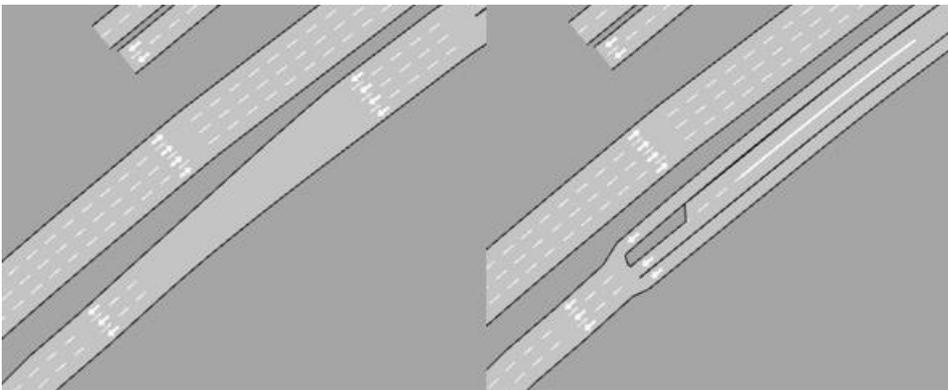
Figure 6: Layout of SH1/2 merge in previous model (left) and in latest model (right)

2.3.5 Speed adjustments for the whole model duration

Some links have been applied with speed adjustments through Attribute Override in order to reflect the actual operating speed the vehicles are able to travel at due to the road conditions. They are as follows:

- Bellevue Road and the southern part of Laings Road – the speed has been reduced to 30 km/h because there are 2 zebra crossings and plenty of on-street parking, the pedestrian movements and parking manoeuvres may increase the times vehicles have to stop or slow down.

- Harbour View Road northbound – the speed has been reduced to 30 km/h given the curvature and the steep upward slope.

- Johnsonville Road after the northbound off-ramp – the speed has been reduced to 10 km/h. This link is the last object in the model extent therefore it cannot capture the delays from the signal at the end of the on-ramp. The speed reduction is to replicate the signal.

- Taita Drive and Stellin Street – the speed has been reduced to 10 km/h for IP only. Taita Drive and Stellin Street are collector roads between Fairway Drive and High Street, they are an ideal corridor for rat running when the Fairway Drive/High Street roundabout gets congested. This behaviour has been observed for AM and PM. However, the roundabout is not congested during IP so the rat run is not likely. But the attractiveness of the corridor in Static layer would still allow a large amount of traffic to use it. The deliberate reduction for the speed is to ban the usage of this corridor during IP for Static layer.

2.3.6 Speed adjustments for specific times

Some links have been applied with speed adjustments through Traffic Management as it only reflects some certain conditions during a particular time period. They are as follows:

- Part of High St to the east of the Fairway Drive roundabout – the speed has been reduced to 35 km/h from 8 to 9 am because there is a school zone.

- SH1 southbound between Ngauranga and Johnsonville for AM – the speed has been reduced variously for different hours. In reality, the variable speed limit is implemented on part of the motorway during peak periods. SH1 southbound during AM peak hours is a major congested corridor, however the model is not able to capture the bottlenecks with the default setting. One major bottleneck is the queues back from the Wellington City, however the southernmost boundary of the HAM extent finishes near Ngauranga therefore the speed has been reduced here. Another bottleneck is near the location below Helston Road Bridge that the motorway starts to go uphill and the alignment becomes curved, vehicles may slow down due to these features. Therefore, the speed has been reduced here, creating an extensive queues on SH1 which fits the observed travel time.

- SH2 southbound between Ngauranga and Petone for AM – the speed has been reduced to 50 km/h from 7 to 9 am. This part of SH2 usually does not have extensive queues, but the delays at Ngauranga and the high traffic volumes may give the commuters an impression of not-to-rush. It has been observed the commuters drive at a speed below the limit.

- SH2 southbound between Petone and Dowse – the speed has been reduced to 15 km/h to 50 km/h from 6.45 to 8.30 am. The slowest speed is set near the Petone merge, and the highest speed is set further away. The speed in each lane is also different, with the kerbside lane having slower speed. As aforementioned Aimsun usually underestimates the traffic delays at the merge, manual speed control has to be implemented here to replicate the high delays due to the on-ramp merge. According to the TomTom travel speed data around this location in Figure 7, it has shown during the AM peak period the mean speed is as slow as only 20 km/h near Petone and gradually increases to 50 km/h near the Dowse interchange. Thus, the manual speed control is based on the TomTom data.
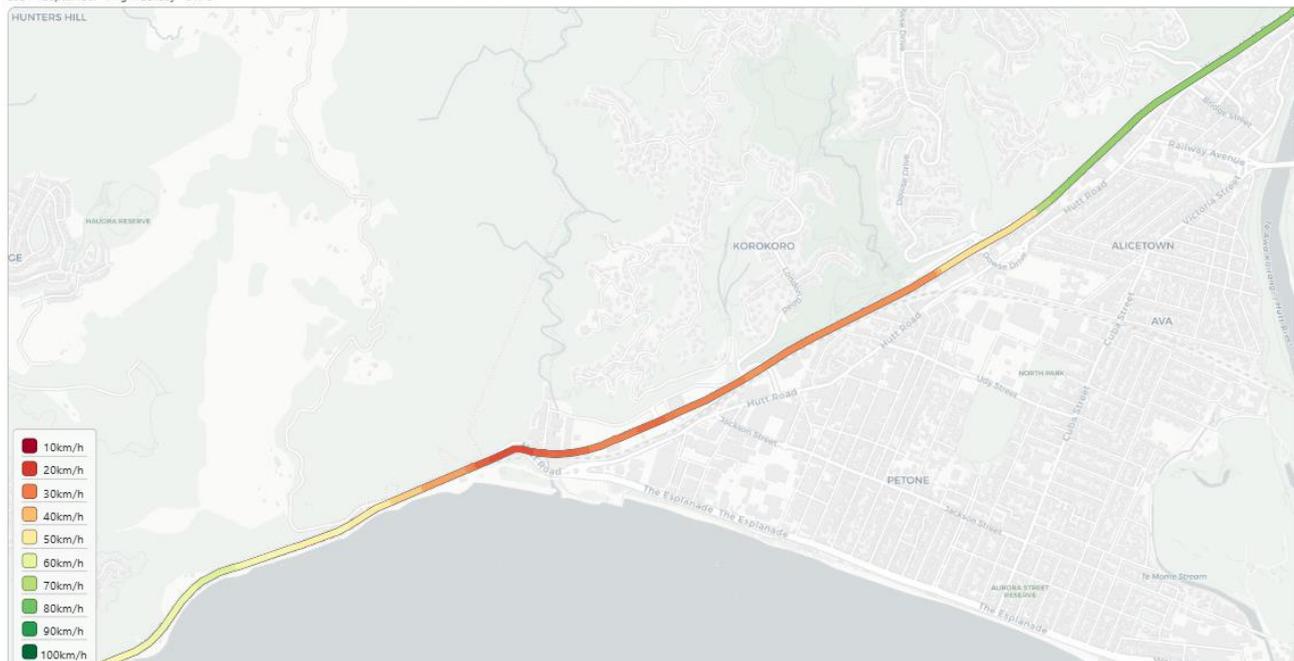
Figure 7: Example of TomTom Travel Time of SH2 southbound between Petone and Dowse

2.3.7   Reduced attractiveness at Dowse Interchange

In reality, the observed counts are usually much lower than the modelled counts on the ramps of the Dowse interchange. Because the interchange has level separation being an overbridge, the ramps go upwards may reduce the operation speed of vehicles and also limit the visibility for drivers. The default settings in Aimsun did not adopt parameters associated with gradients and visibility, therefore providing high attractiveness for the ramps.

The discrepancy of counts on the southbound on-ramp was quite significant in the latest model, as the traffic flow was largely affected by the extensive congestion from the Petone merge. In reality, the queues could reach to the Dowse interchange, restricting traffic flow to come through from the on-ramp. However, the model has been struggling to replicate the extensively long queues due to the merge behaviours at the Petone interchange. Thus, the attractiveness has been reduced through Attribute Overrides detailed as follows:

- The capacity of the southbound on-ramp has been reduced to 800 PCUs/h
- The capacity of other 3 ramps has been reduced to 1500 PCUs/h
- The speed of the westbound link between two roundabouts has been reduced to reflect the limitations caused by the upward gradient and curvature

2.3.8   Kennedy Good Bridge

This bridge used to cause gridlock issues in some scenarios/replications. Generally traffic gets stuck at the SH2 intersection to the north, blocks back under the underpass and back up to SH2.

Three localised changes have improved this in the forecast model, and the details are shown in Figure 8:

- Turning off yellow box behaviour for the giveway left turn from Harcourt Werry Drive onto the ramp, and from the ramp onto Fairway Drive
- Forcing the traffic from Fairway Drive to enter the middle lane on Harcourt Werry Drive, eliminating some of the weaving

These changes have been tested in some of the P2G scenarios and improved the reliability of the intersection in Aimsun (less likely to lockup).
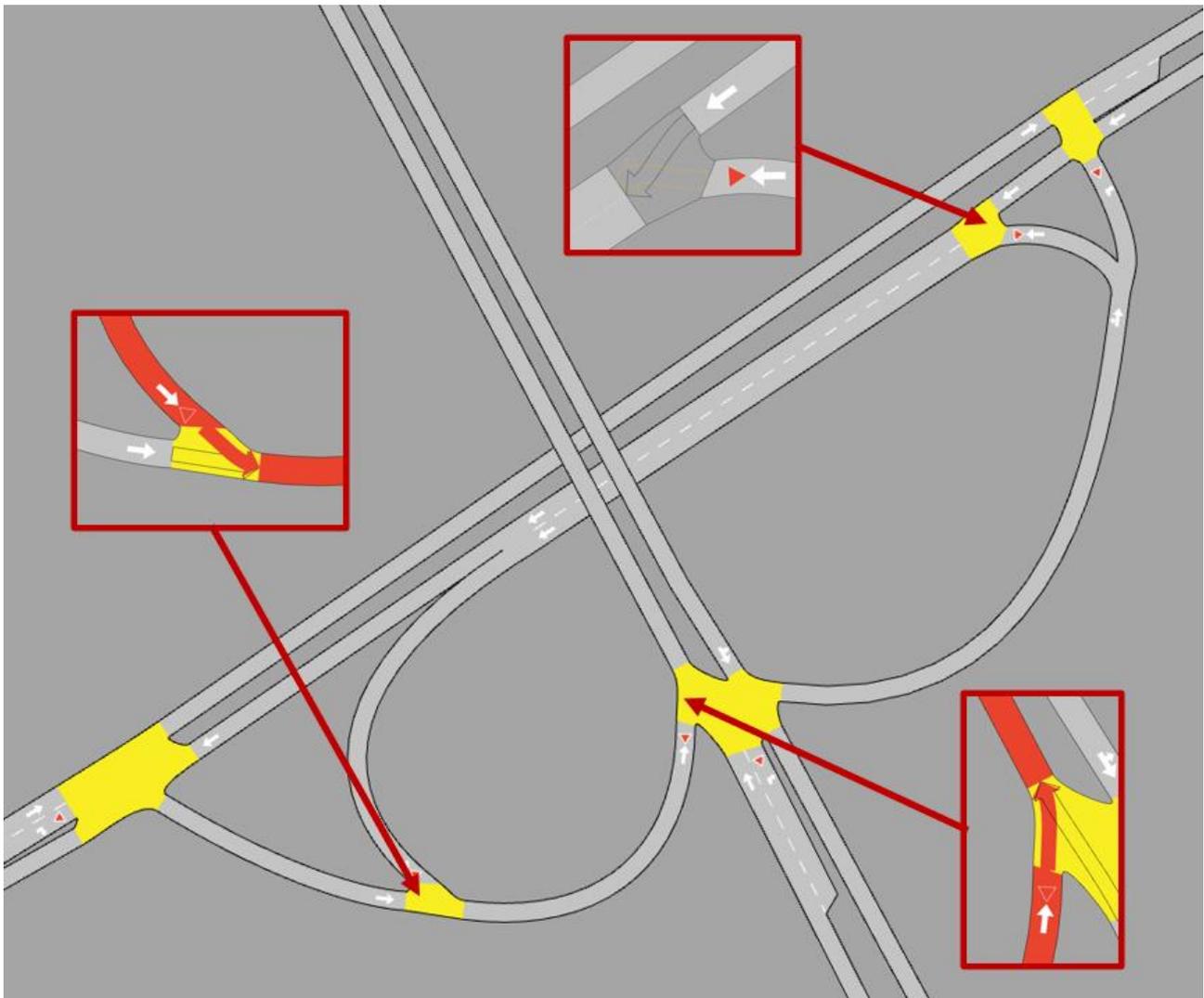
Figure 8: Locations of changes for Fairway Drive and Harcourt Werry Drive

2.4   Zone Improvements

2.4.1   Woolworths/Riverbank Carpark

In the previous HAM model (and the subnetwork Riverlink model (RAM)), the Riverlink project split the Carpark and Woolworths zone (179B) into two. They carried out a survey of the carpark usage to inform the split, with the number of Riverbank cars also factoring in. Using the same count survey data, we should look to do a similar zone split (see comparison in Figure 9).
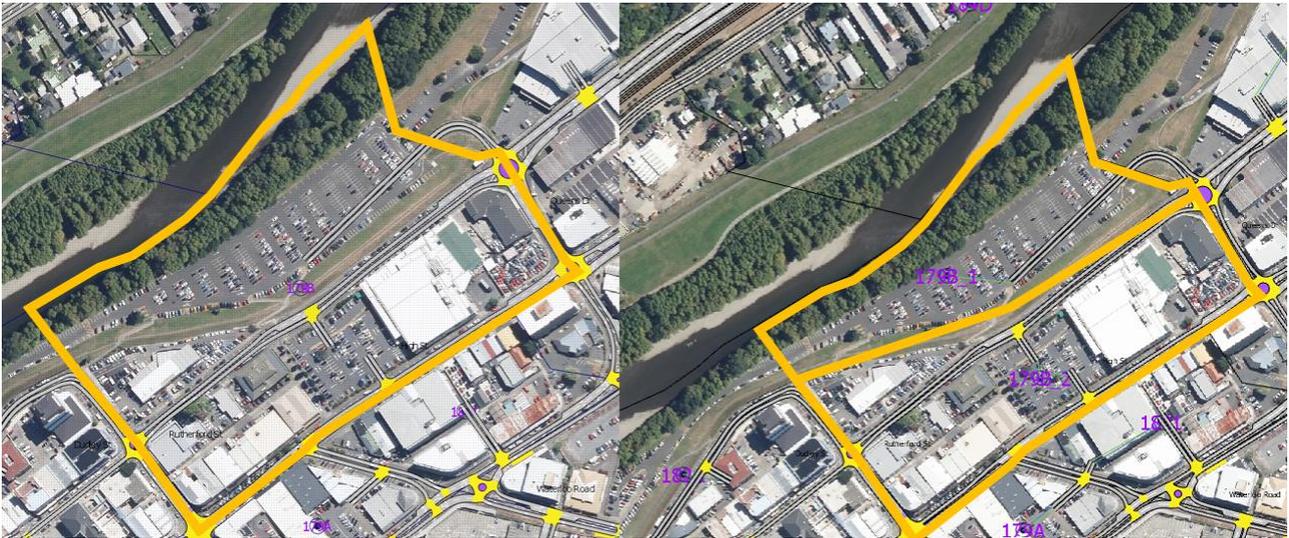
Figure 9: Woolworths/Riverbank carpark zones in previous model (left) and in latest model (right)

2.4.2   Petone shopping zone

Zone 1952 was a large zone containing several retail locations including Pak n Save, the Warehouse and MacDonalds. As it is possible to enter and exit from any side of the block, it was originally decided to not split this zone any further and let the model assignment determine the loading. However this was found to cause some issues during the calibration, as the static assignment in particular, will assign vehicles to their best exit rather than their most realistic. Therefore, the zones have been split into 4 (i.e. 1952_1, 1952_2, 1952_3 and 1952_4) to improve this (see comparison in Figure 10).

Figure 10: Petone shopping zones in previous model (left) and in latest model (right)
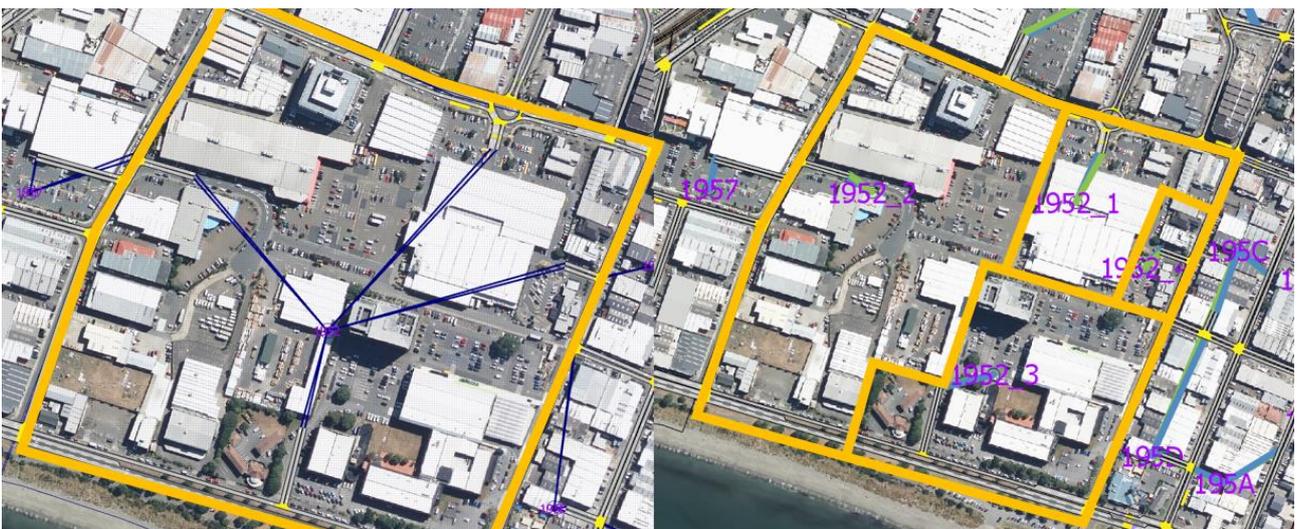
2.4.3   Zone loader review

It has been noted that some zones are loading directly onto intersections or mid-section nodes. Generally this is not good practice and instead vehicle should load from a side road. Midblock loading can be acceptable for lower trafficked areas, but generally should be avoided.

To address this, a high-level review and where appropriate correction of the zone loaders have been carried out across the model network. This review focused primarily on the key areas around Petone and Lower Hutt.

2.5   Observed counts check

A range of data has been used for the calibration and validation process. Given the varying levels of accuracy and coverage, we prioritised these sources from top to bottom as follows:

- **TEAM counts** – While not comprehensive, these surveys were undertaken specifically for this project, ensuring targeted and relevant data. These generally cover the Hutt CBD and main screenlines.
- **TomTom travel time data** – Provides consistent and reliable travel time measurements, making it a key source for model validation.
- **TMS counts** – Primarily focused on state highways (SH), providing useful count timeseries data but has some limitations around when the data is collected and the overall coverage.
- **SCATS counts** – Offers turn counts and signal timing information, but accuracy is limited due to the signal detectors not always registering vehicles passing over them.
- **HCC, UHCC, and WCC tube counts** – Provide comprehensive spatial coverage but are from a selection of dates (occasionally differing years also) which limit their usefulness. Preferred over SCATS counts but not over TEAM counts.

During the re-calibration process, the following checks have been done to ensure the counts used are correct and rational based on the model's needs:

- Counts on lower volume local roads and some collectors outside the Lower Hutt area have been removed for the comparisons as they are of much less significance comparing to the main and arterial routes. The weak matches between the observed and modelled counts for some of these removed locations are mainly due to the inaccurate centroid connections and/or minor unsuitable road types in the area (i.e. therefore different route choices). These inaccuracies would be unlikely to affect the key locations in the model for either the baseline or any future scenarios.
- Some pairs of observed counts have been found to be in the reversed direction. Following checking in the source data, these locations have been corrected.
- With such a range of tube count data, there were found to be some overlaps, with two data sets of data covering the same, or similar location.
    - This generally occurs between the TEAM counts and the Local Authority tube counts. Team Counts are preferred in this instance as they our most consistent data source, having been collected specifically for this model build.
    - The Local Authority counts can also overlap, since this data source contains data from a range of months and years. In this instance, the data that is closest to September 2024 has been preferred, to match the TEAM counts.

3.   Demand Adjustment

During the re-calibration for the latest model, the demand adjustments have been undertaken mainly through the processes of select link adjustments and re-profiling. It also includes a step that checked the Park and Ride demand. The following sub-sections elaborate these procedures and compare the results in detail. Table 3 summarises the differences between the original demands and the adjusted demands.

Table 3: Comparisons between original and adjusted demands

	AM			IP			PM		
	Light	Heavy	L/H	Light	Heavy	L/H	Light	Heavy	L/H
Original	140,314	6,459	96/4	135,095	7,313	95/5	184,367	6,343	97/3
Adjusted	145,680	6,882	95/5	141,474	7,339	95/5	194,706	6,057	97/3
Diff (abs)	5,366	423	-	6,380	26	-	10,339	-286	-
Diff (%)	3.8%	6.6%	-	4.7%	0.4%	-	5.6%	-4.5%	-

There have been increases for both light and heavy vehicles AM. IP also has had increases in light vehicles, but the increases in heavy vehicles are considered negligible. A considerable amount of demands for light vehicles have increased for PM, but there have been minor decreases in heavy vehicles.

3.1   Park and Ride Demands

During the validation process for the latest model, we have found some links and turns near Park and Ride zones have largely unmatching counts. The finding prompted us to check through the demands used in the model against the survey.

The survey was done by Metlink by judging the parking usage on site for each Park and Ride in the region, rather than the actual counts. The parking usage includes the traffic uses the designated Park and Ride carpark and the adjacent on-street parking. The modelled demands from WTSM and Aimsun (retrieved from the previous final model) have been compared against the survey data as shown in Table 4.

Table 4: Comparisons of Park and Ride demands

Area	Station	Survey	Aimsun demands	WTSM demands	Target
Lower Hutt & Upper Hutt	Petone	519	480	357	600
	Western Hutt	0	58	46	0
	Melling	218	314	257	218
	Ava	50	38	36	100
	Woburn	199	885	754	200
	Waterloo	610	804	625	610
	Epuni	0	4	3	50
	Naenae	24	2	2	80
	Wingate	0	10	8	0
	Taita	121	101	81	170
	Pomare	48	344	276	100
	Manor Park	70	12	10	120
	Silverstream	134	198	159	134
	Heretaunga	10	351	287	50
	Trentham	149	2	2	200
	Upper Hutt	352	504	405	352
Outside Hutt	Redwood	135	103	83	180
	Tawa	228	210	169	300
	Takapu Road	207	439	352	300
	Linden	0	222	178	50

The estimated demands from Aimsun and WTSM are fairly consistent, with the Aimsun demands slightly higher than the WTSM demands. For most of stations, the surveyed demands are also quite consistent with the modelled demands, with some amount of deviations.

However, there are a few exceptions that have large differences between the surveyed and modelled demands:

- Woburn Station: the surveyed demand is only 199, however the models produced 800-900 trips
- Pomare Station: the surveyed demand is only 48, however the models produced around 300 trips
- Manor Park Station: the surveyed demand is only 70, however the models only produced around 10 trips
- Heretaunga Station: the surveyed demand is only 10, however the models produced around 300 trips
- Trentham Station: the surveyed demand is only 149, however the models only produced 2 trips
- Takapu Road Station: the surveyed demand is only 207, however the models produced around 400 trips
- Linden Station: the surveyed demand is only 0, however the models produced around 200 trips

These discrepancies between the surveyed demands and modelled trips are the main cause of high GEHs for the links and turns in the vicinity of these Park and Ride zones. Therefore, it was essential to have them checked and corrected. The correction has been done by setting a target demand for each station primarily based on the surveyed demands plus additions of possible drop off and pick up trips occurred around the station. The additions were assumed on the basis of the station/carpark size, the availability of space on the adjacent streets and the GEHs of links and turns around the stations.

Hence, the Park and Ride demands used in the model are consistent with the assumed targets.

3.2   Select link demand adjustments

The main approach used to adjust demands for the re-calibration process is by selecting affected links, rather than the matrix estimation. The advantages of using select link adjustments allows the selection of multiple links that can address the targeted discrepancies along a corridor, including links, turns as well as the zones/sectors the demands come from and to.

- For AM, the routes involved by select links contain a mixture of adjustments in short, medium and long trips. The affected areas cover a broad range of the model network, including short trips within the Lower Hutt area, medium trips between Upper Hutt (and Stokes Valley) and the southern part of Lower Hutt, and long trips outside the Hutt Valley.
- Since the results of PM from the previous model were already well developed, only a small number of demand adjustments has been required for PM due to the network changes implemented for AM and IP. The select link demand adjustments have only been applied to areas around and links involves Melling Link and Harcourt Werry Drive, and Waddington Drive in Naenae.
- Different to AM and PM, the vast majority of adjustments have been applied to IP is very localised trips. For example, trips between different zones with the Hutt Central, and trips between Petone sectors and the Alicetown sector. These places are the most commercial areas in Lower Hutt where there are high demands during midday for shopping (i.e. lunch), therefore it is expected to see many localised trips within the sector or the adjacent sectors. However, WTSM does not have the full ability to capture these trips. Hence, there have been a large number of very short trips added in the latest HAM.

3.3   Trip length distribution

To understand the level of change the demand adjustment process has had on the shape of the demand matrices, the length of trips before and after the adjustment process can be compared. Figure 11-Figure 13 compare the trip length distribution for each period, respectively. The cause of these significant changes may be found by the sector demand comparisons, which is included in Section **Error! Reference source not found. Error! Reference source not found.**. The trip length is compared with the latest model and the original model. As the latest model is developed on top of the previous model, therefore all the demand changes mentioned above are built on the previous matrix estimation process.
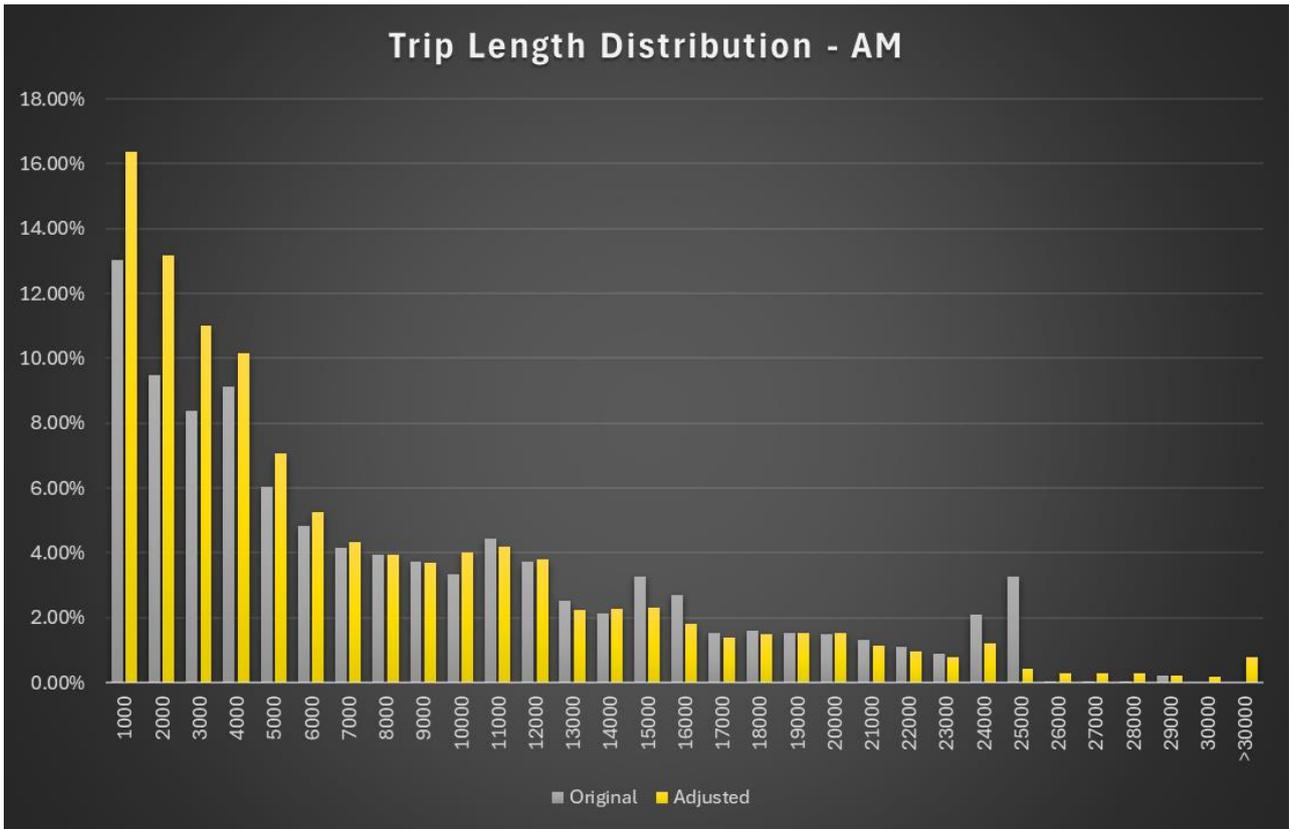
Figure 11: Comparison of trip length distribution – AM – Latest HAM
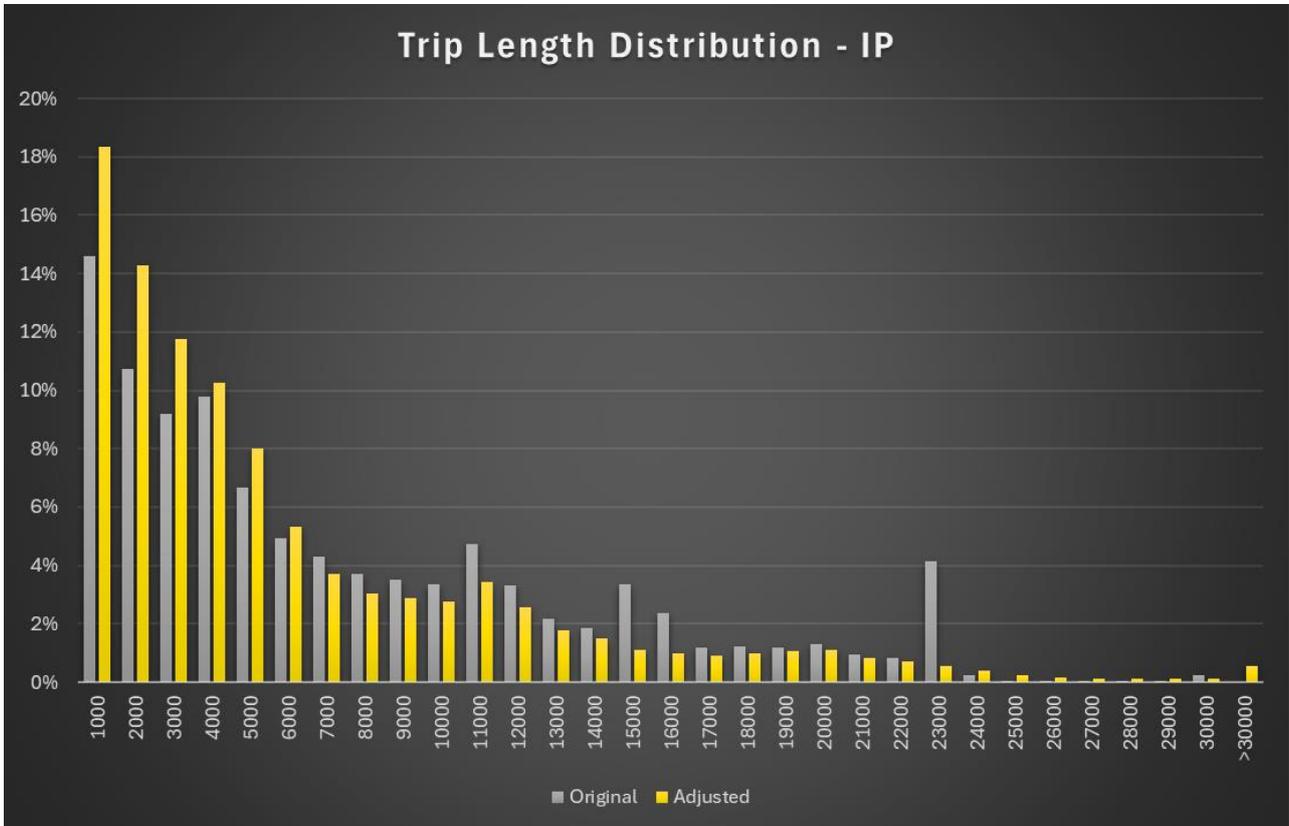
Figure 12: Comparison of trip length distribution – IP– Latest HAM
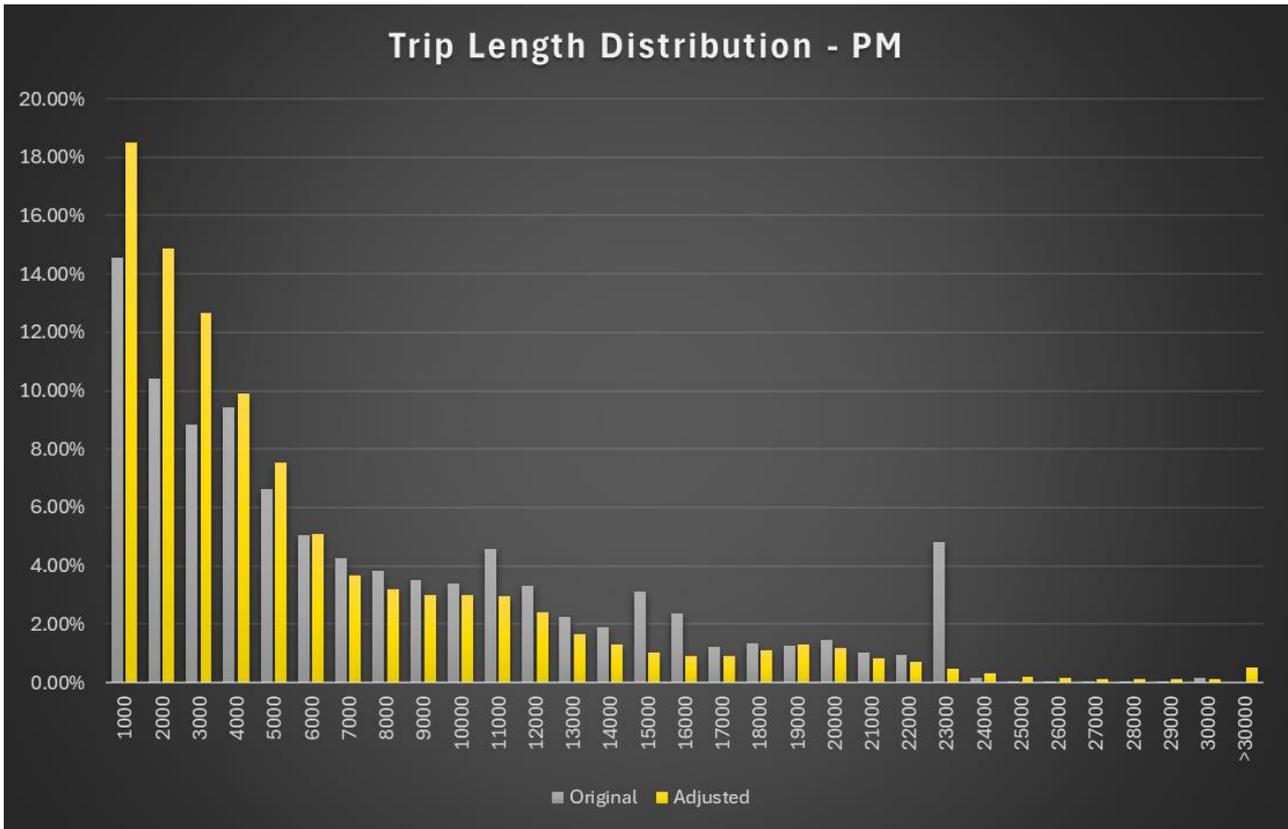
Figure 13: Comparison of trip length distribution – PM– Latest HAM

When they are compared to the previous model, it is highly noticeable that the differences of the short trips (i.e. below around 6 km) have massively increased for each period. In the previous model, the differences for short trips are very negligible. Therefore, the coincidence ratio (CR) has been checked.

CR is a measure of how well the trip length distribution of the trip matrix matches the observed length distribution. Guidance of the desirable range of the CR is shown in Figure 14.

MEASURE	PURPOSE CATEGORY						
	A: REGIONAL (commonly by trip purpose)	B: STRATEGIC NETWORK	C: URBAN AREA	D: NZ TRANSPORT AGENCY PROJECT	E: SMALL AREA /CORRIDOR	F: INTERSECTION / SHORT CORRIDOR	G: HIGH FLOW, SPEED, MULTI LANE
COINCIDENCE RATIO (CR)	>0.60	>0.65	>0.70	>0.75	>0.80	NA	NA

Figure 14: TMDG – CR criteria

The CR is 81% for AM, 76% for IP and 74% for PM. They are well within the desirable range.

3.4   Re-profiling

The demand adjustment process may have shifted some demands across different time periods, therefore affecting the demand profiles. The demand profiles for light vehicles have also been adjusted as part of the demand adjustment process after comparing the results of the initial hybrid model runs have against the TMDG criteria.

During the profiling adjustments of the re-calibration process, we found a few of profiles had been mistakenly placed before. The incorrect profiles were usually assigned with the representative count of the opposite directions of the same location. These have been checked through and corrected. Therefore, re-profiling have had to be undertaken due to the incorrect profiles and also based on the updated demand adjustments.

Together with the changes from the demand adjustment process, the final overall profiles are shown in Figure 15-Figure 17 for each period respectively.
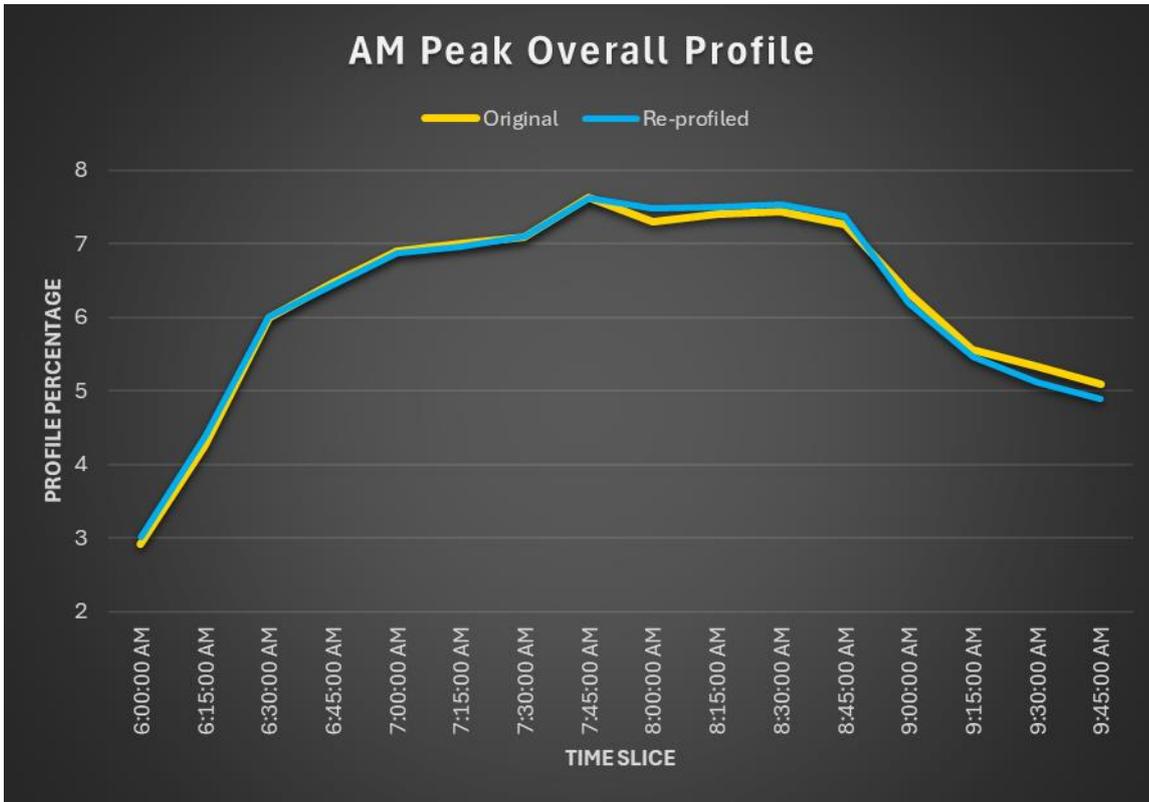
Figure 15: Final overall profile for AM after calibration – Latest vs Original

For AM, slightly more demands have been mainly shifted to the 3rd hour from the 4th hour.
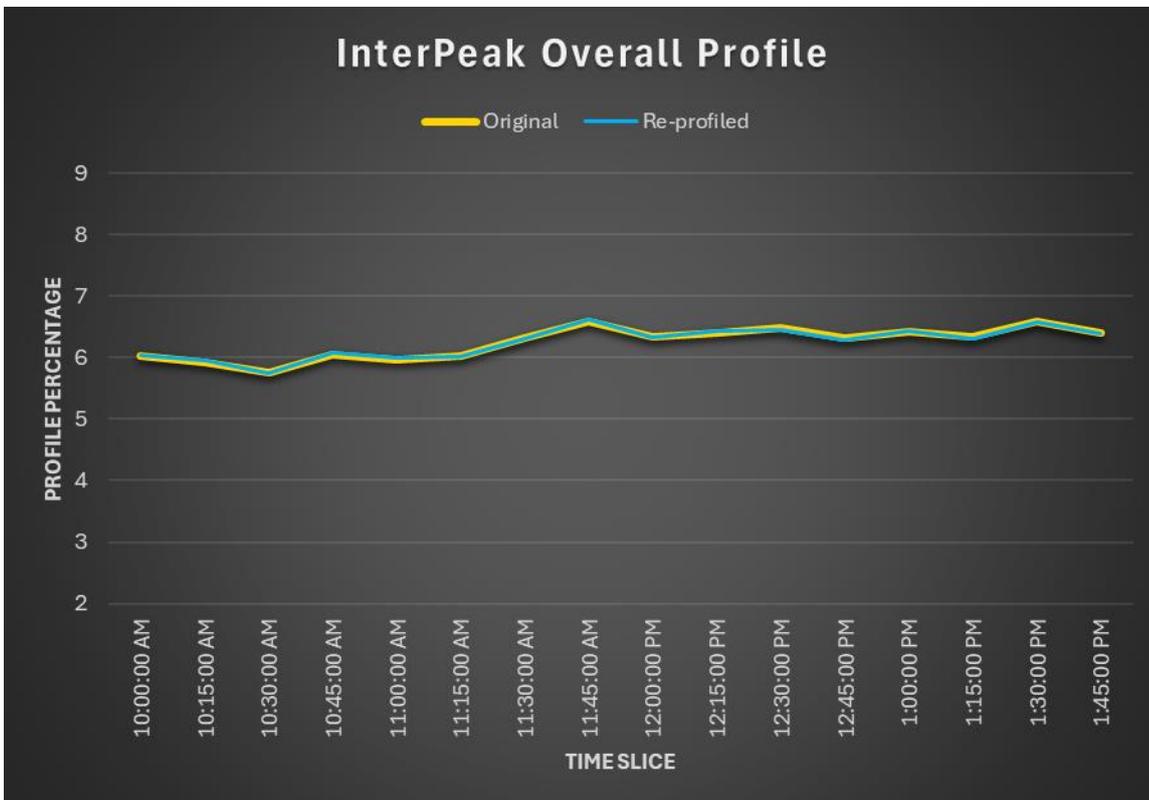
Figure 16: Final overall profile for IP after calibration – Latest vs Original

For IP, the differences are fairly unnoticeable.
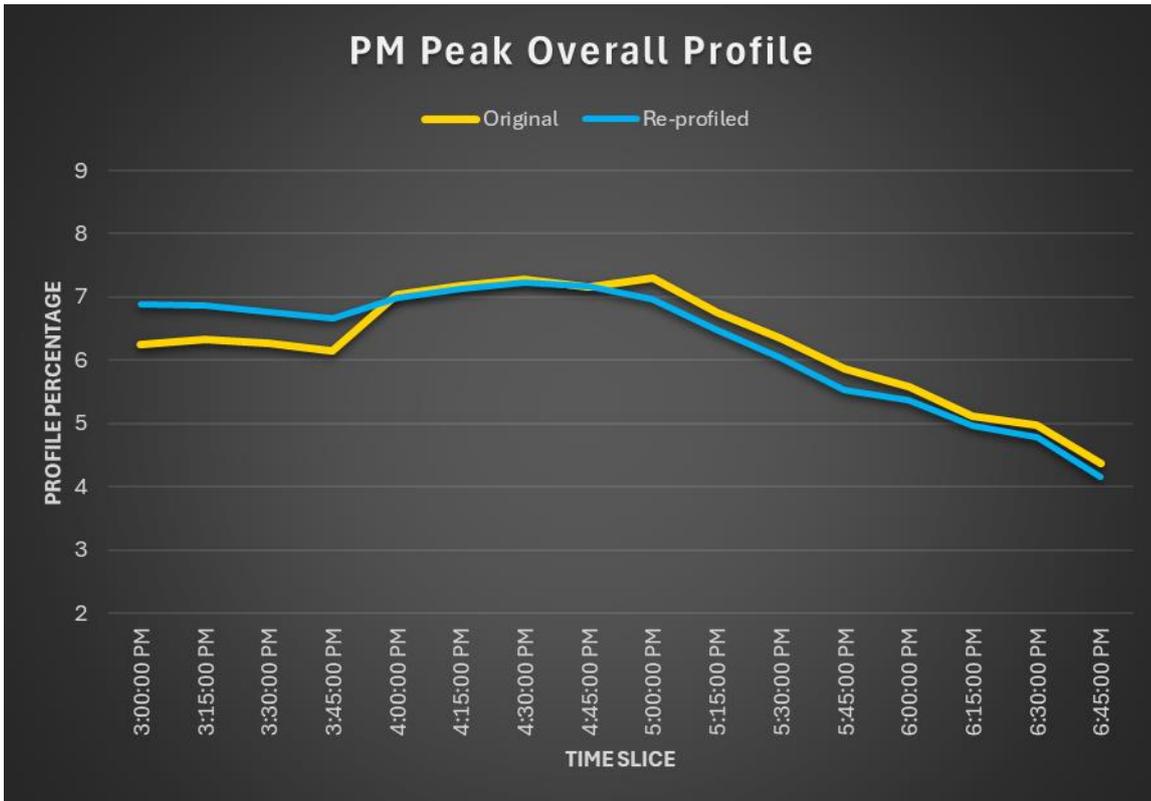
Figure 17: Final overall profile for PM after calibration – Latest vs Original

Of these adjusted profiles, the PM peak shows the most difference from the original. Previously, this peak in particular was showing low traffic early and high traffic towards the end of the model period. Profiles therefore have been shifted from 5-7pm earlier to the pre-peak shoulder between 3 and 4pm. This will also emulate a degree of existing traffic at the start of the model period beyond that which the model warmup period is catering for.

3.5　Matrix sector to sector comparisons

Table 5 compares the prior and final demand matrix in the absolute values for the AM peak. Overall the matrix has increased by 5,366 (out of 145,680) trips.

- Trips between Wellington City and places outside the Hutt Cite area (i.e. SH59, SH1 and Tawa) has the greatest increase in both directions to respond to the low SH1 demand (compared to TMS). This is likely the main source of the increase for the very long trips – as an example, the distance from Wellington to the SH59 external is around 23 km
- Trips to Upper Hutt has moderately decreased, followed by trips to Hutt Central and Petone West, this reduction is to meet the lower count data on SH2.
- However, the trips originated from Upper Hutt has significantly dropped. As it is at the edge of the model extent, it likely causes the significant drop for 25 km.
- The increases in trips from Tawa to Wellington is to address the low counts on Main Road in the southbound direction into the motorway.
- Trips between the Hutt Central and Waterloo/Woburn/Epuni/Naenae sectors have significantly increased in total, causing the high increases in short trips.
- The decreases in trips between Stokes Valley and Hutt Central is to address the high counts along Harcourt Werry Drive in both directions.
- Noticeable changes happened for some Park and Ride zones as the destination, they are the result of the correction of Park and Ride demand adjustments.

	Wellington	SH2	SH59	SH1	Johnsonville	Uhnorth	Uhsouth	Tawa	Newlands	HuttCentral	PetoneWest	PetoneEast	Alicetown	Wainuiomata	EasternHills	Woburn	Waiwhetu	Waterloo	Epuni	Naenae	Boulcott	Avalon	Taita	StockeValley	Eastbourne	Seaview	PnR a	PnR b	PnR c	PnR d	PnR e	PnR 815 f	Total
Wellington	0	2	405	253	0	13	45	198	22	127	-265	-20	7	52	76	-6	29	-23	-51	80	-14	20	-23	-39	-8	38	0	0	0	0	0	0	916
SH2	-89	0	-12	-82	-4	-70	-165	-8	-7	-55	-63	-6	-15	-14	-29	-7	-12	-6	-10	-14	-5	-7	-21	-29	-6	-28	0	0	0	0	0	0	-765
SH59	829	0	0	0	8	-1	3	280	91	41	8	4	14	8	67	3	13	1	-1	3	0	0	0	1	2	24	0	0	0	0	0	0	1397
SH1	574	-10	0	0	2	-14	63	-4	30	-192	-33	6	7	-22	19	-14	-9	41	14	102	4	10	12	18	-10	-18	0	0	0	0	-72	0	503
Johnsonville	31	0	0	0	0	2	8	-22	3	30	-73	-5	3	9	40	-1	7	-5	-8	19	-2	3	-3	-5	-1	14	0	0	0	0	0	0	45
Uhnorth	-68	0	-15	-77	-3	-243	-414	-11	-6	-352	-191	-14	-44	-30	-63	-46	-38	-8	-47	2	-23	-24	-43	-73	-21	-83	0	-2	0	0	0	0	-1936
Uhsouth	141	-9	8	50	10	-110	-5	4	14	-432	-136	8	-4	-25	-13	-38	-27	27	2	417	-3	1	-5	-9	-21	-62	0	-108	0	0	0	0	-324
Tawa	661	0	-29	-3	117	-1	4	120	73	63	25	7	17	11	55	5	16	3	2	23	1	6	1	1	3	22	0	0	0	0	-80	177	1300
Newlands	60	0	143	17	1	2	7	45	7	24	-54	-4	3	8	30	-1	6	-4	-6	15	-2	3	-3	-5	-1	12	0	0	0	0	-2	0	301
HuttCentral	142	-1	20	8	14	-28	-7	15	12	197	152	55	98	-12	12	200	8	409	160	62	27	-18	-62	-120	-10	5	0	20	0	0	0	0	1357
PetoneWest	43	-2	43	2	10	-35	-24	21	11	27	20	20	19	44	-11	3	56	18	23	37	19	4	-26	-58	22	96	0	0	0	0	59	0	441
PetoneEast	-9	0	8	14	-1	11	23	4	-1	49	122	7	44	19	18	15	26	17	29	36	13	18	12	-4	7	46	0	0	0	0	73	0	597
Alicetown	34	0	14	6	4	-7	3	8	5	-11	-14	5	0	-16	-3	-5	-6	-1	122	4	7	5	-10	-30	-8	-2	0	0	0	0	24	0	127
Wainuiomata	89	-2	26	-7	6	-14	-9	15	9	153	94	38	-16	0	-23	-46	19	17	22	22	10	28	-4	-6	-29	5	0	0	0	9	0	-252	156
EasternHills	116	-1	56	27	24	-11	8	47	20	-269	-117	16	-7	-31	-7	-54	-19	16	-17	87	2	7	-1	-27	-16	-17	0	0	0	4	0	82	-83
Woburn	61	0	10	2	4	-6	-1	6	5	352	14	8	9	-13	2	2	-4	6	16	21	9	11	8	-7	-8	-4	0	0	0	0	-33	0	467
Waiwhetu	-3	-1	9	-9	0	-21	-18	5	0	-80	14	20	-32	-13	-18	-63	-1	5	-7	24	-2	22	-1	-8	-16	0	0	0	0	1	0	-99	-292
Waterloo	-47	1	8	37	-4	24	-4	3	-4	512	6	21	32	-15	8	-34	20	0	-26	29	0	94	-12	-16	-3	28	0	0	0	8	0	0	665
Epuni	59	-1	9	0	3	-24	-15	7	5	251	70	56	58	-5	-3	6	14	12	0	84	2	-26	-24	-24	0	25	0	0	0	6	0	0	545
Naenae	147	0	7	45	12	3	4	13	17	67	-51	36	34	-19	41	-46	20	-25	145	2	53	71	14	2	6	53	0	-37	35	0	0	0	648
Boulcott	47	0	4	0	3	-11	-7	4	4	100	44	36	37	3	2	16	7	4	3	26	0	-18	-13	-19	1	11	0	1	2	0	0	0	287
Avalon	-33	-1	-1	-7	-2	-16	1	1	-2	-50	-28	25	11	-5	-37	-9	8	3	-41	17	-17	-4	7	-2	1	14	0	-12	7	0	0	0	-176
Taita	-102	-1	1	8	-8	-9	1	-1	-10	-131	-90	76	-8	-1	-46	12	92	15	-56	20	-23	-1	10	0	58	201	0	0	-9	65	0	0	63
StockeValley	-143	-2	5	29	-10	-28	4	3	-14	-100	-131	47	-9	-8	-69	25	24	2	-41	3	-20	7	0	0	5	76	0	0	-132	4	0	0	-473
Eastbourne	-17	-1	6	-11	-1	-15	-20	3	-1	-85	22	9	-29	-9	-23	-28	-13	-4	1	1	-2	7	-1	-7	-18	-34	0	0	1	0	-84	0	-354
Seaview	14	-1	5	-16	2	-23	-20	3	2	-37	36	11	-16	6	-13	-9	0	2	8	13	1	13	5	-2	-12	0	0	0	0	0	-15	0	-46
PnR a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PnR b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PnR c	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PnR d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PnR e	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PnR f	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2536	-32	727	286	187	-633	-544	760	285	202	-619	465	213	-79	12	-122	234	522	235	1136	33	233	-183	-468	-84	422	0	-138	-67	69	-398	177	5366

Table 5: Sector demand comparison (absolute) – AM

Table 6 compares the prior and final demand matrices, presenting percentage values for the AM peak. Overall, the matrix reflects a 4% increase. The majority of this increase is attributed to aligning with traffic volumes (derived from TMS data) on SH1 and SH2 southbound, prior to the Ngauranga Interchange.

- ▪ The major changes in trips are associated with the Park and Ride zones, with increased of more than 1,000% and decreases of about 70%. It is because their demands in the original model are very low, the correction of Park and Ride demands has a huge impact.
- ▪ The increases in Park and Ride demands have made the increases for other sectors insignificant.
- ▪ Although it seems a lot of sectors have demands decreased largely, it is just because they had very low demands from the original model. Any minor changes to the demands would huge changes in percentage.

	Wellington	SH2	SH59	SH1	Johnsonville	Uhnorth	Uhsouth	Tawa	Newlands	HuttCentral	PetoneWest	PetoneEast	Alicetown	Wainuiomata	EasternHills	Woburn	Waiwhetu	Waterloo	Epuni	Naenae	Boulcott	Avalon	Taita	StockeValley	Eastbourne	Seaview	PnR a	PnR b	PnR c	PnR d	PnR e	PnR 815f	Total
Wellington	0%	1%	45%	45%	0%	9%	27%	41%	2%	17%	-21%	-13%	2%	25%	20%	-6%	18%	-20%	-27%	78%	-20%	24%	-29%	-45%	-8%	18%	0%	0%	0%	0%	0%	0%	11%
SH2	-29%	0%	-40%	-40%	-26%	-8%	-36%	-41%	-28%	-86%	-64%	-38%	-47%	-69%	-46%	-66%	-61%	-30%	-45%	-36%	-47%	-44%	-47%	-47%	-76%	-68%	0%	-9%	0%	0%	0%	0%	-30%
SH59	32%	-10%	0%	0%	1%	-3%	12%	16%	20%	72%	4%	14%	33%	59%	132%	22%	51%	9%	-4%	65%	3%	14%	9%	8%	20%	50%	0%	0%	0%	0%	0%	0%	12%
SH1	32%	-10%	0%	0%	1%	-3%	11%	-1%	21%	-68%	-21%	-21%	9%	-29%	11%	-29%	-12%	40%	12%	60%	8%	12%	10%	8%	-44%	-27%	0%	0%	0%	0%	-32%	0%	7%
Johnsonville	2%	4%	0%	0%	0%	11%	29%	-3%	0%	23%	-20%	-12%	3%	26%	39%	-5%	19%	-19%	-25%	83%	-19%	26%	-20%	-35%	-7%	19%	0%	0%	0%	0%	0%	0%	0%
Uhnorth	-11%	0%	-23%	-20%	-8%	-5%	-15%	-24%	-11%	-81%	-52%	-22%	-31%	-57%	-33%	-57%	-47%	-9%	-29%	1%	-31%	-28%	-30%	-28%	-67%	-57%	0%	-10%	0%	0%	0%	0%	-15%
Uhsouth	21%	-15%	11%	11%	24%	-5%	0%	9%	23%	-71%	-29%	10%	-2%	-37%	-5%	-38%	-26%	22%	1%	263%	-3%	1%	-2%	-2%	-51%	-36%	-7%	-18%	0%	0%	0%	0%	-3%
Tawa	57%	-12%	-1%	-2%	15%	-4%	10%	7%	35%	85%	19%	39%	50%	78%	131%	39%	71%	19%	10%	163%	19%	83%	10%	4%	36%	74%	0%	0%	0%	0%	-39%	37%	18%
Newlands	3%	6%	24%	26%	0%	12%	29%	16%	1%	24%	-18%	-10%	4%	27%	36%	-4%	20%	-19%	-25%	83%	-19%	28%	-23%	-41%	-5%	21%	0%	0%	0%	0%	-32%	0%	5%
HuttCentral	41%	-24%	101%	8%	9%	-17%	-3%	95%	47%	22%	55%	125%	68%	-6%	7%	143%	8%	310%	50%	30%	25%	-7%	-28%	-57%	-16%	8%	0%	134%	0%	0%	93%	0%	30%
PetoneWest	6%	-32%	56%	2%	9%	-26%	-14%	50%	11%	6%	2%	12%	7%	29%	-7%	3%	38%	19%	20%	26%	47%	5%	-26%	-57%	26%	58%	0%	0%	21%	0%	47%	0%	9%
PetoneEast	-4%	24%	39%	62%	-4%	32%	50%	33%	-2%	33%	34%	11%	44%	40%	36%	25%	45%	50%	68%	67%	104%	81%	38%	-15%	21%	52%	0%	0%	41%	0%	87%	0%	34%
Alicetown	12%	-17%	59%	15%	12%	-11%	3%	54%	14%	-5%	-6%	13%	0%	-24%	-3%	-7%	-13%	-2%	215%	8%	38%	11%	-19%	-58%	-27%	-6%	0%	0%	0%	0%	94%	0%	7%
Wainuiomata	10%	-36%	58%	-9%	10%	-30%	-12%	49%	11%	27%	17%	30%	-9%	0%	-12%	-20%	6%	10%	12%	17%	19%	36%	-5%	-13%	-21%	1%	0%	11%	586%	0%	-47%	0%	2%
EasternHills	11%	-15%	86%	17%	23%	-10%	4%	97%	16%	-30%	-14%	12%	-2%	-28%	-1%	-18%	-13%	12%	-6%	54%	2%	5%	-1%	-32%	-28%	-9%	0%	-5%	1%	0%	34%	0%	-1%
Woburn	28%	-22%	80%	8%	28%	-16%	-2%	72%	30%	106%	11%	28%	14%	-18%	3%	1%	-7%	13%	14%	28%	29%	16%	12%	-15%	-25%	-6%	0%	0%	210%	0%	-78%	0%	25%
Waiwhetu	-1%	-46%	44%	-23%	0%	-41%	-23%	37%	1%	-20%	4%	25%	-25%	-26%	-31%	-1%	4%	-5%	15%	-6%	28%	-1%	-13%	-22%	0%	0%	0%	9%	492%	0%	-67%	0%	-9%
Waterloo	-14%	17%	42%	63%	-13%	30%	-3%	21%	-11%	92%	2%	33%	26%	-12%	10%	-16%	12%	0%	-11%	9%	0%	62%	-7%	-15%	-6%	16%	0%	0%	1035%	0%	-66%	0%	17%
Epuni	17%	-29%	52%	-1%	17%	-24%	-11%	58%	19%	39%	40%	165%	72%	-6%	-3%	4%	21%	14%	0%	48%	2%	-12%	-15%	-21%	-1%	34%	0%	0%	1070%	0%	-66%	0%	16%
Naenae	42%	0%	46%	47%	42%	5%	3%	88%	45%	11%	-14%	43%	26%	-20%	22%	-24%	11%	-10%	49%	0%	53%	35%	8%	2%	9%	23%	0%	-10%	1537%	0%	0%	0%	14%
Boulcott	31%	-29%	56%	0%	32%	-23%	-11%	75%	33%	42%	64%	294%	122%	9%	3%	27%	33%	16%	3%	37%	0%	-17%	-18%	-39%	10%	44%	0%	2%	958%	0%	0%	0%	20%
Avalon	-14%	-36%	-13%	-13%	-14%	-30%	-5%	19%	-13%	-10%	-20%	92%	15%	-10%	-28%	-9%	14%	3%	-18%	18%	-20%	-2%	5%	-2%	2%	19%	0%	-10%	812%	0%	0%	0%	-7%
Taita	-40%	-17%	11%	11%	-40%	-11%	1%	-14%	-39%	-27%	-38%	165%	-8%	-1%	-34%	9%	108%	13%	-26%	13%	-27%	0%	5%	0%	190%	178%	0%	17%	-44%	68%	0%	0%	2%
StockeValley	-34%	-17%	15%	15%	-32%	-10%	1%	12%	-34%	-17%	-40%	74%	-7%	-13%	-39%	18%	22%	1%	-18%	2%	-22%	4%	0%	0%	11%	45%	0%	0%	0%	0%	-39%	68%	-8%
Eastbourne	-7%	-70%	37%	-55%	-6%	-65%	-58%	30%	-5%	-50%	11%	18%	-50%	-11%	-39%	-47%	-16%	-9%	1%	2%	-14%	19%	-4%	-24%	-4%	-17%	0%	20%	750%	0%	-81%	0%	-16%
Seaview	13%	-61%	62%	-73%	13%	-64%	-47%	59%	16%	-35%	32%	39%	-45%	6%	-37%	-35%	0%	5%	20%	23%	7%	52%	14%	-6%	-22%	0%	0%	0%	0%	0%	-77%	0%	-4%
PnR a	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PnR b	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PnR c	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PnR d	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PnR e	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PnR f	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	15%	-5%	7%	7%	2%	-6%	-5%	13%	6%	2%	-7%	30%	7%	-2%	0%	-4%	10%	23%	6%	36%	3%	9%	-7%	-15%	-5%	13%	0%	-9%	-9%	68%	-23%	33%	4%

Table 6: Sector demand comparison (percentage) – AM

Table 7 compares the prior and final demand matrix in the absolute values for the IP peak. Overall the matrix has increased by 6,380 (out of 141,474) trips.

- The internal trips within the Hutt Central show the greatest increase, followed by trips between here and Petone West. These are the main sources of the increase in short trips.
- Decreases mostly occur for the external/remote sectors (e.g. Upper Hutt and Stokes Valley), this could cause the significant drop for 23 km.

	Wellington	SH2	SH59	SH1	Johnsonville	Uhnorth	Uhsouth	Tawa	Newlands	HuttCentral	PetoneWest	PetoneEast	Alicetown	Wainuiomata	EasternHills	Woburn	Waiwhetu	Waterloo	Epuni	Naenae	Boulcott	Avalon	Taita	StockeValley	Eastbourne	Seaview	PnR a	PnR b	PnR c	PnR d	PnR e	PnR 815 f	Total
Wellington	0	15	0	0	0	18	21	389	0	-103	184	15	35	81	38	35	28	-76	-93	-21	-27	-17	-34	-41	32	55	0	0	0	0	0	0	534
SH2	-87	0	0	17	-3	0	-11	1	-3	-2	2	-1	-2	-4	-1	0	-2	-2	2	-1	0	-1	0	-8	-1	-3	0	0	0	0	0	0	-108
SH59	0	0	0	0	0	1	1	0	0	6	23	2	4	5	5	3	2	-3	-2	-1	0	-1	0	1	4	7	0	0	0	0	0	0	56
SH1	0	8	0	0	0	13	16	0	0	-20	10	-3	-16	-24	4	-2	-10	-12	20	-14	1	-9	-4	6	-5	-12	0	0	0	0	0	0	-54
Johnsonville	0	1	0	0	0	2	3	0	0	15	50	3	9	9	8	5	6	-9	-4	-3	0	-2	-3	-4	6	12	0	0	0	0	0	0	105
Uhnorth	-92	0	2	25	-6	0	-169	2	-6	-53	15	-6	-27	-22	-3	-7	-19	-22	32	-12	-2	-13	0	-140	-8	-23	0	0	0	0	0	15	-553
Uhsouth	-112	0	3	32	-8	0	-35	2	-8	-97	23	-8	-44	-31	-5	-10	-28	-34	48	-14	-3	-16	0	-41	-11	-31	0	0	-2	0	0	0	-430
Tawa	439	0	0	0	0	1	1	0	0	5	16	1	3	3	3	2	2	-3	-2	-1	0	-1	-1	0	2	5	0	0	0	0	0	0	476
Newlands	0	1	0	0	0	2	3	0	0	12	46	3	8	8	7	4	5	-8	-3	-3	0	-1	-3	-4	5	10	0	0	0	0	0	0	91
HuttCentral	58	-2	3	-11	5	-61	-324	2	4	1000	623	78	81	-186	-54	51	-93	126	662	101	96	353	-130	-198	-17	-37	0	0	0	0	0	0	2131
PetoneWest	207	0	20	7	59	-3	-5	16	48	224	876	521	3	22	4	38	66	42	33	-10	3	-18	-59	-71	79	108	0	0	0	0	2	0	2212
PetoneEast	25	1	2	5	4	9	11	2	4	57	311	2	14	9	11	8	21	13	14	17	4	4	-3	-3	17	27	0	0	0	0	1	0	585
Alicetown	29	0	2	5	5	0	0	2	4	126	93	16	0	-43	1	19	-15	12	32	23	6	-1	-29	-33	4	-2	0	0	0	0	0	0	258
Wainuiomata	96	-3	3	-14	7	-17	-25	3	6	-75	68	13	5	0	-16	-19	-13	-7	-5	-7	2	-11	-9	-4	-12	-25	0	0	0	0	-2	0	-59
EasternHills	77	0	7	9	11	-4	-5	5	9	-11	37	1	-25	-49	-9	3	-19	-24	-4	-41	-3	-35	-36	-36	-4	-17	0	0	0	0	0	0	-164
Woburn	47	-1	2	-3	3	-12	-40	2	3	26	79	11	18	-31	3	0	-26	-3	0	-1	5	3	-2	-12	-8	-14	0	0	0	0	0	0	49
Waiwhetu	60	-2	4	-8	8	-21	-40	3	6	-39	128	24	10	-11	-7	-16	-1	0	-3	-5	2	-9	-4	-5	0	0	0	0	0	0	0	0	76
Waterloo	-11	-2	0	-8	-1	-21	-27	0	-1	82	123	20	25	-10	-7	2	-1	0	14	-8	2	-16	-11	-6	0	0	0	0	0	0	0	0	138
Epuni	-40	-1	-2	-3	-3	-20	-36	-2	-2	283	183	34	48	-7	-12	39	0	17	1	17	2	0	227	-3	-5	-5	0	0	0	0	0	0	713
Naenae	-20	-1	-1	-8	-2	-13	-6	-1	-2	56	15	14	-14	-7	-34	6	-2	-3	-9	0	-6	2	21	-2	0	-1	0	0	0	0	0	0	-16
Boulcott	-17	0	-1	-1	-1	-8	-10	-1	-1	133	4	6	-2	-3	-19	10	2	2	2	1	0	-3	60	-8	1	0	0	0	0	0	0	0	146
Avalon	-7	0	0	-2	0	-10	-5	0	0	265	-7	-4	-24	-5	-20	2	-5	-2	2	15	-1	0	20	0	-6	-6	0	0	0	0	0	0	198
Taita	-26	0	0	3	-3	0	0	-1	-2	-12	-25	-1	-26	3	-28	-1	3	18	189	24	51	18	11	0	-5	-1	0	0	0	0	0	0	190
StockeValley	-67	0	1	13	-5	0	0	1	-5	-153	-61	-6	-44	-4	-39	-7	-4	-2	4	-2	-9	5	-1	0	-4	-6	0	0	0	0	0	0	-396
Eastbourne	54	-1	3	-5	5	-10	-25	2	5	-20	95	15	6	-4	-4	-6	0	0	-9	-1	0	-3	-2	-2	0	0	0	0	0	0	0	1	93
Seaview	73	-2	6	-7	9	-24	-50	4	8	-22	133	25	7	-9	-7	-8	0	0	-8	-3	1	-6	-7	-4	0	0	0	0	0	0	0	0	107
PnR a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PnR b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PnR c	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PnR d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PnR e	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PnR f	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	686	9	57	46	86	-178	-756	430	66	1685	3045	775	51	-308	-178	149	-101	18	913	49	126	222	4	-618	63	40	0	-2	0	0	1	0	6380

Table 7: Sector demand comparison (absolute) – IP

Table 8 compares the prior and final demand adjusted matrix in the percentage values for the IP peak. Overall the matrix has increased by 5%.

- Trips between Petone sectors have the greatest percentage increases, this reflects the significant addition of localised trips aforementioned.
- There have been some significant percentage decreased in the long distance trips between the remote suburbs (Eastbourne, Seaview and Wainuiomata) and external sectors (SH1, SH2 and Upper Hutt), although their absolute differences are very low.

	Wellington	SH2	SH59	SH1	Johnsonville	Uhnorth	Uhsouth	Tawa	Newlands	HuttCentral	PetoneWest	PetoneEast	Alicetown	Wainuiomata	EasternHills	Woburn	Waiwhetu	Waterloo	Epuni	Naenae	Boulcott	Avalon	Taita	StockeValley	Eastbourne	Seaview	PnR a	PnR b	PnR c	PnR d	PnR e	PnR 815 f	Total
Wellington	0%	11%	0%	0%	0%	11%	11%	50%	0%	-14%	14%	10%	10%	25%	10%	35%	16%	-60%	-48%	-20%	-36%	-18%	-40%	-41%	31%	31%	0%	0%	0%	0%	0%	0%	5%
SH2	-56%	0%	11%	11%	-37%	0%	-11%	10%	-35%	-18%	11%	-17%	-32%	-46%	-4%	-17%	-39%	-31%	33%	-16%	-2%	-20%	0%	-48%	-35%	-42%	0%	0%	0%	0%	0%	0%	-12%
SH59	0%	6%	0%	0%	0%	6%	6%	0%	0%	13%	14%	11%	10%	25%	7%	37%	17%	-41%	-18%	-21%	3%	-20%	-7%	6%	31%	31%	0%	0%	0%	0%	0%	0%	1%
SH1	0%	6%	0%	0%	0%	6%	6%	0%	0%	-15%	12%	-15%	-31%	-43%	3%	-13%	-36%	-26%	39%	-23%	5%	-21%	-7%	6%	-32%	-51%	0%	0%	0%	0%	0%	0%	-1%
Johnsonville	0%	11%	0%	0%	0%	11%	11%	0%	0%	13%	14%	10%	10%	25%	9%	37%	18%	-39%	-15%	-16%	3%	-16%	-21%	-25%	31%	31%	0%	0%	0%	0%	0%	0%	1%
Uhnorth	-40%	0%	11%	11%	-39%	0%	-6%	11%	-42%	-19%	8%	-16%	-32%	-46%	-3%	-17%	-38%	-31%	30%	-15%	-3%	-20%	0%	-47%	-34%	-42%	0%	0%	0%	0%	0%	0%	-4%
Uhsouth	-38%	0%	11%	11%	-38%	0%	-1%	11%	-41%	-19%	8%	-16%	-32%	-45%	-3%	-18%	-37%	-30%	29%	-11%	-5%	-15%	0%	-8%	-34%	-41%	0%	-7%	0%	0%	0%	0%	-4%
Tawa	81%	6%	0%	0%	0%	6%	6%	0%	0%	13%	15%	10%	10%	25%	6%	37%	16%	-42%	-16%	-16%	3%	-16%	-21%	1%	31%	31%	0%	0%	0%	0%	0%	0%	7%
Newlands	0%	11%	0%	0%	0%	11%	11%	0%	0%	12%	15%	10%	10%	25%	9%	37%	16%	-41%	-17%	-16%	3%	-16%	-23%	-28%	31%	31%	0%	0%	0%	0%	0%	0%	2%
HuttCentral	9%	-21%	10%	-10%	7%	-20%	-68%	8%	7%	49%	87%	60%	29%	-42%	-11%	14%	-23%	23%	81%	18%	34%	69%	-28%	-42%	-10%	-20%	0%	9%	1%	0%	19%	0%	20%
PetoneWest	19%	-2%	18%	10%	25%	-2%	-2%	21%	25%	31%	46%	154%	1%	7%	1%	29%	21%	18%	16%	-4%	4%	-15%	-35%	-38%	44%	44%	0%	0%	-2%	0%	17%	0%	26%
PetoneEast	16%	25%	15%	33%	16%	24%	23%	16%	16%	42%	92%	3%	18%	14%	18%	27%	31%	28%	38%	33%	34%	18%	-10%	-10%	42%	42%	0%	0%	21%	0%	20%	0%	39%
Alicetown	9%	0%	9%	11%	9%	0%	0%	9%	9%	36%	18%	18%	0%	-34%	0%	31%	-12%	12%	36%	25%	21%	-1%	-36%	-37%	7%	-3%	0%	0%	0%	0%	3%	0%	8%
Wainuiomata	22%	-36%	22%	-27%	22%	-36%	-40%	22%	22%	-17%	22%	20%	4%	0%	-15%	-24%	-7%	-6%	-4%	-9%	7%	-22%	-19%	-11%	-12%	-12%	0%	-6%	5%	0%	-6%	0%	-1%
EasternHills	16%	-2%	12%	8%	14%	-3%	-3%	10%	15%	-2%	8%	1%	-14%	-46%	-2%	4%	-24%	-28%	-3%	-29%	-3%	-28%	-34%	-35%	-7%	-18%	0%	-14%	-17%	0%	-2%	0%	-4%
Woburn	39%	-29%	39%	-20%	39%	-29%	-75%	39%	39%	7%	54%	38%	32%	-42%	5%	0%	-29%	-3%	0%	-2%	16%	5%	-3%	-26%	-23%	-27%	0%	0%	32%	0%	2%	0%	3%
Waiwhetu	30%	-37%	31%	-27%	30%	-36%	-50%	30%	30%	-11%	38%	34%	10%	-6%	-9%	-19%	0%	0%	-3%	-3%	7%	-13%	-5%	-7%	0%	0%	0%	0%	1%	0%	0%	0%	3%
Waterloo	-7%	-27%	-7%	-18%	-6%	-27%	-24%	-6%	-6%	17%	52%	43%	28%	-7%	-8%	3%	0%	0%	9%	-3%	4%	-15%	-9%	-5%	0%	0%	0%	0%	13%	0%	0%	0%	5%
Epuni	-18%	-17%	-17%	-7%	-18%	-17%	-23%	-18%	-17%	33%	86%	94%	61%	-6%	-10%	38%	0%	10%	1%	8%	2%	0%	141%	-2%	-11%	-7%	0%	2%	5%	0%	-12%	0%	20%
Naenae	-13%	-16%	-13%	-13%	-13%	-15%	-5%	-13%	-13%	10%	6%	28%	-15%	-8%	-24%	9%	-1%	-1%	-5%	0%	-9%	2%	14%	-1%	-1%	-1%	0%	-1%	0%	0%	0%	0%	0%
Boulcott	-20%	-15%	-19%	-5%	-20%	-15%	-14%	-20%	-20%	47%	6%	46%	-7%	-9%	-25%	31%	6%	4%	2%	1%	1%	-4%	93%	-13%	6%	1%	0%	0%	-7%	0%	-29%	0%	11%
Avalon	-6%	-13%	-4%	-4%	-6%	-13%	-4%	-6%	-6%	48%	-6%	-18%	-6%	-10%	-16%	4%	-8%	-2%	1%	10%	-1%	0%	13%	0%	-20%	-12%	0%	0%	-1%	0%	-14%	0%	8%
Taita	-22%	0%	7%	7%	-24%	0%	0%	-20%	-26%	-3%	-15%	-3%	-33%	7%	-28%	-2%	5%	14%	114%	16%	77%	12%	6%	0%	-18%	-3%	0%	0%	0%	0%	0%	0%	7%
StockeValley	-42%	0%	11%	11%	-41%	0%	0%	10%	-43%	-33%	-32%	-19%	-50%	-10%	-38%	-14%	-6%	-2%	3%	-1%	-15%	5%	0%	0%	-13%	-9%	0%	0%	0%	0%	0%	0%	-10%
Eastbourne	39%	-45%	39%	-37%	39%	-45%	-83%	39%	39%	-12%	56%	41%	11%	-4%	-7%	-19%	0%	0%	-19%	-3%	-1%	-12%	-7%	-8%	0%	0%	0%	0%	0%	0%	14%	0%	5%
Seaview	39%	-40%	39%	-32%	39%	-41%	-70%	39%	39%	-12%	57%	40%	11%	-4%	-8%	-19%	0%	0%	-12%	-3%	3%	-14%	-11%	-7%	0%	0%	0%	0%	0%	0%	2%	0%	5%
PnR a	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PnR b	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PnR c	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PnR d	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PnR e	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PnR f	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	6%	1%	0%	1%	1%	-1%	-8%	7%	1%	15%	33%	51%	2%	-6%	-5%	9%	-4%	1%	26%	1%	10%	9%	0%	-16%	3%	2%	0%	-3%	0%	0%	1%	0%	5%

Table 8: Sector demand comparison (percentage) – IP

Table 9 compares the prior and final demand matrix in the absolute values for the PM peak. Overall the matrix has increased by 10,339 (out of 194,706) trips.

- The internal trips within the Hutt Central show the greatest increase, followed by internal trips within Petone. These are likely the main sources of the increase in short trips. The increases within Petone are to meet the lower count data on Jackson St.

- The trips from Wellington City also show the highest increase to various sectors where have essential access of SH1 and 2. However, the drop for the Petone West sector is to suppress the high volumes on the off-ramp.

- Decreases mostly occur for the external/remote sectors (e.g. Upper Hutt, Stokes Valley and Eastbourne), this could cause the significant drop for 23 km.

	Wellington	SH2	SH59	SH1	Johnsonville	Uhnorth	Uhsouth	Tawa	Newlands	HuttCentral	PetoneWest	PetoneEast	Alicetown	Wainuiomata	EasternHills	Woburn	Waiwhetu	Waterloo	Epuni	Naenae	Boulcott	Avalon	Taita	StockeValley	Eastbourne	Seaview	PnR a	PnR b	PnR c	PnR d	PnR e	PnR 815 f	Total
Wellington	0	-20	646	351	0	260	198	263	378	354	-586	-68	128	-125	489	116	-116	48	15	457	19	19	-19	-41	-105	-95	0	0	0	0	0	0	2565
SH2	26	0	-1	-21	1	20	-30	1	2	-1	1	-3	-4	-7	-2	-1	-4	4	-2	0	-1	-1	-4	-7	-2	-4	0	0	0	0	0	0	-42
SH59	-15	-9	37	2	51	5	-6	602	-114	5	-73	-10	-1	-12	41	2	-11	-1	-1	15	-1	-2	-4	-8	-9	-11	0	0	0	0	0	0	474
SH1	-10	-136	0	0	-6	53	-58	13	-12	35	27	-23	-39	-56	21	-10	-34	100	-23	138	-9	-19	-32	-56	-23	-31	0	0	0	0	0	0	-188
Johnsonville	-463	2	76	-23	0	45	36	-176	618	-42	-257	-28	-38	-37	-17	-3	-34	-16	-16	15	-5	-7	-13	-11	-23	-30	0	0	0	0	0	0	-446
Uhnorth	21	150	-3	-68	0	216	-688	-1	1	-55	-10	-37	-71	-48	-37	-27	-53	63	-73	-5	-32	-35	-72	-208	-29	-52	0	0	0	0	0	0	-1152
Uhsouth	46	-260	-3	-69	2	-940	624	0	3	-85	-5	-55	-115	-67	-47	-38	-63	113	-111	129	-49	-12	32	126	-44	-72	0	0	0	0	0	0	-960
Tawa	305	-6	149	-13	-248	7	-2	495	96	30	-28	-4	16	-3	70	8	-6	5	3	32	2	2	-1	-5	-6	-6	0	0	0	0	0	0	895
Newlands	311	-4	13	3	483	23	15	-38	620	29	-119	-14	18	-18	67	8	-20	3	-1	56	1	0	-5	-8	-17	-17	0	0	0	0	0	0	1389
HuttCentral	42	-19	7	-123	-13	-325	-585	4	2	1450	308	98	100	-204	-666	520	-184	564	662	-131	587	86	328	-124	-106	-64	0	0	0	0	0	0	2215
PetoneWest	77	-55	15	-90	-39	-219	-340	18	62	444	1012	950	33	147	-208	53	-43	-27	-20	-176	-36	-77	-162	-255	17	80	0	0	0	0	0	0	1159
PetoneEast	-46	-8	-10	-5	-19	-21	-36	-5	-11	79	399	7	5	109	-21	24	36	42	19	-8	3	1	35	-24	20	35	0	0	0	0	0	0	599
Alicetown	-60	-6	-9	117	-39	84	50	-6	-17	169	-9	9	14	-70	-33	13	-60	-6	-11	-44	-12	-15	-36	-68	-29	-20	0	0	0	0	0	0	-93
Wainuiomata	-138	-15	-9	-70	-20	-59	-73	-6	-13	-147	20	-11	-9	0	-79	-32	11	33	-79	-34	-16	0	-31	-51	-56	-67	0	0	0	0	0	0	-951
EasternHills	85	-24	23	76	10	-6	-63	32	16	213	149	55	54	-45	-18	71	-34	95	-19	140	-18	-72	-76	-100	-32	-31	0	0	0	0	0	0	481
Woburn	89	-3	7	-9	4	-43	-60	5	5	326	38	13	13	-58	-52	-17	-64	15	31	-63	61	-24	30	-11	-29	-18	0	0	0	0	0	0	185
Waiwhetu	104	-13	11	-35	13	-71	-83	7	19	20	303	48	33	135	-26	8	-4	71	1	-27	5	3	44	-61	-35	-16	0	0	0	0	0	0	454
Waterloo	38	6	7	175	0	180	42	2	4	400	101	69	15	222	53	18	196	153	5	-95	17	107	33	-80	47	74	0	0	0	0	0	0	1787
Epuni	-76	-4	-3	31	-7	21	-24	-4	-5	732	41	30	18	39	-100	94	0	62	74	18	84	-102	-18	-48	-17	-7	0	0	0	0	0	0	827
Naenae	-113	-6	10	252	-21	62	109	-7	-17	-67	-156	14	-45	35	213	-44	53	-129	-23	-34	33	64	166	-8	-17	14	0	0	0	0	0	0	338
Boulcott	2	0	1	51	-1	75	60	0	0	299	55	22	22	-1	8	48	-5	26	50	33	23	-44	-27	-44	-6	-5	0	0	0	0	0	0	641
Avalon	-5	-4	0	-9	-1	-33	41	0	0	5	-18	-15	-45	92	-55	-34	16	77	-93	16	-69	-13	51	13	-34	-14	0	0	0	0	0	0	-131
Taita	-41	-22	0	-8	-8	-30	162	-2	-6	-77	-65	-1	-69	-8	-42	12	40	-10	3	86	-42	23	40	-7	8	17	0	0	0	0	0	0	-49
StockeValley	-78	-37	-4	-55	-10	-157	16	-3	-9	-212	-84	-9	-51	-26	39	-15	-15	-47	-63	-4	-47	-19	-106	168	-14	-15	0	0	0	0	0	0	-858
Eastbourne	-35	-6	-5	-22	-9	-32	-42	-3	-5	-67	79	-4	-4	20	-39	-18	-45	-37	-24	-55	-6	-23	-6	-35	-7	-29	0	0	0	0	0	0	-458
Seaview	38	-25	8	-44	-1	-98	-120	4	9	29	353	46	39	313	-11	11	25	99	26	16	11	24	137	-30	-17	10	0	0	0	0	0	0	853
PnR a	0	3	0	0	0	60	-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
PnR b	0	-1	0	0	0	-26	26	0	0	8	0	0	0	58	-18	2	34	-6	2	-107	0	-9	2	0	0	1	0	0	0	0	0	0	-34
PnR c	0	0	0	0	0	0	0	0	0	62	21	0	4	1	77	0	0	3	5	21	8	33	20	9	0	0	0	0	0	0	0	0	264
PnR d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	37	-1	0	0	0	0	0	0	0	37
PnR e	0	0	0	-6	0	0	0	-29	-1	0	102	153	2	-30	106	-7	-8	3	-1	0	0	0	0	0	-14	-1	0	0	0	0	0	0	269
PnR f	0	0	1	0	0	0	0	213	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	214
Total	104	-520	965	389	121	-951	-840	1377	1626	3937	1599	1232	23	355	-286	761	-388	1299	333	390	512	-112	344	-977	-580	-375	0	0	0	0	0	0	10339

Table 9: Sector demand comparison (absolute) – PM

Table 10 compares the prior and final demand adjusted matrix in the percentage values for the PM peak. Overall the matrix has increased by 6%.

- Trips from Waterloo has the greatest percentage increases (except the Park and Ride zones), and they mainly go to SH1.
- Trips between the Petone sectors also has significant increases, they are mostly from the internal trip, the Hutt Central and several Park and Rides.
- There have been some significant increases in the trips from Tawa/Newlands and external sectors to Naenae, which likely contributed to the moderate increase for 24 km.
- Noticeable changes happened for some Park and Ride zones as the origin, they are the result of the correction of Park and Ride demand adjustments. The Park and Ride zones have increases of more than 300% and decreases up to 100%. It is because their demands in the original model are very low, the correction of Park and Ride demands has a huge impact.S

	Wellington	SH2	SH59	SH1	Johnsonville	Uhnorth	Uhsouth	Tawa	Newlands	HuttCentral	PetoneWest	PetoneEast	Alicetown	Wainuiomata	EasternHills	Woburn	Waiwhetu	Waterloo	Epuni	Naenae	Boulcott	Avalon	Taita	StockeValley	Eastbourne	Seaview	PnR a	PnR b	PnR c	PnR d	PnR e	PnR 815 f	Total
Wellington	0%	-9%	22%	20%	0%	78%	52%	21%	18%	39%	-36%	-31%	29%	-19%	68%	69%	-42%	20%	5%	214%	15%	12%	-12%	-18%	-57%	-48%	0%	0%	0%	0%	0%	0%	14%
SH2	14%	0%	-10%	-10%	7%	5%	-30%	7%	20%	-9%	10%	-82%	-70%	-74%	-18%	-53%	-78%	66%	-49%	4%	-41%	-40%	-46%	-40%	-93%	-92%	0%	0%	0%	0%	0%	0%	-4%
SH59	-1%	-45%	1%	1%	4%	9%	-9%	23%	-20%	18%	-52%	-49%	-3%	-40%	77%	26%	-57%	-8%	-13%	130%	-17%	-28%	-38%	-29%	-68%	-61%	0%	0%	0%	0%	0%	0%	3%
SH1	-1%	-46%	0%	0%	-3%	12%	-11%	7%	-13%	21%	23%	-74%	-59%	-62%	13%	-33%	-68%	128%	-30%	136%	-25%	-30%	-39%	-28%	-88%	-88%	0%	0%	0%	0%	0%	0%	-3%
Johnsonville	-40%	17%	5%	-6%	0%	128%	84%	-15%	31%	-36%	-72%	-69%	-41%	-64%	-14%	-21%	-75%	-45%	-53%	51%	-48%	-50%	-62%	-43%	-82%	-77%	0%	0%	0%	0%	0%	0%	-3%
Uhnorth	9%	18%	-13%	-19%	2%	2%	-17%	-6%	5%	-18%	-5%	-83%	-72%	-76%	-25%	-54%	-79%	61%	-53%	-5%	-51%	-46%	-52%	-50%	-93%	-93%	0%	0%	0%	0%	0%	0%	-7%
Uhsouth	17%	-73%	-10%	-15%	7%	-23%	13%	-1%	11%	-15%	-1%	-82%	-71%	-69%	-20%	-50%	-60%	68%	-50%	78%	-48%	-9%	12%	16%	-93%	-90%	0%	0%	0%	0%	0%	0%	-7%
Tawa	52%	-36%	6%	-4%	-22%	19%	-4%	20%	36%	61%	-24%	-21%	51%	-10%	140%	90%	-34%	33%	17%	243%	29%	23%	-6%	-24%	-51%	-38%	0%	0%	0%	0%	0%	0%	12%
Newlands	26%	-22%	2%	2%	28%	57%	32%	-15%	50%	31%	-38%	-37%	22%	-28%	56%	54%	-47%	7%	-5%	182%	5%	1%	-22%	-27%	-61%	-51%	0%	0%	0%	0%	0%	0%	22%
HuttCentral	5%	-84%	15%	-53%	-14%	-65%	-73%	9%	3%	71%	52%	63%	50%	-26%	-54%	96%	-36%	76%	57%	-14%	139%	11%	42%	-14%	-42%	-40%	0%	0%	0%	0%	0%	0%	15%
PetoneWest	6%	-81%	6%	-38%	-8%	-58%	-66%	11%	14%	83%	48%	176%	11%	25%	-21%	35%	-9%	-7%	-9%	-40%	-46%	-46%	-56%	-69%	6%	34%	0%	0%	0%	0%	0%	0%	10%
PetoneEast	-28%	-66%	-26%	-13%	-40%	-33%	-44%	-28%	-27%	83%	112%	8%	9%	89%	-15%	81%	34%	54%	52%	-9%	26%	2%	68%	-39%	31%	57%	0%	0%	0%	0%	0%	0%	30%
Alicetown	-16%	-25%	-16%	104%	-32%	53%	23%	-15%	-16%	52%	-2%	8%	5%	-31%	-8%	16%	-39%	-4%	-10%	-29%	-28%	-16%	-27%	-42%	-37%	-33%	0%	0%	0%	0%	0%	0%	-2%
Wainuiomata	-29%	-96%	-27%	-87%	-42%	-90%	-88%	-31%	-33%	-30%	6%	-14%	-6%	0%	-52%	-32%	5%	17%	-57%	-27%	-38%	0%	-47%	-76%	-42%	-32%	0%	0%	0%	0%	0%	0%	-14%
EasternHills	17%	-52%	40%	27%	8%	-3%	-21%	66%	16%	37%	32%	63%	26%	-25%	-2%	73%	-30%	70%	-11%	62%	-17%	-41%	-46%	-52%	-40%	-36%	0%	0%	0%	0%	0%	0%	9%
Woburn	73%	-82%	76%	-33%	43%	-57%	-63%	70%	69%	84%	30%	31%	29%	-32%	-23%	-13%	-41%	10%	17%	-41%	104%	-23%	27%	-9%	-47%	-43%	0%	0%	0%	0%	0%	0%	7%
Waiwhetu	51%	-91%	54%	-70%	28%	-78%	-68%	50%	51%	10%	89%	52%	50%	42%	-16%	13%	-1%	30%	1%	-12%	20%	4%	38%	-48%	-28%	-9%	0%	0%	0%	0%	0%	0%	14%
Waterloo	23%	40%	65%	233%	0%	158%	26%	20%	16%	145%	43%	126%	27%	103%	33%	35%	94%	47%	4%	-26%	54%	87%	19%	-45%	68%	83%	0%	0%	0%	0%	0%	0%	53%
Epuni	-34%	-49%	-32%	39%	-46%	11%	-10%	-36%	-35%	89%	25%	80%	34%	21%	-37%	68%	0%	26%	21%	5%	54%	-36%	-7%	-19%	-24%	-12%	0%	0%	0%	0%	0%	0%	18%
Naenae	-75%	-22%	206%	221%	-79%	47%	55%	-74%	-76%	-13%	-54%	19%	-50%	25%	102%	-53%	24%	-31%	-10%	-7%	37%	64%	74%	-4%	-20%	13%	0%	0%	0%	0%	0%	0%	8%
Boulcott	2%	4%	14%	138%	-15%	92%	55%	2%	1%	109%	98%	180%	129%	-3%	7%	123%	-13%	42%	35%	30%	59%	-40%	-26%	-43%	-32%	-27%	0%	0%	0%	0%	0%	0%	39%
Avalon	-4%	-64%	-16%	-13%	-20%	-29%	24%	-4%	-8%	1%	-14%	-58%	-65%	110%	-29%	-40%	17%	43%	-29%	8%	-50%	-6%	21%	6%	-68%	-30%	0%	0%	0%	0%	0%	0%	-4%
Taita	-36%	-70%	-7%	-10%	-44%	-17%	55%	-32%	-37%	-15%	-34%	-3%	-72%	-11%	-29%	16%	36%	-5%	1%	39%	-42%	12%	14%	-2%	18%	29%	0%	0%	0%	0%	0%	0%	-1%
StockeValley	-52%	-77%	-33%	-30%	-48%	-39%	2%	-23%	-52%	-41%	-39%	-22%	-50%	-46%	30%	-24%	-16%	-30%	-35%	-3%	-59%	-14%	-41%	14%	-35%	-24%	0%	0%	0%	0%	0%	0%	-17%
Eastbourne	-26%	-97%	-24%	-89%	-39%	-92%	-94%	-26%	-27%	-43%	46%	-8%	-7%	13%	-52%	-43%	-42%	-55%	-42%	-75%	-33%	-60%	-15%	-80%	-1%	-26%	0%	0%	0%	0%	0%	0%	-19%
Seaview	20%	-93%	21%	-76%	-2%	-83%	-82%	19%	19%	28%	134%	46%	89%	68%	-6%	25%	9%	53%	42%	7%	54%	35%	123%	-21%	-7%	12%	0%	0%	0%	0%	0%	0%	26%
PnR a	0%	46%	0%	0%	0%	23%	-31%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	18%
PnR b	0%	-72%	0%	0%	0%	-24%	7%	0%	0%	141%	57%	189%	56%	38%	-39%	19%	79%	-6%	7%	-57%	-2%	-35%	39%	-56%	1%	48%	0%	0%	0%	0%	0%	0%	-3%
PnR c	0%	0%	0%	0%	0%	0%	0%	0%	0%	229%	276%	9%	25%	37%	88%	10%	1%	73%	41%	79%	95%	89%	63%	6%	-3%	7%	0%	0%	0%	0%	0%	0%	64%
PnR d	0%	0%	0%	0%	0%	0%	0%	0%	0%	-80%	0%	0%	0%	0%	-100%	0%	0%	-12%	181%	18%	-34%	38%	80%	-1%	0%	0%	0%	0%	0%	0%	0%	0%	27%
PnR e	0%	0%	-1%	0%	0%	0%	0%	-17%	-13%	-3%	121%	315%	16%	-20%	55%	-38%	-21%	40%	-30%	19%	20%	-17%	-35%	44%	-40%	-21%	0%	0%	0%	0%	0%	0%	29%
PnR f	0%	0%	81%	71%	0%	0%	0%	53%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	53%
Total	1%	-24%	6%	5%	1%	-5%	-6%	15%	22%	37%	16%	57%	1%	4%	-4%	34%	-10%	28%	7%	7%	28%	-3%	8%	-15%	-20%	-17%	0%	0%	0%	0%	0%	0%	6%

Table 10: Sector demand comparison (percentage) – PM

4. Calibration and Validation Results

4.1 Calibration criteria

This section presents the link results of the light vehicles for the hybrid layer compared against all the criteria listed in the sub-sections below. Generally only light vehicle comparisons have been carried out to show how the updated results compare to the previous calibration presented in TN4.

Figure 18 shows the seven screenlines compared for the model.
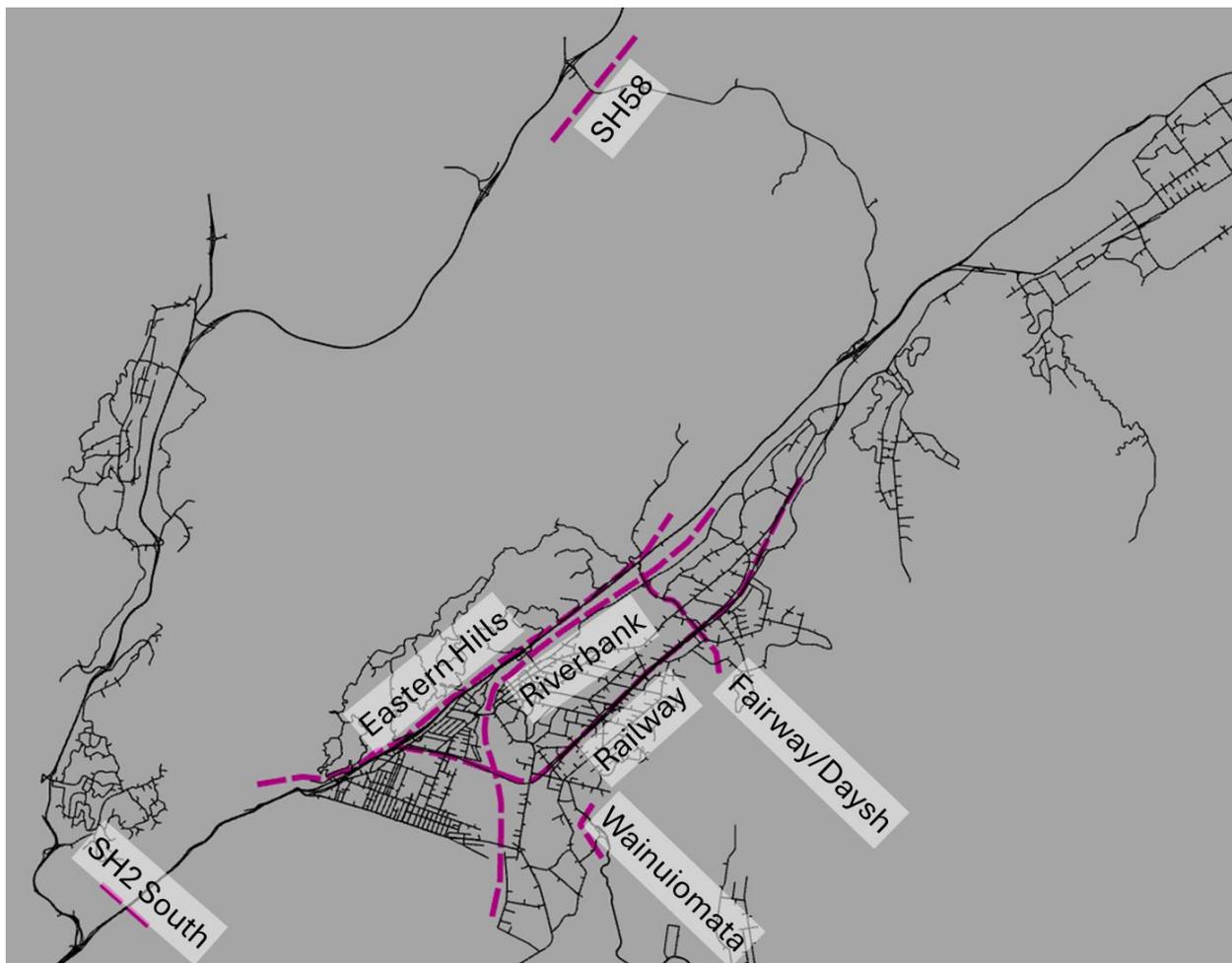
Figure 18: Screenlines used for comparisons

4.1.1   GEH and count band comparison

These criteria compare the observed and modelled count data at a section and screenline level by way of the GEH statistic. The GEH statistic is a form of Chi-squared statistic that can be used to compare observed and modelled counts. It is a useful for these comparisons because it is tolerant of relative and absolute errors, eg larger percentage differences on lower counts and larger absolute differences on higher counts. The GEH formula is given below

$$GEH = \sqrt{\frac{(m-o)^2}{\frac{(m+o)}{2}}}$$

Where m is the modelled count and o is the observed count.

Figure 19 shows the screenline and count calibration criteria as per the TMDG. HAM is targeting a Category C level of calibration for both Static and Hybrid scenarios. For the Hybrid scenarios, the modelled data presented is the average of SRC replications with different simulation seed values.

COUNT COMPARISON	PURPOSE CATEGORY						
	A: REGIONAL	B: STRATEGIC NETWORK	C: URBAN AREA	D: NZ TRANSPORT AGENCY PROJECT	E: SMALL AREA /CORRIDOR	F: INTERSECTION / SHORT CORRIDOR	G: HIGH FLOW, SPEED, MULTI LANE
TOTAL DIRECTIONAL COUNT ACROSS SCREENLINE:							
GEH<5.0 (% OF SCREENLINES)	>60%	>75%	>85%	>90%	NA	NA	NA
GEH<7.5 (% OF SCREENLINES)	>75%	>85%	>90%	>95%	NA	NA	NA
GEH<10.0 (% OF SCREENLINES)	>90%	>95%	>95%	100%	NA	NA	NA
INDIVIDUAL DIRECTIONAL LINK COUNT ON SCREENLINES:							
GEH<5.0 (% OF COUNTS)	>65%	>80%	>85%	>87.5%	NA	NA	>90%
GEH<7.5 (% OF COUNTS)	>75%	>85%	>90%	>92.5%	NA	NA	>95%
GEH<10.0 (% OF COUNTS)	>85%	>90%	>95%	>97.5%	NA	NA	100%
GEH<12.0 (% OF COUNTS)	>95%	>95%	100%	100%	NA	NA	100%
INDIVIDUAL TURNING MOVEMENTS AND / OR DIRECTIONAL LINK COUNTS:							
GEH<5.0 (% OF TURNS)	NA	>75%	>80%	>82.5%	>85%	>95%	>85%
GEH<7.5 (% OF TURNS)	NA	>80%	>85%	>87.5%	>90%	100%	>90%
GEH<10.0 (% OF TURNS)	NA	>85%	>90%	>92.5%	>95%	100%	>95%

Figure 19: TMDG – Hourly GEH count comparison criteria

4.1.2 XY scatter plots

This criteria presents the observed vs modelled count scatter plots and associated R-Squared statistical results. These scatter plots compare all counts from the model and give an indication of how well the model fits the count dataset. The R Squared value and line of best fit are also compared to the TMDG criteria to give an indication of how well the trend line compares to the input count data; the closer these statistics are to 1, the better the match of the data compared.

Figure 20 lists the TMDG criteria for the R-Squared and line of best fit comparisons.

STATISTIC	PURPOSE CATEGORY						
	A: REGIONAL	B: STRATEGIC NETWORK	C: URBAN AREA	D: NZ TRANSPORT AGENCY PROJECT	E: SMALL AREA /CORRIDOR	F: INTERSECTION / SHORT CORRIDOR	G: HIGH FLOW, SPEED, MULTI LANE
R SQUARED VALUE	>0.85	>0.9	>0.95	>0.95	>0.95	>0.95	>0.95
LINE OF BEST FIT	y=0.9x - 1.1x	y=0.9x - 1.1x	y=0.9x - 1.1x	y=0.925x - 1.075x	y=0.95x - 1.05x	y=0.97x - 1.03x	y=0.97x - 1.03x

Figure 20: TMDG – Observed vs modelled count comparison XY scatter criteria

4.1.3 RMSE

This criteria presents the root mean square error (RMSE) comparisons for the model against the count data. RMSE is a measure of the predictive success of the model and is a commonly referenced as providing an indication of the error of a model. The percentage RMSE is defined as:

$$\%RMSE = \sqrt{\frac{\sum(m-o)^2}{(N-1)}}\bigg/\sum\frac{o}{N}$$

Where m is the modelled count, o is the observed count and N is the number of datapoints

Figure 21 shows the TMDG criteria for RMSE of different tiers.

STATISTIC	PURPOSE CATEGORY						
	A: REGIONAL	B: STRATEGIC NETWORK	C: URBAN AREA	D: NZ TRANSPORT AGENCY PROJECT	E: SMALL AREA /CORRIDOR	F: INTERSECTION / SHORT CORRIDOR	G: HIGH FLOW, SPEED, MULTI LANE
RMSE							
ACCEPTABLE	<30%	<25%	<20%	<17.5%	<15%	NA	NA
REQUIRES CLARIFICATION	30-40%	25-35%	20-30%	17.5-27.5%	15-25%	NA	NA
UNLIKELY TO BE APPROPRIATE	>40%	>35%	>30%	>27.5%	>25%	NA	NA

Figure 21: TMDG – Observed vs modelled count comparison RMSE criteria

4.2   Link calibration results

4.2.1   Hybrid layer link results

This section includes the comparisons of:

- GEHs of link counts for light vehicles of the total 4-hour period and the middle 2-hour peak (Table 11-Table 16)
- Count bands of link counts for light vehicles of the total 4-hour period and the middle 2-hour peak are shown in Appendix
- GEH plots of all link counts (including across screenlines and individual ones) of light vehicles for the middle 2-hour peak
    - Full model extent (Figure 22, Figure 25 and Figure 28)
    - The Hutt CBD area (Figure 23, Figure 26 and Figure 29)
    - The Petone area (Figure 24, Figure 27 and Figure 30)
- GEHs of link counts for heavy vehicles of the total 4-hour period and the middle 2-hour peak (Table 17-Table 22)
- GEHs of the middle 2-hour peak counts for the screenlines (Table 23-Table 28)

Most of the counts have met the TMDG targets, and the brief comments are provided below each figure to point out the areas that have not meet the targets. In general, vast majority of GEHs in the latest model have been improved significantly for each period, especially for individual counts. Although it is still hard to meet the target for GEH less than 5 for some time periods, the improvement can still be seen noticeably. Some of the 4-hour periods are able to meet the targets for all GEH targets.

During the re-calibration and validation process, although the count data has been well cleaned and filter, Park and Ride demands and profiles have been checked through and corrected, the latest results are still not perfect. It is important to still be aware that, for the criteria that the model struggle to meet, several factors contribute to the model's challenges in meeting certain calibration and validation criteria:

- Data from Multiple Sources with Varying Confidence Levels
    - The observed data come from various sources, including tube counts from city councils, survey data from Teams Traffic, and TMS counts from NZTA. Each source has different levels of accuracy and confidence and combining them introduces inconsistencies that affect the model's ability to match them closely.
- Data Collected at Different Times and Seasons
    - Traffic data were gathered during different periods and seasons, meaning some counts reflect summer conditions while others represent winter or off-peak traffic. Since the model typically represents a "typical" day or period, aligning it perfectly with all observed datasets is challenging.

The green cells in the tables below indicate the results have achieved the TMDG targets, and the red cells have not passed the target. However, the light red cells mean they are very close to the target (i.e. 5% below the target).

Table 11: GEH comparisons for link counts of light vehicles in hybrid layer – AM – Previous HAM

Measure	Criteria	Target	AM 4hour 0700-0900	AM Hour 2 0700-0800	AM Hour 3 0800-0900
Total Directional Count Across Screenline	GEH<5	85%	100%	64%	93%
	GEH<7.5	90%	100%	100%	100%
	GEH<10	95%	100%	100%	100%
Individual Link Count on Screenlines	GEH<5	85%	82%	82%	79%
	GEH<7.5	90%	98%	95%	88%
	GEH<10	95%	98%	96%	98%
	GEH<12	100%	100%	98%	100%
Individual Link Counts	GEH<5	80%	73%	62%	59%
	GEH<7.5	85%	88%	80%	76%
	GEH<10	90%	97%	89%	88%

Table 12: GEH comparisons for link counts of light vehicles in hybrid layer – AM – Latest HAM

Measure	Criteria	Target	AM 4hour 0700-0900	AM Hour 2 0700-0800	AM Hour 3 0800-0900
Total Directional Count Across Screenline	GEH<5	85%	93%	57%	79%
	GEH<7.5	90%	100%	71%	100%
	GEH<10	95%	100%	100%	100%
Individual Link Count on Screenlines	GEH<5	85%	91%	68%	82%
	GEH<7.5	90%	96%	91%	95%
	GEH<10	95%	98%	98%	98%
	GEH<12	100%	98%	100%	98%
Individual Link Counts	GEH<5	80%	86%	69%	74%
	GEH<7.5	85%	96%	89%	88%
	GEH<10	90%	99%	97%	94%

The latest HAM for AM has significant improvements for individual counts comparing to the previous HAM, although it has also compromised the screenline counts slightly. The latest model still has had difficulties of meeting criteria for GEH less than 5, but it has passed the target for the 4 hour period and for GEH between 7.5 and 10.
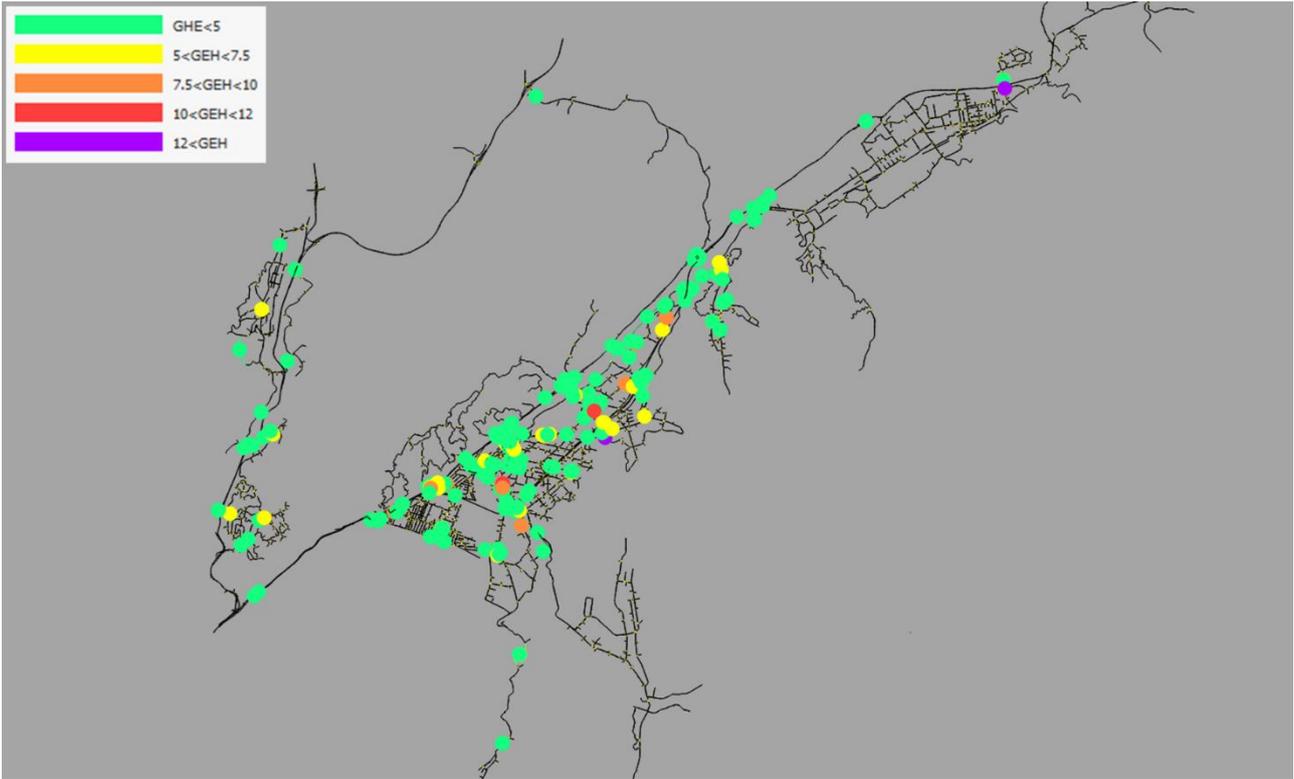
Figure 22: GEH plot of all link counts of light vehicles from 7 am to 9 am in hybrid layer – full model extent – AM

Figure 23: GEH plot of all link counts of light vehicles from 7 am to 9 am in hybrid layer – Hutt CBD – AM

The GEH values in the Hutt Central generally indicate a strong alignment between observed and modelled counts. However, a few of them are between GEH of 5 and 7.5 which are very close to the target.
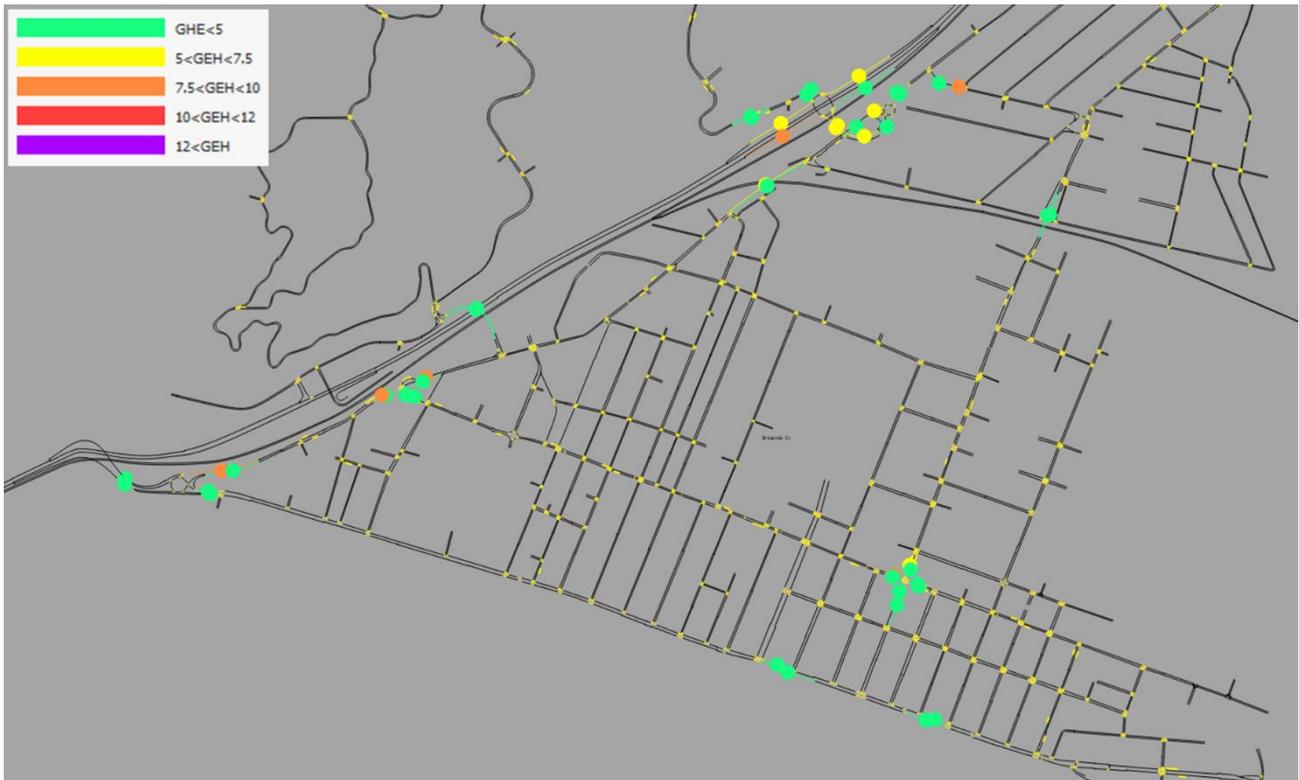
Figure 24: GEH plot of all link counts of light vehicles from 7 am to 9 pm in hybrid layer – Petone – AM

The traffic counts along the Esplanade, including the Petone interchange, most of Jackson Street and Cuba Street generally align well with observed data. However, there is a slight overestimation on Hutt Road in the northbound direction and ramps of the Dowse interchange (except the northbound off-ramp is being low). The on-ramp of the Dowse interchange has relatively high volumes, which may have impacts on the option testing for the P2G/CVL project.

Table 13: GEH comparisons for link counts of light vehicles in hybrid layer – IP – Previous HAM

Measure	Criteria	Target	IP 4hour 1100-1300	IP Hour 2 1100-1200	IP Hour 3 1200-1300
Total Directional Count Across Screenline	GEH<5	85%	100%	100%	100%
	GEH<7.5	90%	100%	100%	100%
	GEH<10	95%	100%	100%	100%
Individual Link Count on Screenlines	GEH<5	85%	95%	93%	91%
	GEH<7.5	90%	98%	100%	98%
	GEH<10	95%	100%	100%	100%
	GEH<12	100%	100%	100%	100%
Individual Link Counts	GEH<5	80%	76%	70%	70%
	GEH<7.5	85%	90%	85%	85%
	GEH<10	90%	95%	92%	92%

Table 14: GEH comparisons for link counts of light vehicles in hybrid layer – IP – Latest HAM

Measure	Criteria	Target	IP 4hour 1100-1300	IP Hour 2 1100-1200	IP Hour 3 1200-1300
Total Directional Count Across Screenline	GEH<5	85%	100%	100%	100%
	GEH<7.5	90%	100%	100%	100%
	GEH<10	95%	100%	100%	100%
Individual Link Count on Screenlines	GEH<5	85%	93%	91%	95%
	GEH<7.5	90%	98%	98%	98%
	GEH<10	95%	100%	100%	100%
	GEH<12	100%	100%	100%	100%
Individual Link Counts	GEH<5	80%	83%	83%	79%
	GEH<7.5	85%	98%	95%	95%
	GEH<10	90%	100%	97%	97%

All the criteria have been met during IP, except for the individual link counts for GEH less than 5 for Hour 3 which is almost there.
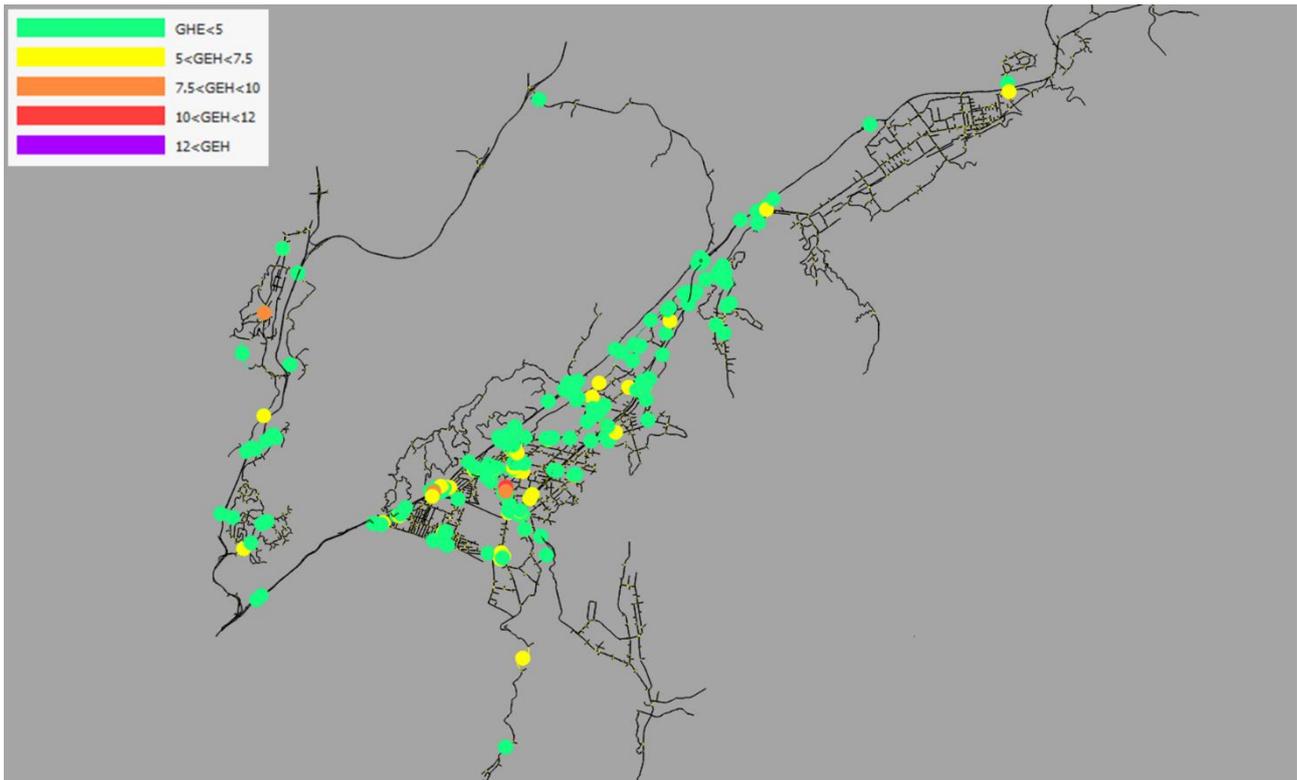
Figure 25: GEH plot of all link counts of light vehicles from 11 am to 1 pm in hybrid layer – full model extent – IP

Figure 26: GEH plot of all link counts of light vehicles from 11 am to 1 pm in hybrid layer – Hutt CBD – IP

Most of GEHs within the Hutt CBD are below 5. Some are between 5 and 7.5, especially along Knights Road and near the Melling Link/High Street roundabout. The modelled counts on Knights Road and the northbound/southbound direction are higher than the observed counts, but lower for the

eastbound/westbound direction on High Street. A couple of them are between 7.5 and 10, one on High Street and one on Laings Road.

Figure 27: GEH plot of all link counts of light vehicles from 11 am to 1 pm in hybrid layer – Petone – IP

The Esplanade shows very decent GEHs along the corridor. The modelled counts along some part of Jackson Street are still low but it has significantly improved from the previous HAM where Jackson St and the southbound direction of Hutt Rd lack considerable amount of volumes to match the observed counts. The highest GEH on Jackson Street in only up to 6.8 in the latest model. This improvement is made by mainly the addition of the local trips as well as the zone split/refinements in the area.

Table 15: GEH comparisons for link counts of light vehicles in hybrid layer – PM – Previous HAM

Measure	Criteria	Target	PM 4hour 0700-0900	PM Hour 2 1600-1700	PM Hour 3 1700-1800
Total Directional Count Across Screenline	GEH<5	85%	93%	86%	93%
	GEH<7.5	90%	100%	93%	93%
	GEH<10	95%	100%	100%	100%
Individual Link Count on Screenlines	GEH<5	85%	91%	79%	91%
	GEH<7.5	90%	98%	95%	100%
	GEH<10	95%	100%	98%	100%
	GEH<12	100%	100%	100%	100%
Individual Link Counts	GEH<5	80%	89%	73%	80%
	GEH<7.5	85%	97%	88%	92%
	GEH<10	90%	99%	94%	94%

Table 16: GEH comparisons for link counts of light vehicles in hybrid layer – PM – Latest HAM

Measure	Criteria	Target	PM 4hour 0700-0900	PM Hour 2 1600-1700	PM Hour 3 1700-1800
Total Directional Count Across Screenline	GEH<5	85%	93%	86%	86%
	GEH<7.5	90%	100%	100%	93%
	GEH<10	95%	100%	100%	93%
Individual Link Count on Screenlines	GEH<5	85%	88%	75%	89%
	GEH<7.5	90%	98%	95%	96%
	GEH<10	95%	100%	100%	100%
	GEH<12	100%	100%	100%	100%
Individual Link Counts	GEH<5	80%	85%	74%	77%
	GEH<7.5	85%	96%	90%	91%
	GEH<10	90%	99%	96%	95%

The latest and previous HAM for PM show very similar results, with some getting improved and others getting slightly compromised.
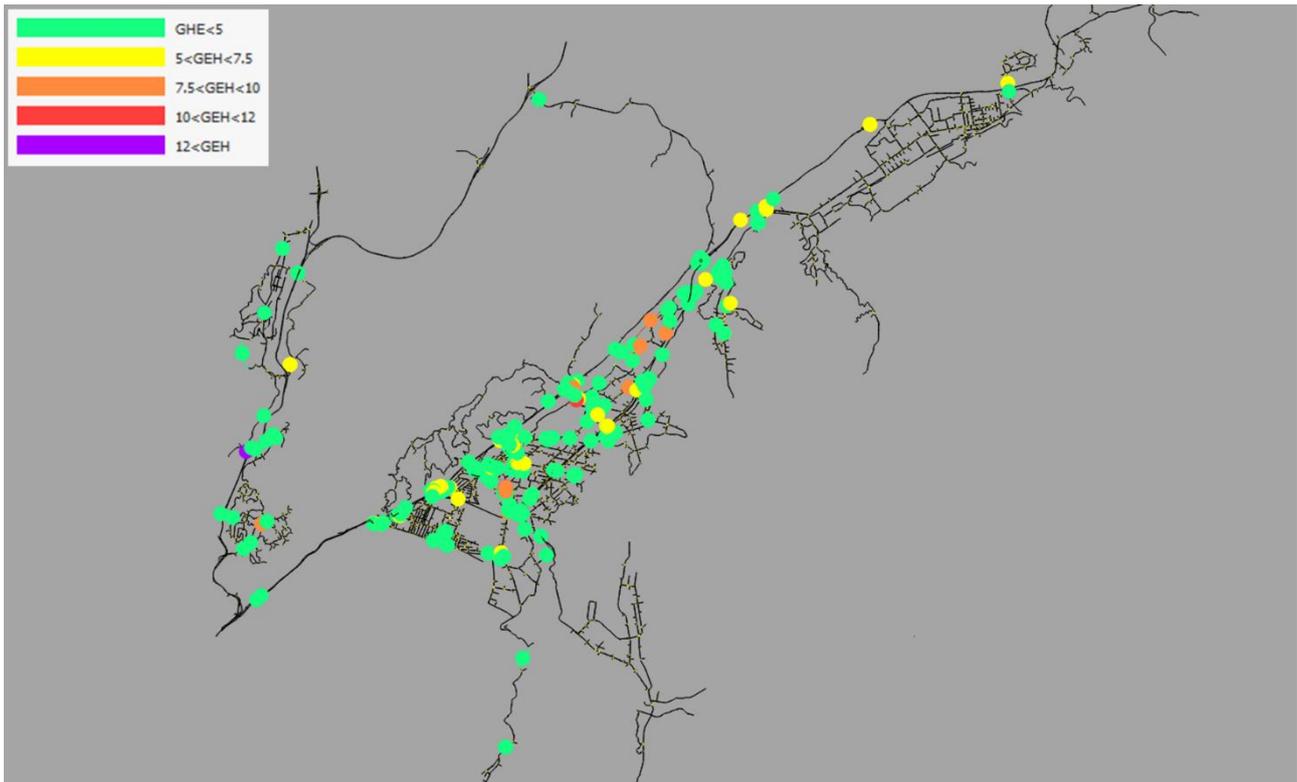
Figure 28: GEH plot of all link counts of light vehicles from 4 pm to 6 pm in hybrid layer – full model extent – PM

Figure 29: GEH plot of all link counts of light vehicles from 4 pm to 6 pm in hybrid layer – Hutt CBD – PM

The counts between the observed and modelled within the Hutt CBD are mostly aligned. All the links have GEHs lower than 7.5 in the area, except for Melling Link in the northbound direction being higher than what it should be.

Figure 30: GEH plot of all link counts of light vehicles from 4p pm to 6 pm in hybrid layer – Petone – PM

The Petone interchange and the adjacent main corridors, including The Esplanade, Hutt Rd and Jackson St, all have decent match between the observed and modelled counts.

Table 17: GEH comparisons for link counts of heavy vehicles in hybrid layer – AM – Previous HAM

Measure	Criteria	Target	AM 4hour 0700-0900	AM Hour 2 0700-0800	AM Hour 3 0800-0900
Total Directional Count Across Screenline	GEH<5	85%	64%	57%	71%
	GEH<7.5	90%	100%	71%	100%
	GEH<10	95%	100%	100%	100%
Individual Link Count on Screenlines	GEH<5	85%	88%	84%	92%
	GEH<7.5	90%	100%	98%	100%
	GEH<10	95%	100%	100%	100%
	GEH<12	100%	100%	100%	100%
Individual Link Counts	GEH<5	80%	88%	86%	84%
	GEH<7.5	85%	99%	96%	99%
	GEH<10	90%	99%	99%	100%

Table 18: GEH comparisons for link counts of heavy vehicles in hybrid layer – AM – Latest HAM

Measure	Criteria	Target	AM 4hour 0700-0900	AM Hour 2 0700-0800	AM Hour 3 0800-0900
Total Directional Count Across Screenline	GEH<5	85%	71%	57%	71%
	GEH<7.5	90%	93%	71%	100%
	GEH<10	95%	100%	93%	100%
Individual Link Count on Screenlines	GEH<5	85%	84%	80%	86%
	GEH<7.5	90%	100%	96%	100%
	GEH<10	95%	100%	100%	100%
	GEH<12	100%	100%	100%	100%
Individual Link Counts	GEH<5	80%	88%	82%	85%
	GEH<7.5	85%	98%	94%	96%
	GEH<10	90%	100%	97%	98%

Most of the criteria have still been met, although some screenline counts have been compromised.

Table 19: GEH comparisons for link counts of heavy vehicles in hybrid layer – IP – Previous HAM

Measure	Criteria	Target	IP 4hour 1100-1300	IP Hour 2 1100-1200	IP Hour 3 1200-1300
Total Directional Count Across Screenline	GEH<5	85%	79%	79%	86%
	GEH<7.5	90%	100%	100%	100%
	GEH<10	95%	100%	100%	100%
Individual Link Count on Screenlines	GEH<5	85%	96%	96%	94%
	GEH<7.5	90%	100%	100%	100%
	GEH<10	95%	100%	100%	100%
	GEH<12	100%	100%	100%	100%
Individual Link Counts	GEH<5	80%	89%	91%	90%
	GEH<7.5	85%	99%	99%	99%
	GEH<10	90%	100%	100%	100%

Table 20: GEH comparisons for link counts of heavy vehicles in hybrid layer – IP – Latest HAM

Measure	Criteria	Target	IP 4hour 1100-1300	IP Hour 2 1100-1200	IP Hour 3 1200-1300
Total Directional Count Across Screenline	GEH<5	85%	79%	79%	79%
	GEH<7.5	90%	100%	100%	100%
	GEH<10	95%	100%	100%	100%
Individual Link Count on Screenlines	GEH<5	85%	95%	95%	93%
	GEH<7.5	90%	100%	100%	98%
	GEH<10	95%	100%	100%	100%
	GEH<12	100%	100%	100%	100%
Individual Link Counts	GEH<5	80%	90%	87%	88%
	GEH<7.5	85%	100%	97%	97%
	GEH<10	90%	100%	98%	98%

The latest and previous HAM show very similar results, although the total directional count acress screenline for Hour 3 is slightly compromised.

Table 21: GEH comparisons for link counts of heavy vehicles in hybrid layer – PM – Previous HAM

Measure	Criteria	Target	PM 4hour 0700-0900	PM Hour 2 1600-1700	PM Hour 3 1700-1800
Total Directional Count Across Screenline	GEH<5	85%	79%	50%	50%
	GEH<7.5	90%	100%	100%	100%
	GEH<10	95%	100%	100%	100%
Individual Link Count on Screenlines	GEH<5	85%	96%	92%	94%
	GEH<7.5	90%	100%	96%	100%
	GEH<10	95%	100%	100%	100%
	GEH<12	100%	100%	100%	100%
Individual Link Counts	GEH<5	80%	95%	93%	92%
	GEH<7.5	85%	100%	99%	100%
	GEH<10	90%	100%	100%	100%

Table 22: GEH comparisons for link counts of heavy vehicles in hybrid layer – PM – Latest HAM

Measure	Criteria	Target	PM 4hour 0700-0900	PM Hour 2 1600-1700	PM Hour 3 1700-1800
Total Directional Count Across Screenline	GEH<5	85%	93%	71%	71%
	GEH<7.5	90%	100%	100%	100%
	GEH<10	95%	100%	100%	100%
Individual Link Count on Screenlines	GEH<5	85%	88%	86%	91%
	GEH<7.5	90%	100%	96%	100%
	GEH<10	95%	100%	100%	100%
	GEH<12	100%	100%	100%	100%
Individual Link Counts	GEH<5	80%	95%	91%	91%
	GEH<7.5	85%	100%	97%	97%
	GEH<10	90%	100%	98%	98%

Most of the criteria have still been met, and the overall results of the latest HAM have noticeable improvements comparing to the latest HAM.

Table 23: GEH comparisons of link counts across screenlines for light vehicles in hybrid layer – AM – Previous HAM

Screenlines	Direction	AM Hour 2 0700-0800					AM Hour 3 0800-0900				
		Obs	Mod	Diff	% Diff	GEH	Obs	Mod	Diff	% Diff	GEH
Eastern Hills	EB	1861	1875	14	1%	0.33	2091	1841	-250	-12%	5.63
	WB	560	725	165	30%	6.53	1004	855	-149	-15%	4.90
	Total	2420	2600	180	7%	3.59	3095	2696	-399	-13%	7.41
Railway	NB	3581	3936	355	10%	5.78	4773	4496	-277	-6%	4.07
	SB	2872	3042	170	6%	3.12	3940	3703	-237	-6%	3.83
	Total	6454	6978	524	8%	6.40	8713	8199	-514	-6%	5.59
Riverbank	EB	3931	3926	-5	0%	0.07	4656	4361	-295	-6%	4.39
	WB	4047	4045	-2	0%	0.03	4065	4109	44	1%	0.69
	Total	7978	7971	-7	0%	0.07	8721	8470	-251	-3%	2.70
Fairway/Daysh	NB	1247	1431	184	15%	5.03	1809	1838	29	2%	0.68
	SB	2648	2377	-271	-10%	5.41	3095	3141	46	1%	0.82
	Total	3895	3808	-87	-2%	1.40	4904	4979	75	2%	1.06
Wainuiomata	NB	466	539	73	16%	3.26	654	575	-79	-12%	3.20
	SB	1852	1673	-179	-10%	4.27	1575	1582	7	0%	0.18
	Total	2318	2212	-106	-5%	2.24	2229	2157	-72	-3%	1.54
SH2 South	NB	2673	2410	-263	-10%	5.22	2592	2408	-184	-7%	3.69
	SB	3302	3218	-84	-3%	1.48	2983	3057	74	2%	1.35
	Total	5975	5628	-347	-6%	4.56	5575	5465	-110	-2%	1.48
SH58	NB	1145	1097	-48	-4%	1.44	875	861	-14	-2%	0.46
	SB	820	741	-79	-10%	2.83	757	791	34	5%	1.23
	Total	1965	1838	-127	-6%	2.92	1632	1652	21	1%	0.51

Table 24: GEH comparisons of link counts across screenlines for light vehicles in hybrid layer – AM – Latest HAM

Screenlines	Direction	AM Hour 2 0700-0800					AM Hour 3 0800-0900				
		Obs	Mod	Diff	% Diff	GEH	Obs	Mod	Diff	% Diff	GEH
Eastern Hills	EB	1861	1885	24	1%	0.56	2091	1864	-227	-11%	5.10
	WB	560	801	241	43%	9.25	1004	888	-116	-12%	3.78
	Total	2420	2686	266	11%	5.26	3095	2752	-343	-11%	6.34
Railway	NB	3581	3814	233	6%	3.82	4773	4860	87	2%	1.25
	SB	2872	3366	494	17%	8.84	3940	4204	264	7%	4.14
	Total	6454	7180	726	11%	8.80	8713	9064	351	4%	3.72
Riverbank	EB	3931	3808	-123	-3%	1.97	4656	4278	-378	-8%	5.65
	WB	4047	3812	-235	-6%	3.75	4065	4420	355	9%	5.45
	Total	7978	7620	-358	-4%	4.05	8721	8698	-23	0%	0.24
Fairway/Daysh	NB	1269	1439	170	13%	4.63	1854	1767	-87	-5%	2.05
	SB	2628	2440	-188	-7%	3.74	3069	3138	69	2%	1.24
	Total	3897	3879	-18	0%	0.29	4923	4905	-18	0%	0.26
Wainuiomata	NB	466	543	77	17%	3.43	654	610	-44	-7%	1.76
	SB	1852	1524	-328	-18%	7.99	1575	1686	111	7%	2.76
	Total	2318	2067	-251	-11%	5.37	2229	2296	67	3%	1.41
SH2 South	NB	2673	2415	-258	-10%	5.12	2592	2523	-69	-3%	1.37
	SB	3302	2825	-477	-14%	8.62	2983	3094	111	4%	2.02
	Total	5975	5240	-735	-12%	9.82	5575	5617	42	1%	0.56
SH58	NB	1145	973	-172	-15%	5.29	875	808	-67	-8%	2.30
	SB	820	695	-125	-15%	4.54	757	789	32	4%	1.16
	Total	1965	1668	-297	-15%	6.97	1632	1597	-35	-2%	0.86

Although the GEH of most of individual counts during AM has significantly improved, the screenline counts have compromised, especially during Hour 2. But the GEHs of screenline counts do not exceed 10.

Table 25: GEH comparisons of link counts across screenlines for light vehicles in hybrid layer – IP – Previous HAM

Screenlines	Direction	IP Hour 2 1000-1100					IP Hour 3 1100-1200				
		Obs	Mod	Diff	% Diff	GEH	Obs	Mod	Diff	% Diff	GEH
Eastern Hills	EB	763	829	66	9%	2.33	756	864	108	14%	3.80
	WB	690	751	61	9%	2.26	808	787	-21	-3%	0.74
	Total	1454	1580	126	9%	3.24	1564	1651	87	6%	2.17
Railway	NB	3132	3311	179	6%	3.15	3226	3366	140	4%	2.44
	SB	3310	3371	61	2%	1.05	3525	3454	-71	-2%	1.19
	Total	6442	6682	240	4%	2.96	6750	6820	70	1%	0.84
Riverbank	EB	3432	3507	75	2%	1.27	3571	3647	76	2%	1.27
	WB	3421	3540	119	3%	2.01	3445	3513	68	2%	1.15
	Total	6854	7047	193	3%	2.32	7016	7160	144	2%	1.71
Fairway/Daysh	NB	1377	1337	-40	-3%	1.09	1491	1305	-186	-12%	4.97
	SB	1593	1604	11	1%	0.28	1584	1528	-56	-4%	1.43
	Total	2970	2941	-29	-1%	0.53	3075	2833	-242	-8%	4.46
Wainuiomata	NB	608	677	69	11%	2.71	687	701	14	2%	0.53
	SB	646	701	55	9%	2.13	593	713	120	20%	4.71
	Total	1254	1378	124	10%	3.42	1280	1414	134	11%	3.66
SH2 South	NB	2044	2103	59	3%	1.29	2122	2201	79	4%	1.70
	SB	1998	2124	126	6%	2.78	2041	2213	172	8%	3.73
	Total	4042	4227	185	5%	2.87	4163	4414	251	6%	3.83
SH58	NB	425	407	-18	-4%	0.86	428	403	-25	-6%	1.22
	SB	419	399	-20	-5%	0.97	451	423	-28	-6%	1.34
	Total	843	806	-37	-4%	1.29	879	826	-53	-6%	1.81

Table 26: GEH comparisons of link counts across screenlines for light vehicles in hybrid layer – IP – Latest HAM

Screenlines	Direction	IP Hour 2 1000-1100					IP Hour 3 1100-1200				
		Obs	Mod	Diff	% Diff	GEH	Obs	Mod	Diff	% Diff	GEH
Eastern Hills	EB	763	811	48	6%	1.70	756	860	104	14%	3.66
	WB	690	768	78	11%	2.88	808	809	1	0%	0.04
	Total	1454	1579	125	9%	3.22	1564	1669	105	7%	2.61
Railway	NB	3132	3151	19	1%	0.34	3226	3222	-4	0%	0.07
	SB	3310	3339	29	1%	0.50	3525	3340	-185	-5%	3.15
	Total	6442	6490	48	1%	0.60	6750	6562	-188	-3%	2.31
Riverbank	EB	3432	3176	-256	-7%	4.46	3571	3285	-286	-8%	4.88
	WB	3421	3469	48	1%	0.81	3445	3506	61	2%	1.03
	Total	6854	6645	-209	-3%	2.54	7016	6791	-225	-3%	2.70
Fairway/Daysh	NB	1454	1507	53	4%	1.37	1551	1459	-92	-6%	2.38
	SB	1585	1610	25	2%	0.64	1587	1602	15	1%	0.36
	Total	3039	3117	78	3%	1.41	3139	3061	-78	-2%	1.40
Wainuiomata	NB	608	619	11	2%	0.43	687	619	-68	-10%	2.66
	SB	646	687	41	6%	1.60	593	710	117	20%	4.60
	Total	1254	1306	52	4%	1.46	1280	1329	49	4%	1.37
SH2 South	NB	2044	2041	-3	0%	0.07	2122	2062	-60	-3%	1.31
	SB	1998	1931	-67	-3%	1.51	2041	2000	-41	-2%	0.91
	Total	4042	3972	-70	-2%	1.11	4163	4062	-101	-2%	1.57
SH58	NB	425	416	-9	-2%	0.41	428	407	-21	-5%	1.02
	SB	419	397	-22	-5%	1.07	451	418	-33	-7%	1.58
	Total	843	813	-30	-4%	1.05	879	825	-54	-6%	1.84

The latest modelled counts for IP still maintains the GEHs below 5.

Table 27: GEH comparisons of link counts across screenlines for light vehicles in hybrid layer – PM – Previous HAM

Screenlines	Direction	PM Hour 2 1600-1700					PM Hour 3 1600-1700				
		Obs	Mod	Diff	% Diff	GEH	Obs	Mod	Diff	% Diff	GEH
Eastern Hills	EB	1030	1223	193	19%	5.75	1140	1474	334	29%	9.23
	WB	1635	1554	-81	-5%	2.04	1818	1667	-151	-8%	3.62
	Total	2665	2777	112	4%	2.14	2958	3141	183	6%	3.31
Railway	NB	4376	4326	-50	-1%	0.76	3968	4166	198	5%	3.10
	SB	4750	4938	188	4%	2.71	4449	4586	137	3%	2.04
	Total	9126	9264	138	2%	1.44	8417	8752	335	4%	3.62
Riverbank	EB	5028	4993	-35	-1%	0.49	4901	4924	23	0%	0.32
	WB	4696	4894	198	4%	2.86	4212	4324	112	3%	1.71
	Total	9724	9887	163	2%	1.65	9114	9248	134	1%	1.40
Fairway/Daysh	NB	2681	2572	-109	-4%	2.13	2475	2583	108	4%	2.16
	SB	2344	2362	18	1%	0.37	2162	2051	-111	-5%	2.42
	Total	5025	4934	-91	-2%	1.29	4637	4634	-3	0%	0.04
Wainuiomata	NB	1811	1681	-130	-7%	3.12	1639	1628	-11	-1%	0.26
	SB	828	737	-91	-11%	3.25	712	647	-65	-9%	2.49
	Total	2639	2418	-221	-8%	4.40	2351	2275	-76	-3%	1.57
SH2 South	NB	3287	3082	-205	-6%	3.63	2775	2922	147	5%	2.76
	SB	2910	2841	-69	-2%	1.28	2609	2465	-144	-6%	2.87
	Total	6197	5923	-274	-4%	3.52	5384	5387	3	0%	0.04
SH58	NB	923	810	-113	-12%	3.84	829	784	-45	-5%	1.58
	SB	1101	860	-241	-22%	7.70	906	847	-59	-7%	1.99
	Total	2024	1670	-354	-18%	8.24	1735	1631	-104	-6%	2.54

Table 28: GEH comparisons of link counts across screenlines for light vehicles in hybrid layer – PM – Latest HAM

Screenlines	Direction	PM Hour 2 1600-1700					PM Hour 3 1600-1700				
		Obs	Mod	Diff	% Diff	GEH	Obs	Mod	Diff	% Diff	GEH
Eastern Hills	EB	1089	1271	182	17%	5.29	1030	1242	212	21%	6.29
	WB	1392	1412	20	1%	0.54	1635	1612	-23	-1%	0.58
	Total	2481	2683	202	8%	3.98	2665	2854	189	7%	3.59
Railway	NB	3960	4099	139	4%	2.19	4376	4295	-81	-2%	1.23
	SB	4455	4559	104	2%	1.55	4750	4866	116	2%	1.68
	Total	8415	8658	243	3%	2.63	9126	9161	35	0%	0.37
Riverbank	EB	4616	4800	184	4%	2.68	5028	4988	-40	-1%	0.56
	WB	4368	4352	-16	0%	0.24	4696	4557	-139	-3%	2.04
	Total	8984	9152	168	2%	1.76	9724	9545	-179	-2%	1.82
Fairway/Daysh	NB	2384	2491	107	4%	2.17	2743	2698	-45	-2%	0.87
	SB	2107	2315	208	10%	4.43	2312	2328	16	1%	0.33
	Total	4491	4806	315	7%	4.62	5055	5026	-29	-1%	0.41
Wainuiomata	NB	1330	1461	131	10%	3.52	1811	1647	-164	-9%	3.95
	SB	715	659	-56	-8%	2.15	828	741	-87	-10%	3.10
	Total	2045	2120	75	4%	1.64	2639	2388	-251	-10%	5.01
SH2 South	NB	3060	3226	166	5%	2.96	3287	3121	-166	-5%	2.93
	SB	2380	2494	114	5%	2.30	2910	2703	-207	-7%	3.90
	Total	5440	5720	280	5%	3.74	6197	5824	-373	-6%	4.81
SH58	NB	689	727	38	5%	1.42	923	826	-97	-11%	3.29
	SB	756	853	97	13%	3.41	1101	905	-196	-18%	6.19
	Total	1446	1580	134	9%	3.45	2024	1731	-293	-14%	6.77

The latest GEHs have also improved significantly for PM as most are below 5, and the highest GEH is only 6.77 which is well below some GEHs in the previous model that are between 7.5 and 10.

4.2.2 Observed vs modelled count XY scatter plots

This section presents the observed vs modelled count scatter plots and associated R-Squared statistical results for the link counts of the light vehicles. Figure 31, Figure 32 and Figure 33 present the R-squared comparisons and the line of best fit results in hybrid level for each period, respectively, for the latest model.

Of all the periods, R-squared value is larger than 0.95 and the line of best fit is within the range of 0.9x-1.1x. They are all complied with the requirements stated in TMDG.
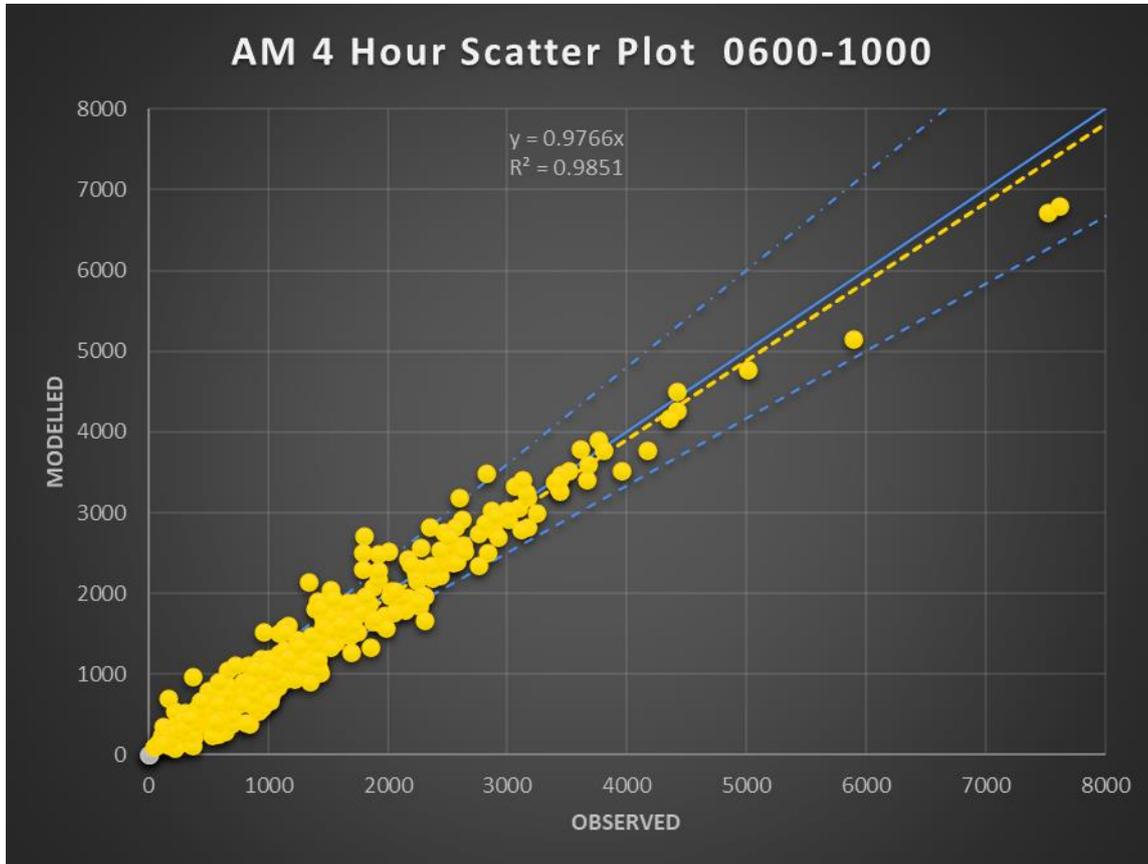
Figure 31: XY scatter plot for link counts of light vehicles in hybrid layer – AM – Latest HAM
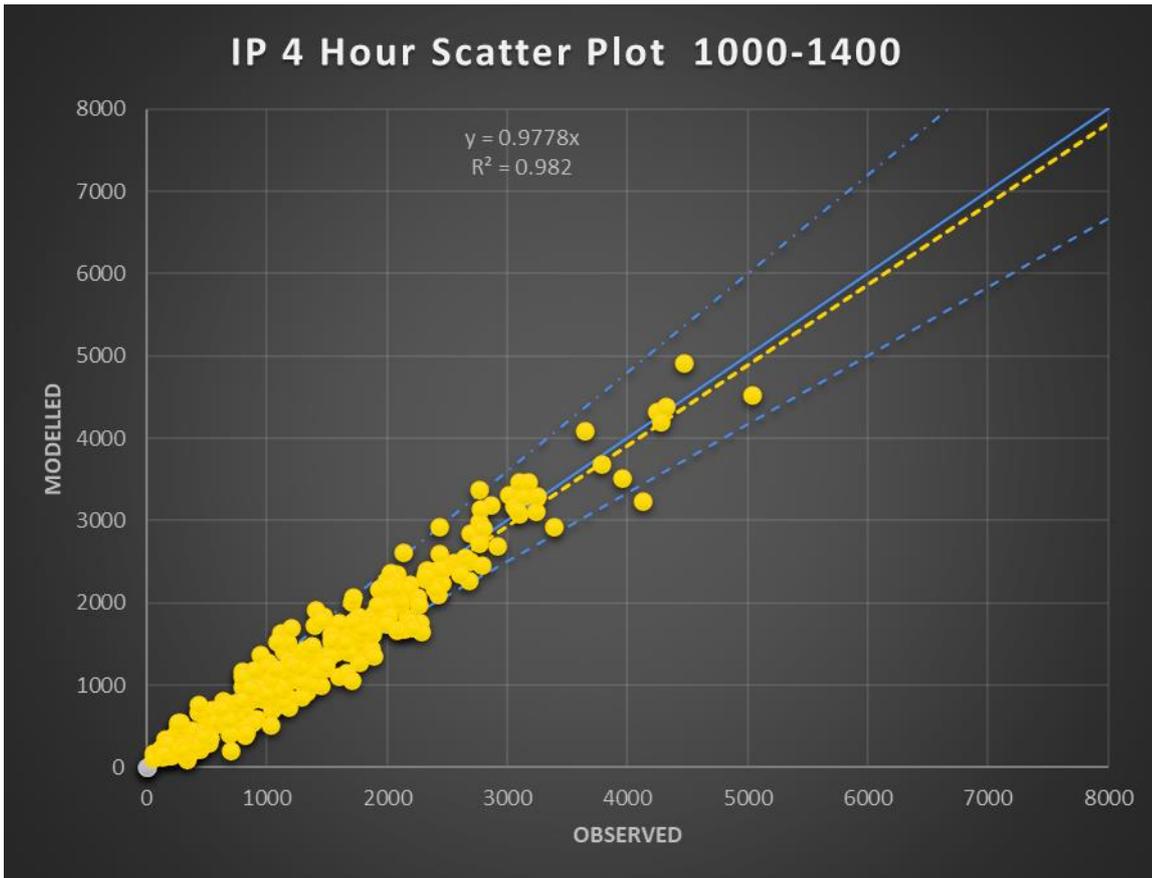
Figure 32: XY scatter plot for link counts of light vehicles in hybrid layer – IP – Latest HAM
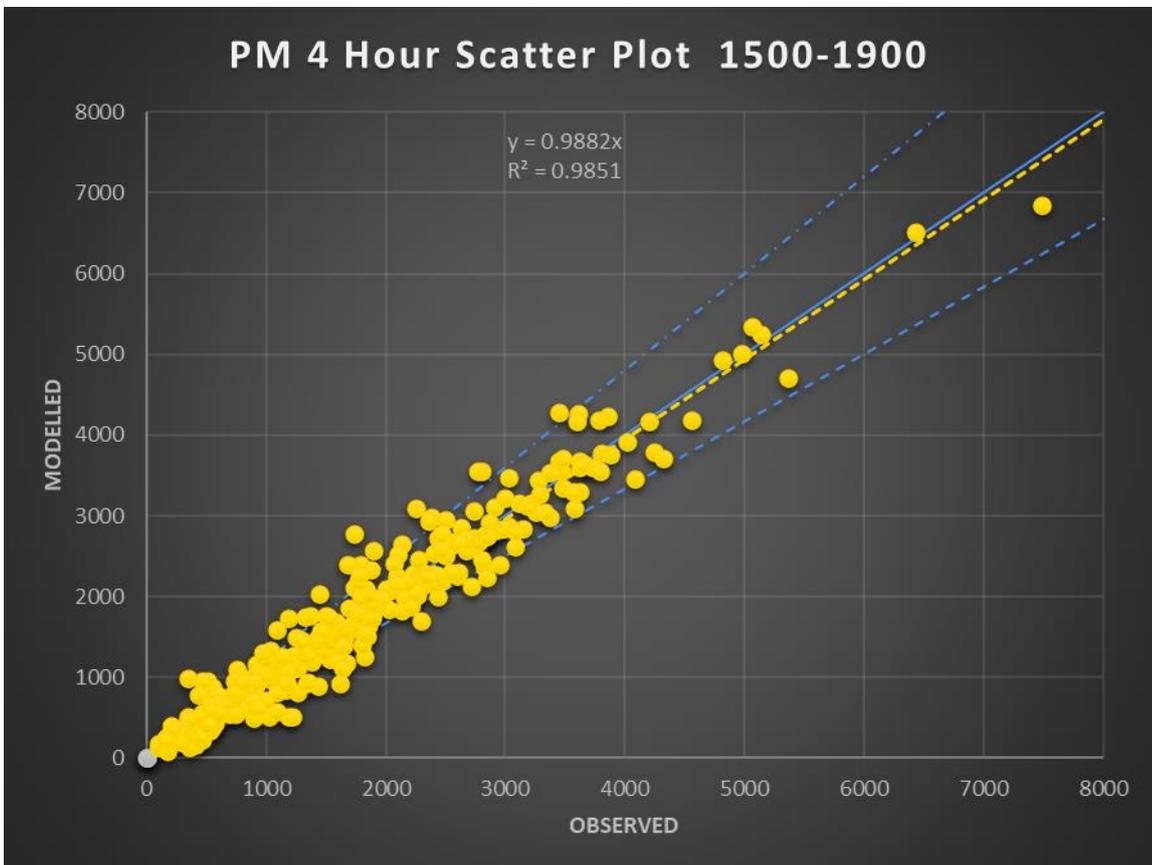
Figure 33: XY scatter plot for link counts of light vehicles in hybrid layer – PM – Latest HAM

4.2.3   Observed vs modelled root mean square error

Table 29 and Table 30 presents the RMSE of the counts in hybrid layer across the time periods, for the previous and latest HAM, respectively. Only PM are below (or near) 20% which is acceptable, and most of the other hours need clarification.

Table 29: RMSE of link counts for light vehicles in hybrid layer – Previous HAM

%RMSE	4hour	Hour 2	Hour 3
AM	24%	29%	29%
IP	26%	28%	27%
PM	18%	21%	19%

Table 30: RMSE of link counts for light vehicles in hybrid layer – Latest HAM

%RMSE	4hour	Hour 2	Hour 3
AM	16%	20%	18%
IP	17%	16%	17%
PM	15%	18%	18%

All the periods are below 20% which is acceptable, except Hour 2 for AM is at exactly 20%. Although 20% is within the range that needs clarification, it is considered acceptable as being very close to the target. The higher RMSE for Hour 2 compared to other hours is highly due to the compromised screenline counts. However, in overall, the latest model has significantly improved RMSE from needing clarification to being acceptable.

4.3   Turn count validation results

The turn count data set was not used in the matrix estimation process and can therefore be considered a somewhat independent data set. A caveat to this however is that some of the link counts have been derived from the turn counts; some of which have been used in the calibration process. The results outlined below should be interpreted in this context.

4.3.1   Hybrid layer turn results

This section includes the comparisons of:

- GEHs of turn counts for light vehicles of the total 4-hour period and the middle 2-hour peak (Table 31- Table 36)
- GEHs of turn counts for heavy vehicles of the total 4-hour period and the middle 2-hour peak (Table 37- Table 42)

Table 31: GEH comparisons for turn counts of light vehicles in hybrid layer – AM – Previous HAM

Measure	Criteria	Target	AM 4hour 0700-0900	AM Hour 2 0700-0800	AM Hour 3 0800-0900
Individual	GEH<5	80%	71%	68%	60%
Turn	GEH<7.5	85%	87%	83%	73%
Counts	GEH<10	90%	96%	94%	85%

Table 32: GEH comparisons for turn counts of light vehicles in hybrid layer – AM – Latest HAM

Measure	Criteria	Target	AM 4hour 0700-0900	AM Hour 2 0700-0800	AM Hour 3 0800-0900
Individual	GEH<5	80%	83%	76%	72%
Turn	GEH<7.5	85%	95%	92%	87%
Counts	GEH<10	90%	98%	98%	92%

GEHs from the latest HAM have met all the targets for the 4 hour period, and also have been improved in overall.

Table 33: GEH comparisons for turn counts of light vehicles in hybrid layer – IP – Previous HAM

Measure	Criteria	Target	IP 4hour 1100-1300	IP Hour 2 1100-1200	IP Hour 3 1200-1300
Individual	GEH<5	80%	62%	66%	59%
Turn	GEH<7.5	85%	82%	83%	79%
Counts	GEH<10	90%	93%	95%	89%

Table 34: GEH comparisons for turn counts of light vehicles in hybrid layer – IP – Latest HAM

Measure	Criteria	Target	IP 4hour 1100-1300	IP Hour 2 1100-1200	IP Hour 3 1200-1300
Individual	GEH<5	80%	76%	82%	79%
Turn	GEH<7.5	85%	93%	94%	94%
Counts	GEH<10	90%	98%	100%	99%

Targets have been met for GEH between 7.5 and 10 for the latest model for IP, as well as more counts have achieved GEH less than 5.

Table 35: GEH comparisons for turn counts of light vehicles in hybrid layer – PM – Previous HAM

Measure	Criteria	Target	PM 4hour 0700-0900	PM Hour 2 1600-1700	PM Hour 3 1700-1800
Individual	GEH<5	80%	82%	75%	64%
Turn	GEH<7.5	85%	89%	89%	78%
Counts	GEH<10	90%	94%	94%	89%

Table 36: GEH comparisons for turn counts of light vehicles in hybrid layer – PM – Latest HAM

Measure	Criteria	Target	PM 4hour 0700-0900	PM Hour 2 1600-1700	PM Hour 3 1700-1800
Individual Turn Counts	GEH<5	80%	74%	81%	75%
	GEH<7.5	85%	92%	94%	92%
	GEH<10	90%	98%	100%	97%

Similarly for PM, targets have been met for GEH between 7.5 and 10 for the latest model, as well as more counts have achieved GEH less than 5 for the middle 2 hours.

For heavy vehicles, all the turn counts in the latest model have still met the GEH and count band criteria. The exception is the GEH less than 5 for Hour 3 of individual turn counts for AM is slightly below the target.

Table 37: GEH comparisons for turn counts of heavy vehicles in hybrid layer – AM – Previous HAM

Measure	Criteria	Target	AM 4hour 0700-0900	AM Hour 2 0700-0800	AM Hour 3 0800-0900
Individual Turn Counts	GEH<5	80%	94%	95%	87%
	GEH<7.5	85%	99%	99%	99%
	GEH<10	90%	100%	99%	100%

Table 38: GEH comparisons for turn counts of heavy vehicles in hybrid layer – AM – Latest HAM

Measure	Criteria	Target	AM 4hour 0700-0900	AM Hour 2 0700-0800	AM Hour 3 0800-0900
Individual Turn Counts	GEH<5	80%	87%	82%	75%
	GEH<7.5	85%	95%	94%	88%
	GEH<10	90%	98%	98%	93%

Table 39: GEH comparisons for turn counts of heavy vehicles in hybrid layer – IP – Previous HAM

Measure	Criteria	Target	IP 4hour 1100-1300	IP Hour 2 1100-1200	IP Hour 3 1200-1300
Individual Turn Counts	GEH<5	80%	95%	96%	96%
	GEH<7.5	85%	100%	99%	99%
	GEH<10	90%	100%	100%	100%

Table 40: GEH comparisons for turn counts of heavy vehicles in hybrid layer – IP – Latest HAM

Measure	Criteria	Target	IP 4hour 1100-1300	IP Hour 2 1100-1200	IP Hour 3 1200-1300
Individual Turn Counts	GEH<5	80%	82%	87%	86%
	GEH<7.5	85%	94%	97%	96%
	GEH<10	90%	98%	99%	99%

Table 41: GEH comparisons for turn counts of heavy vehicles in hybrid layer – PM – Previous HAM

Measure	Criteria	Target	PM 4hour 0700-0900	PM Hour 2 1600-1700	PM Hour 3 1700-1800
Individual Turn Counts	GEH<5	80%	96%	94%	89%
	GEH<7.5	85%	100%	100%	99%
	GEH<10	90%	100%	100%	100%

Table 42: GEH comparisons for turn counts of heavy vehicles in hybrid layer – PM – Latest HAM

Measure	Criteria	Target	PM 4hour 0700-0900	PM Hour 2 1600-1700	PM Hour 3 1700-1800
Individual Turn Counts	GEH<5	80%	87%	84%	80%
	GEH<7.5	85%	92%	94%	94%
	GEH<10	90%	97%	97%	98%

4.3.2 Observed vs modelled count XY scatter plots

This section presents the observed vs modelled count scatter plots and associated R-Squared statistical results for the turn counts of the light vehicles. Figure 31, Figure 32 and Figure 33 present the R-squared comparisons and the line of best fit results in hybrid level for each period, respectively, for the latest model.

Of all the periods, R-squared value is larger than 0.95 and the line of best fit is within the range of 0.9x-1.1x. They are all complied with the requirements stated in TMDG.
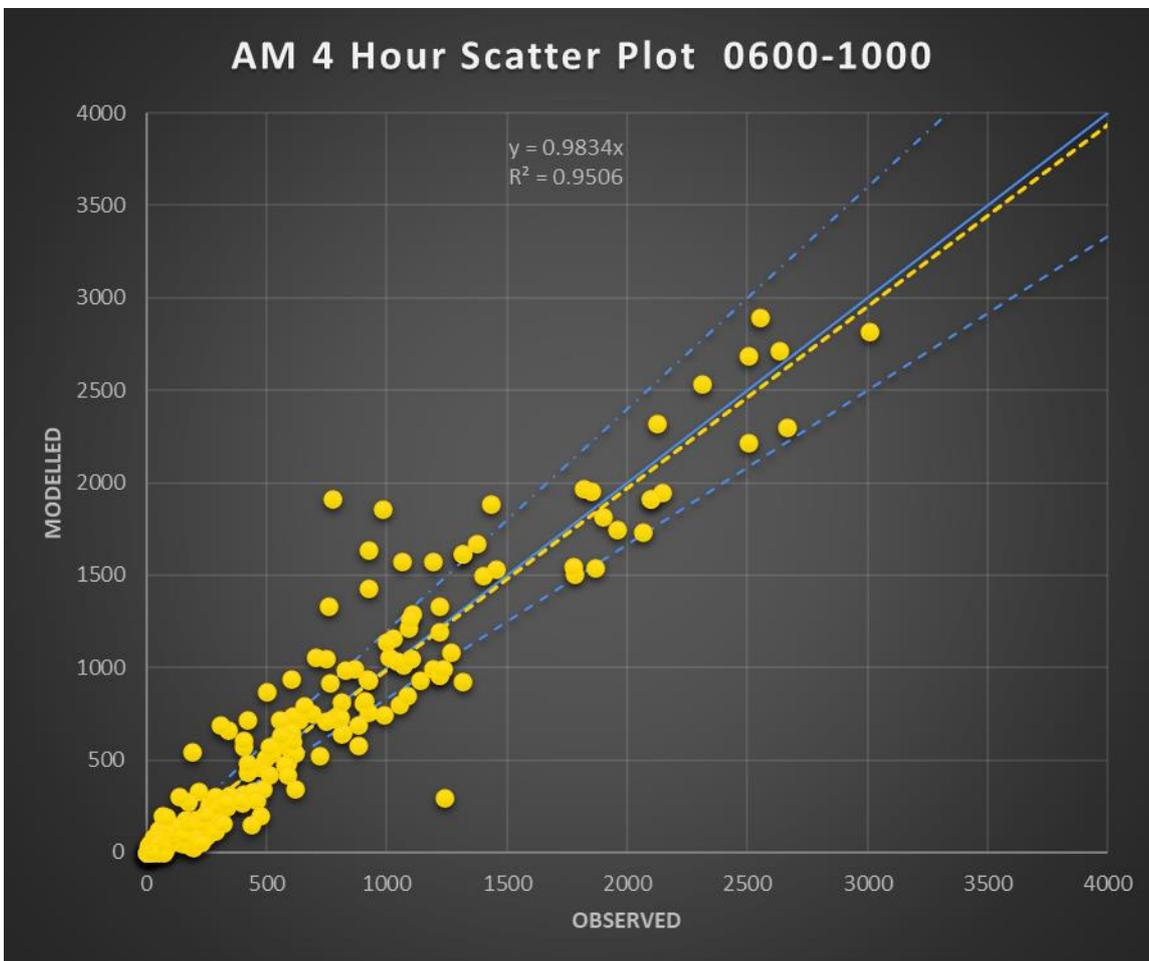
Figure 34: XY scatter plot for turn counts of light vehicles in hybrid layer – AM – Latest HAM
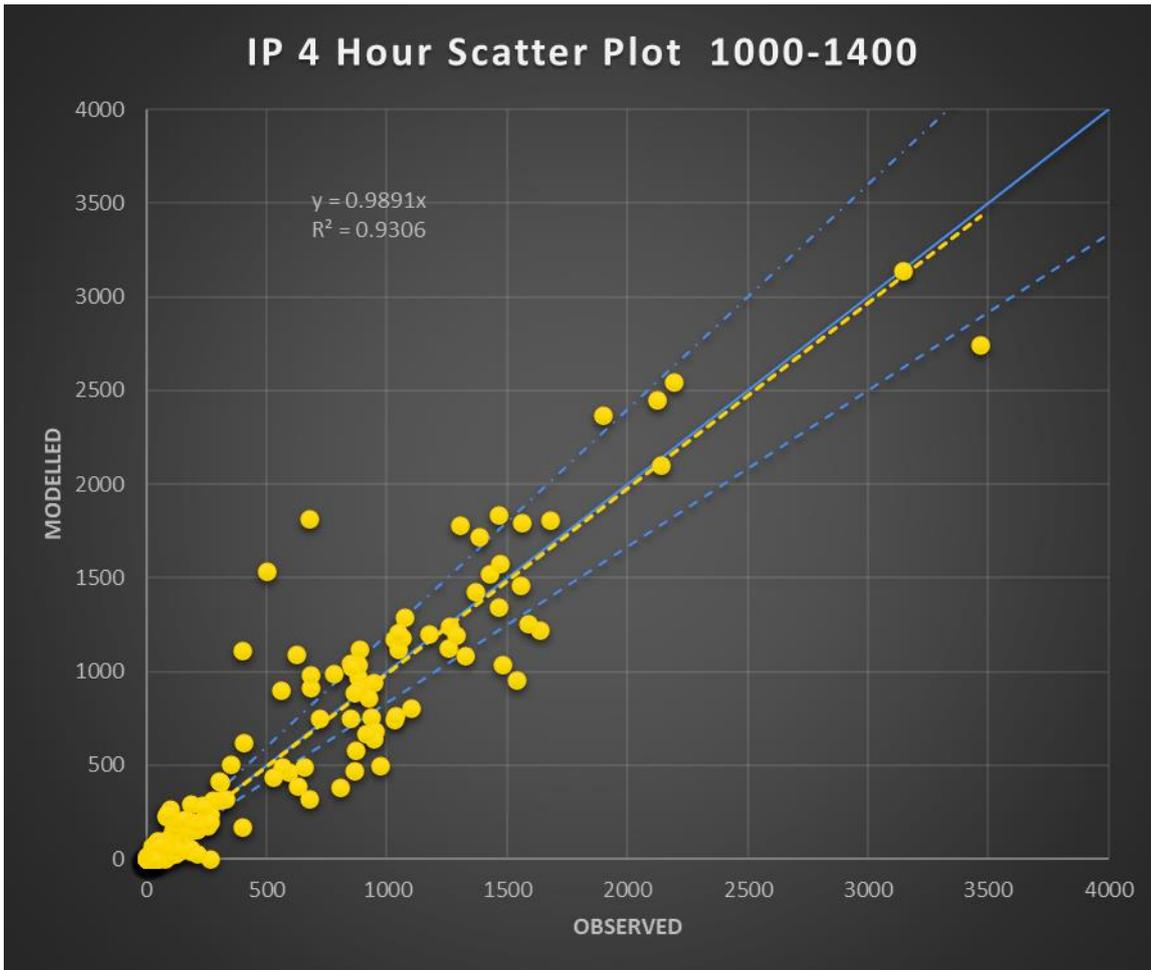
Figure 35: XY scatter plot for turn counts of light vehicles in hybrid layer – IP – Latest HAM
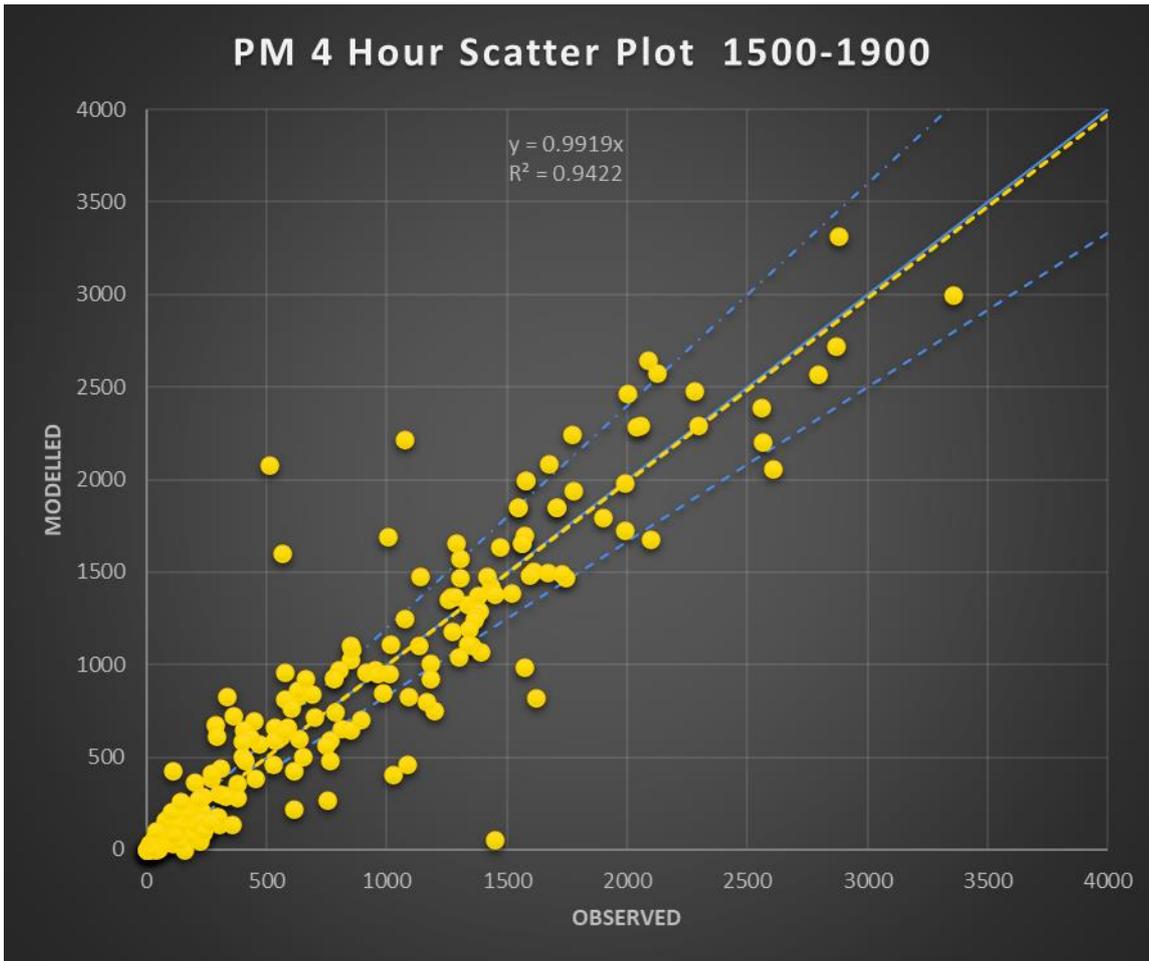
Figure 36: XY scatter plot for turn counts of light vehicles in hybrid layer – PM – Latest HAM

4.3.3   Observed vs modelled root mean square error

Table 43 and Table 44 present the RMSE of the counts in hybrid layer across the time periods. Although all the RMSE of the counts in the latest model still fall out of the target window, the values have been significantly reduced to at least below 40% except the 4 hour period for IP is 43%.

Table 43: RMSE of turn counts for light vehicles in hybrid layer – Previous HAM

%RMSE	4hour	Hour 2	Hour 3
AM	41%	41%	68%
IP	46%	41%	60%
PM	38%	35%	53%

Table 44: RMSE of turn counts for light vehicles in hybrid layer – Latest HAM

%RMSE	4hour	Hour 2	Hour 3
AM	33%	31%	33%
IP	43%	36%	37%
PM	34%	30%	31%

4.4   Travel time validation results

Vehicle travel time data was obtained from TomTom Traffic Stats for September 2024 over 11 pairs of routes. The extraction of the travel time data is documented in TN 1 – Data Collection. Figure 37 shows the locations of the routes and each route has both directions.
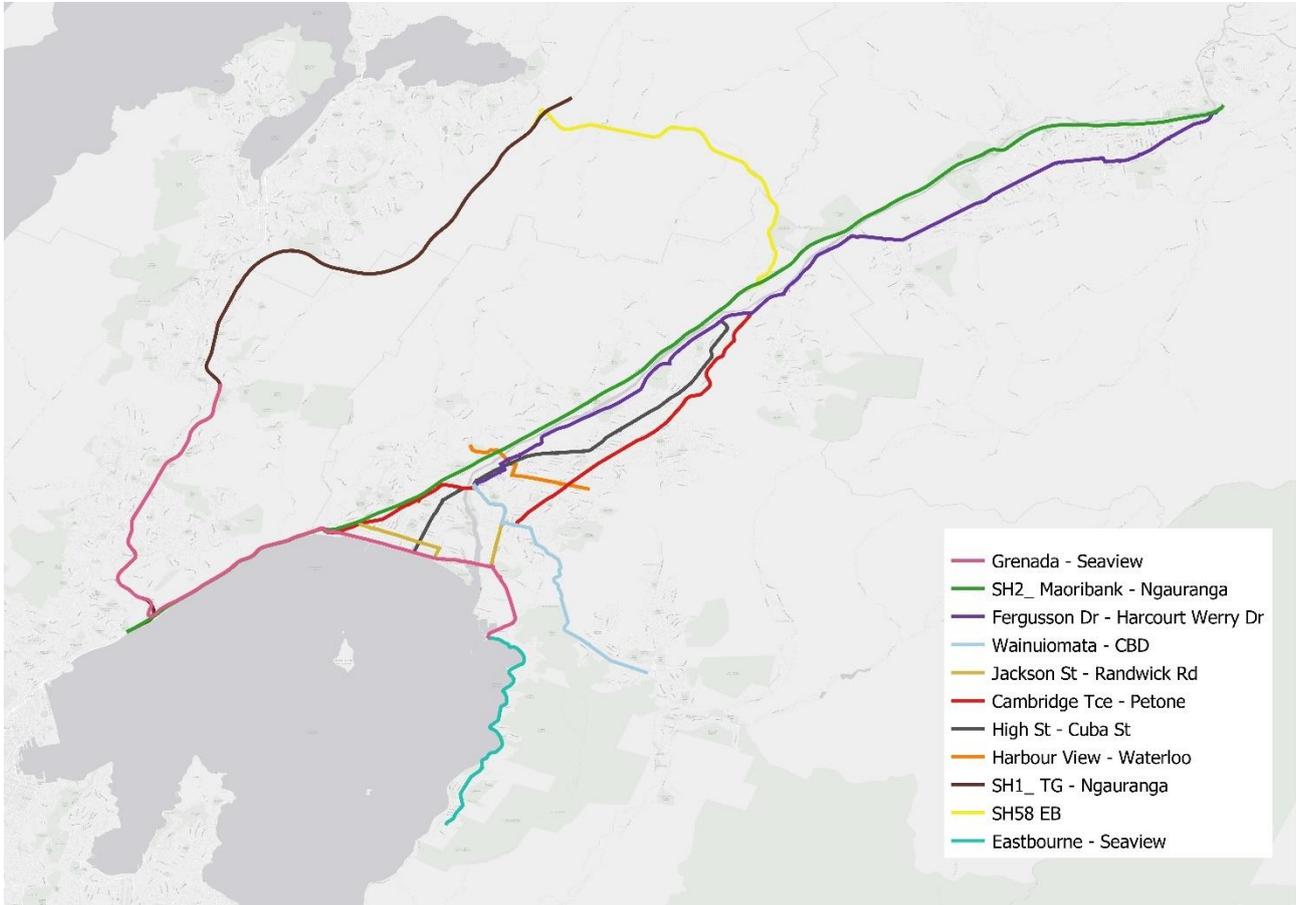
Figure 37: Locations of the travel time routes

Figure 38 shows the acceptability levels for comparing the total observed and modelled directional travel times provided by TMDG.

TOTAL ROUTE DIRECTIONAL PEAK JOURNEY TIME	PURPOSE CATEGORY						
	A: REGIONAL	B: STRATEGIC NETWORK	C: URBAN AREA	D: NZ TRANSPORT AGENCY PROJECT	E: SMALL AREA /CORRIDOR	F: INTERSECTION / SHORT CORRIDOR	G: HIGH FLOW, SPEED, MULTI LANE
WITHIN 15% OR 1 MINUTE (IF HIGHER) (% OF ROUTES)	>80%	>85%	>85%	>87.5%	>90%	>90%	>90%
WITHIN 25% OR 1.5 MINUTES (IF HIGHER) (% OF ROUTES)	>85%	>90%	>90%	>92.5%	>95%	100%	100%

Figure 38: Locations of the travel time routes

The Tier 1 criteria considers the travel time is acceptable if the difference between the observed and modelled is within 15% or 1 minute. Table 45 and Table 46 list the performance of each route for the middle 2-hour peak of each period, for the previous and latest model, respectively. All hours and periods of the latest model pass the target which is 85%, except the 2nd hour of AM is 82% which is fairly close to the target. It is an improvement compared to the previous model which has 3 hours not pass the target.

Table 45: Criteria Tier 1 for travel time comparisons – Previous HAM

Routes	AM (7-8)	AM (8-9)	IP (11-12)	IP (12-1)	PM (4-5)	PM (5-6)
Grenada - Seaview	Fail	Pass	Pass	Pass	Pass	Pass
Seaview - Grenada	Pass	Pass	Pass	Pass	Pass	Pass
SH2: Maoribank - Ngauranga	Fail	Pass	Pass	Pass	Pass	Pass
SH2: Ngauranga - Maoribank	Pass	Fail	Pass	Pass	Pass	Pass
Fergusson Dr - Harcourt Werry Dr	Pass	Pass	Pass	Pass	Pass	Fail
Harcourt Werry Dr - Fergusson Dr	Pass	Pass	Pass	Pass	Pass	Fail
Wainuiomata - CBD	Pass	Fail	Pass	Pass	Pass	Pass
CBD - Wainuiomata	Pass	Fail	Pass	Pass	Pass	Fail
Jackson St - Randwick Rd	Pass	Pass	Pass	Pass	Pass	Pass
Randwick Rd - Jackson St	Fail	Fail	Pass	Pass	Pass	Pass
Cambridge Tce - Petone	Pass	Fail	Pass	Pass	Pass	Pass
Petone - Cambride Tce	Pass	Pass	Pass	Pass	Pass	Pass
High St - Cuba St	Pass	Fail	Pass	Pass	Pass	Pass
Cuba St - High St	Pass	Pass	Pass	Pass	Pass	Pass
Harbour View - Waterloo	Pass	Pass	Fail	Fail	Pass	Fail
Waterloo - Harbour View	Pass	Fail	Fail	Fail	Pass	Pass
SH1: TG - Ngauranga	Fail	Pass	Pass	Pass	Pass	Pass
SH1: Ngauranga - TG	Pass	Pass	Pass	Pass	Pass	Pass
SH58 EB	Pass	Pass	Pass	Pass	Pass	Pass
SH58 WB	Pass	Pass	Pass	Pass	Pass	Pass
Eastbourne - Seaview	Pass	Fail	Pass	Fail	Pass	Pass
Seaview - Eastbourne	Pass	Pass	Pass	Pass	Fail	Fail
Target	85%					
% of routes	82%	64%	91%	86%	95%	77%

Table 46: Criteria Tier 1 for travel time comparisons – Latest HAM

Routes	AM (7-8)	AM (8-9)	IP (11-12)	IP (12-1)	PM (4-5)	PM (5-6)
Grenada - Seaview	Pass	Pass	Pass	Pass	Pass	Fail
Seaview - Grenada	Pass	Pass	Pass	Pass	Pass	Pass
SH2: Maoribank - Ngauranga	Pass	Pass	Pass	Pass	Pass	Pass
SH2: Ngauranga - Maoribank	Pass	Pass	Pass	Pass	Pass	Pass
Fergusson Dr - Harcourt Werry Dr	Pass	Pass	Pass	Pass	Pass	Pass
Harcourt Werry Dr - Fergusson Dr	Pass	Pass	Pass	Pass	Pass	Pass
Wainuiomata - CBD	Pass	Fail	Pass	Pass	Pass	Pass
CBD - Wainuiomata	Pass	Pass	Pass	Pass	Pass	Fail
Jackson St - Randwick Rd	Pass	Pass	Pass	Pass	Pass	Pass
Randwick Rd - Jackson St	Fail	Fail	Pass	Pass	Pass	Pass
Cambridge Tce - Petone	Pass	Pass	Pass	Pass	Pass	Pass
Petone - Cambride Tce	Pass	Pass	Pass	Pass	Pass	Pass
High St - Cuba St	Pass	Fail	Pass	Pass	Pass	Pass
Cuba St - High St	Pass	Pass	Pass	Pass	Pass	Pass
Harbour View - Waterloo	Pass	Pass	Fail	Pass	Pass	Pass
Waterloo - Harbour View	Pass	Pass	Pass	Pass	Fail	Pass
SH1: TG - Ngauranga	Pass	Pass	Pass	Pass	Pass	Pass
SH1: Ngauranga - TG	Pass	Pass	Pass	Pass	Pass	Pass
SH58 EB	Pass	Pass	Pass	Pass	Pass	Pass
SH58 WB	Pass	Pass	Pass	Pass	Pass	Pass
Eastbourne - Seaview	Pass	Pass	Pass	Fail	Pass	Pass
Seaview - Eastbourne	Pass	Pass	Pass	Pass	Fail	Fail
Target	85%					
% of routes	95%	82%	95%	95%	91%	86%

The Tier 2 criteria considers the travel time is acceptable if the difference between the observed and modelled is within 25% or 1.5 minute. Table 47 and Table 48 show the passing percentage for the middle 2-hour peak of each period, for the previous and latest model, respectively. All hours achieved 100% for the latest model.

Table 47: Criteria Tier 2 for travel time comparisons – Previous HAM

	AM (7-8)	AM (8-9)	IP (11-12)	IP (12-1)	PM (4-5)	PM (5-6)
Target	90%					
% of routes	100%	95%	95%	100%	100%	100%

Table 48: Criteria Tier 2 for travel time comparisons – Latest HAM

	AM (7-8)	AM (8-9)	IP (11-12)	IP (12-1)	PM (4-5)	PM (5-6)
Target	90%					
% of routes	100%	100%	100%	100%	100%	100%

The travel time difference between the observed and modelled is shown in Figure 39 for the previous HAM and in Figure 40 for the latest HAM, for each route and for the middle 2-hour peak. The ones failed for the Tier 1 criteria are pointed in light blue. The travel time profiles for each route and period of the latest model are attached in Appendix B. The findings are as follows:

- The previous model had 17 failed ones, and the latest model reduced them down to 11
- Regardless the acceptability of the results, the modelled times of most of the routes are still faster than the observed times, which is similar to the previous model
- The difference scales for the routes in the latest model have also been largely reduced
- The routes and hours have failed in both models are as follows:

- CBD-Wainuiomata during the 2nd hour of PM for being faster
- Randwick-Jackson of AM for being faster
- High Street-Cube Street during the 2nd hour of AM for being faster
- Harbour View-Waterloo during the 1st hour of IP for being faster
- Eastbourne-Seaview during the 2nd hour of IP for being faster
- Seaview-Eastbourne of PM for being slower
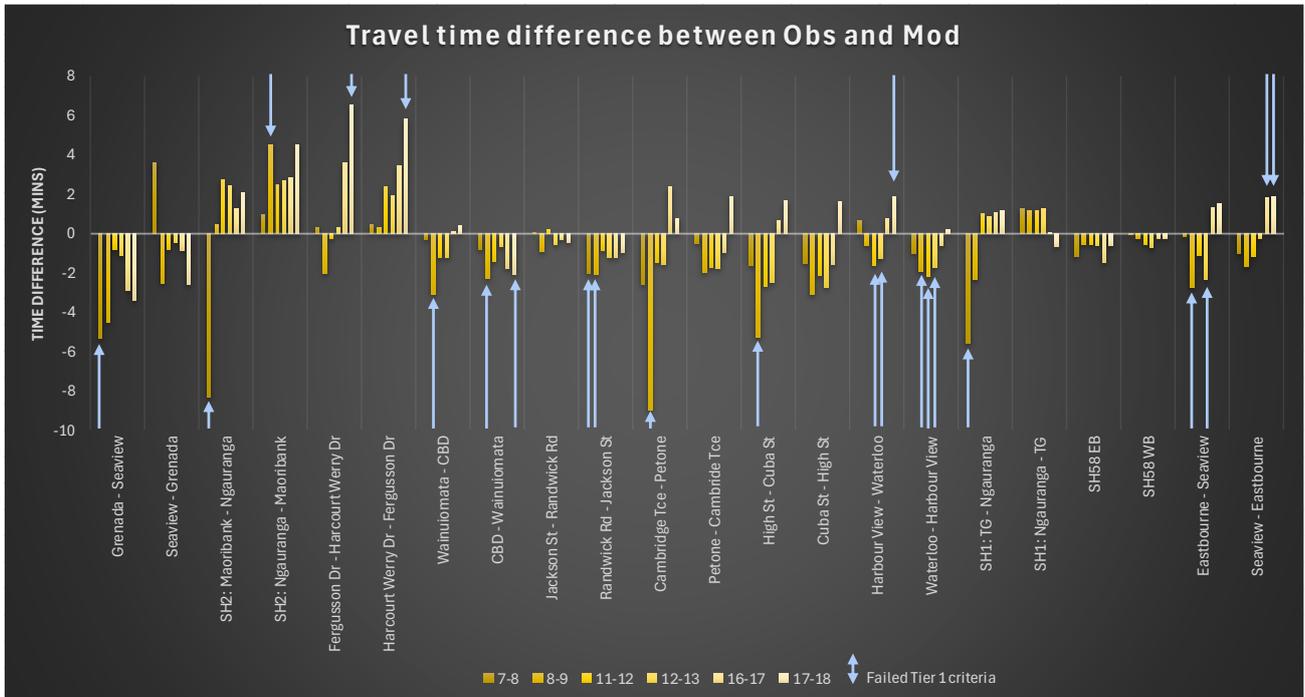
Figure 39: Travel time differences for each route – Previous HAM
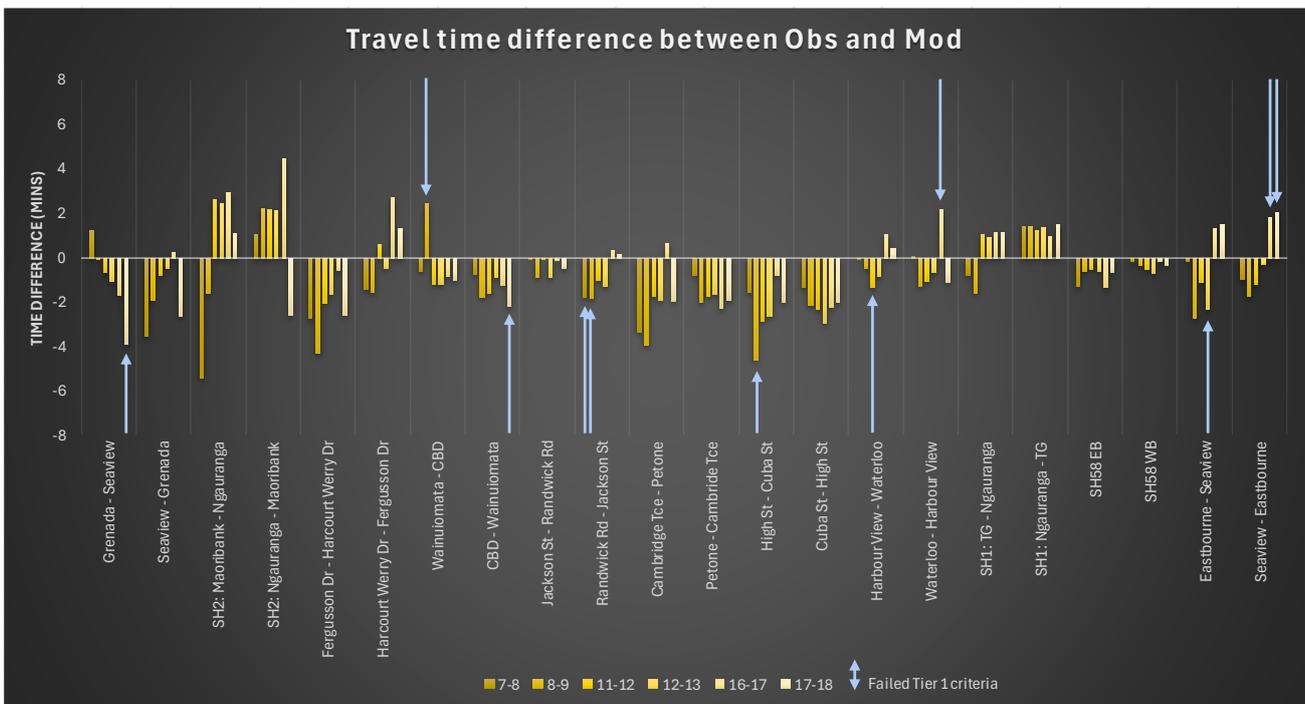
Figure 40: Travel time differences for each route – Latest HAM

5. Summary

This report has presented the results of the recalibrated Hutt Aimsun Model (HAM). Overall, the model validation has improved compared to the previous version.

- Link calibration has improved overall. Looking at each of the model periods the model shows:
    - Previously the AM peak fell slightly short of the calibration targets, particularly in the individual link count metric. While the updated model has improved this individual link count metric, the screenline comparison has regressed slightly. The overall four hour period metrics still look good.
    - The interpeak already compared well, meeting all but the individual GEH under 5 metric. The update improves this to meet all GEH metrics, except the counts under 5 between 12 and 1pm which is 1% short. This is considered a good result.
    - The PM peak already looked good in the previous model. The updated model shows a similar outcome, with some slight improvements and regressions but good overall.
- Turn count validation was a notable weakness in the previous model, as this data wasn't compared until late in the original model process. In the updated model all periods show significant improvements. Previously there were many instances of not meeting GEH over 7.5 and 10, whereas now the updated model passes these metrics. The updated model still falls slightly short of the GEH under 5 in some cases, but is still a much better match in this metric compared to the previous model.
- Travel time also shows a notable improvement in the updated model. There are two criteria for comparing travel time validation:
    - Criteria 1 is the model should be within 15% or 1 minute (if higher) of the travel time observed data across 85% of the routes. Previously the AM peak fell short of this in both model peak hours, and the PM peak was short in the second peak hour. In the updated model, only the AM peak second hour falls short and not by much.
    - Criteria 2 is the model should be within 25% or 1.5 minutes (if higher) of the observed travel time data across 90% of the routes. This metric is generally easier to meet; the model previously passed across all the model peak periods as does the updated model. The updated model matches across 100% of the peak periods which is still an improvement over the previous model.

The improved model calibration provides increased confidence in results produced by the model, particularly for the upcoming option testing and application of the model. The model is considered fit for the assessment of significant transport schemes, such as Petone to Grenada and the Cross Valley Link projects. It is also suitable for smaller scale option testing within the Hutt City area. Care should be taken using the model outside these areas; Upper Hutt is currently only mesoscopic and the Western suburbs such as Tawa and Newlands have had limited focus during the calibration.
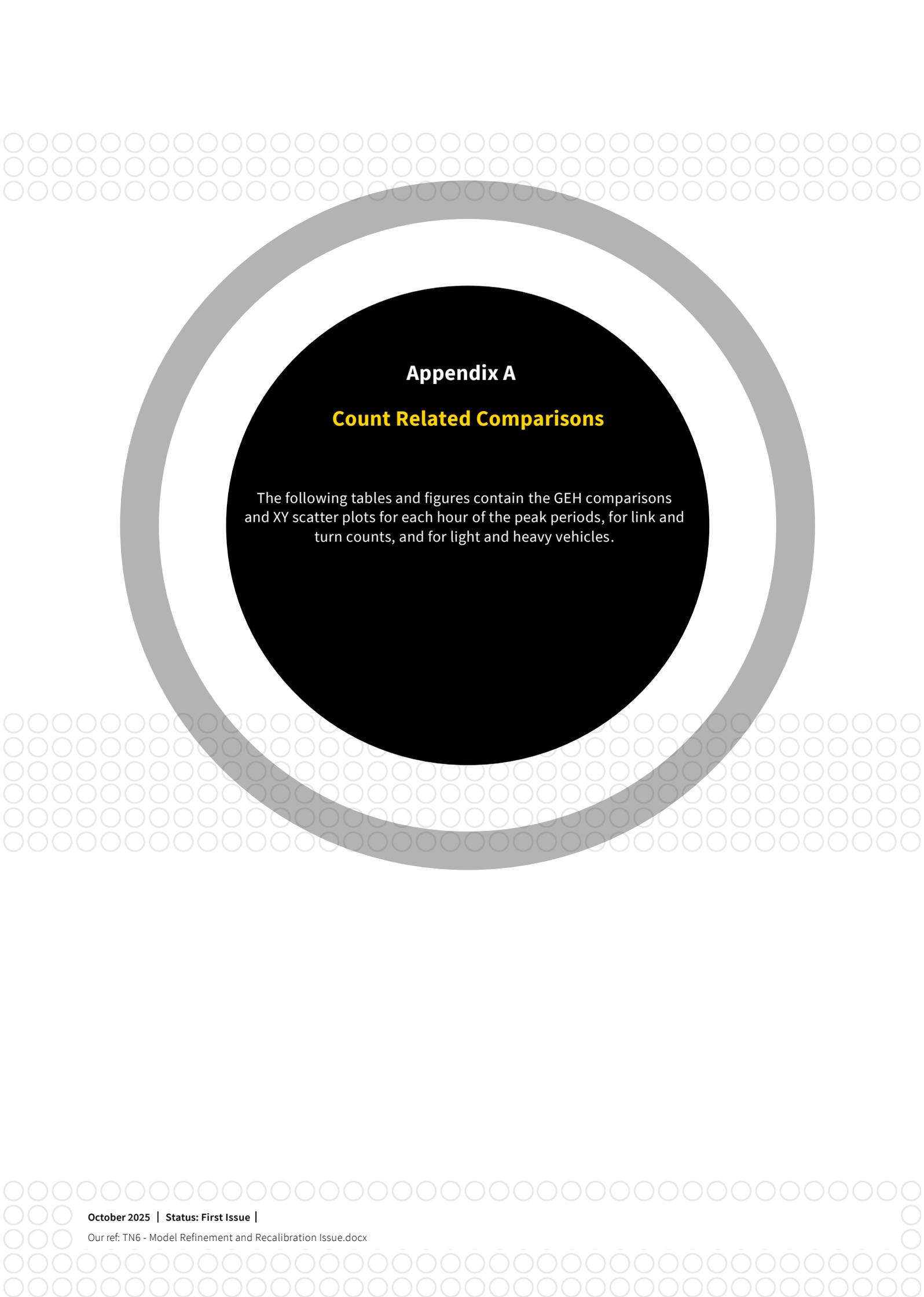
Appendix A

Count Related Comparisons

The following tables and figures contain the GEH comparisons and XY scatter plots for each hour of the peak periods, for link and turn counts, and for light and heavy vehicles.

Screenline	AM 2hour 0700-0900					AM Hour 1 0600-0700					AM Hour 2 0700-0800					AM Hour 3 0800-0900					AM Hour 4 0900-1000				
	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH
Eastern Hills	3,951	3,749	-202	-5%	2.30	814	887	73	9%	2.50	1,861	1,885	24	1%	0.56	2,091	1,864	-227	-11%	5.10	1,062	1,022	-40	-4%	1.23
	1,564	1,689	125	8%	2.19	186	397	211	114%	12.98	560	801	241	43%	9.25	1,004	888	-116	-12%	3.78	719	647	-72	-10%	2.77
	5,515	5,438	-77	-1%	0.74	1,000	1,284	284	28%	8.41	2,420	2,686	266	11%	5.26	3,095	2,752	-343	-11%	6.34	1,781	1,669	-112	-6%	2.69
Railway	8,355	8,674	319	4%	2.45	1,828	2,373	545	30%	11.85	3,581	3,814	233	6%	3.82	4,773	4,860	87	2%	1.25	3,341	3,848	507	15%	8.46
	6,812	7,570	758	11%	6.32	1,407	1,754	347	25%	8.73	2,872	3,366	494	17%	8.84	3,940	4,204	264	7%	4.14	3,282	3,258	-24	-1%	0.42
	15,167	16,244	1,077	7%	6.08	3,235	4,127	892	28%	14.79	6,454	7,180	726	11%	8.80	8,713	9,064	351	4%	3.72	6,623	7,106	483	7%	5.83
Riverbank	8,586	8,086	-500	-6%	3.87	1,838	2,074	236	13%	5.34	3,931	3,808	-123	-3%	1.97	4,656	4,278	-378	-8%	5.65	3,586	3,082	-504	-14%	8.72
	8,112	8,232	120	1%	0.94	2,833	2,676	-157	-6%	3.00	4,047	3,812	-235	-6%	3.75	4,065	4,420	355	9%	5.45	3,445	3,674	229	7%	3.84
	16,698	16,318	-380	-2%	2.09	4,671	4,750	79	2%	1.15	7,978	7,620	-358	-4%	4.05	8,721	8,698	-23	0%	0.24	7,030	6,756	-274	-4%	3.30
Fairway/Daysh	3,123	3,206	83	3%	1.05	640	793	153	24%	5.73	1,269	1,439	170	13%	4.63	1,854	1,767	-87	-5%	2.05	1,535	1,489	-46	-3%	1.18
	5,697	5,578	-119	-2%	1.12	1,489	1,299	-190	-13%	5.08	2,628	2,440	-188	-7%	3.74	3,069	3,138	69	2%	1.24	1,913	2,099	186	10%	4.16
	8,820	8,784	-36	0%	0.27	2,128	2,092	-36	-2%	0.79	3,897	3,879	-18	0%	0.29	4,923	4,905	-18	0%	0.26	3,448	3,588	140	4%	2.37
Wainuiomata	1,120	1,153	33	3%	0.69	256	335	79	31%	4.62	466	543	77	17%	3.43	654	610	-44	-7%	1.76	585	480	-105	-18%	4.56
	3,427	3,210	-217	-6%	2.66	1,354	1,075	-279	-21%	8.01	1,852	1,524	-328	-18%	7.99	1,575	1,686	111	7%	2.76	838	1,214	376	45%	11.71
	4,547	4,363	-184	-4%	1.95	1,610	1,410	-200	-12%	5.14	2,318	2,067	-251	-11%	5.37	2,229	2,296	67	3%	1.41	1,424	1,694	270	19%	6.85
SH2 South	5,265	4,938	-327	-6%	3.24	1,465	1,601	136	9%	3.46	2,673	2,415	-258	-10%	5.12	2,592	2,523	-69	-3%	1.37	1,991	1,814	-177	-9%	4.06
	6,285	5,919	-366	-6%	3.31	2,704	2,069	-635	-23%	13.00	3,302	2,825	-477	-14%	8.62	2,983	3,094	111	4%	2.02	2,260	2,960	700	31%	13.70
	11,550	10,857	-693	-6%	4.63	4,170	3,670	-500	-12%	7.98	5,975	5,240	-735	-12%	9.82	5,575	5,617	42	1%	0.56	4,251	4,774	523	12%	7.78
SH58	2,020	1,781	-239	-12%	3.87	613	632	19	3%	0.77	1,145	973	-172	-15%	5.29	875	808	-67	-8%	2.30	608	593	-15	-2%	0.61
	1,577	1,484	-93	-6%	1.68	541	442	-99	-18%	4.47	820	695	-125	-15%	4.54	757	789	32	4%	1.16	520	593	73	14%	3.11
	3,597	3,265	-332	-9%	4.00	1,154	1,074	-80	-7%	2.40	1,965	1,668	-297	-15%	6.97	1,632	1,597	-35	-2%	0.86	1,128	1,186	58	5%	1.72

Directional counts on screenlines GEH – light vehicles – hybrid layer– AM

Individual counts on screenlines GEH– light vehicles – hybrid layer– AM

Screenline	IP 2hour 1100-1300					IP Hour 1 1000-1100					IP Hour 2 1100-1200					IP Hour 3 1200-1300					IP Hour 4 1300-1400				
	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH
Eastern Hills	1,519	1,671	152	10%	2.69	782	803	21	3%	0.76	763	811	48	6%	1.70	756	860	104	14%	3.66	716	774	58	8%	2.11
	1,498	1,577	79	5%	1.42	602	740	138	23%	5.32	690	768	78	11%	2.88	808	809	1	0%	0.04	818	810	-8	-1%	0.28
	3,018	3,248	230	8%	2.91	1,384	1,543	159	11%	4.16	1,454	1,579	125	9%	3.22	1,564	1,669	105	7%	2.61	1,534	1,584	50	3%	1.26
Railway	6,358	6,373	15	0%	0.13	2,987	3,027	40	1%	0.73	3,132	3,151	19	1%	0.34	3,226	3,222	-4	0%	0.07	3,077	3,124	47	2%	0.84
	6,835	6,679	-156	-2%	1.34	3,068	3,245	177	6%	3.15	3,310	3,339	29	1%	0.50	3,525	3,340	-185	-5%	3.15	3,437	3,335	-102	-3%	1.75
	13,193	13,052	-141	-1%	0.87	6,055	6,272	217	4%	2.76	6,442	6,490	48	1%	0.60	6,750	6,562	-188	-3%	2.31	6,514	6,459	-55	-1%	0.68
Riverbank	7,003	6,461	-542	-8%	4.67	3,270	3,128	-142	-4%	2.50	3,432	3,176	-256	-7%	4.46	3,571	3,285	-286	-8%	4.88	3,670	3,309	-361	-10%	6.11
	6,866	6,975	109	2%	0.92	3,089	3,228	139	4%	2.47	3,421	3,469	48	1%	0.81	3,445	3,506	61	2%	1.03	3,369	3,460	91	3%	1.56
	13,869	13,436	-433	-3%	2.62	6,359	6,356	-3	0%	0.03	6,854	6,645	-209	-3%	2.54	7,016	6,791	-225	-3%	2.70	7,039	6,769	-270	-4%	3.25
Fairway/Daysh	3,006	2,966	-40	-1%	0.51	1,329	1,446	117	9%	3.13	1,454	1,507	53	4%	1.37	1,551	1,459	-92	-6%	2.38	1,519	1,452	-67	-4%	1.74
	3,172	3,212	40	1%	0.50	1,566	1,572	6	0%	0.15	1,585	1,610	25	2%	0.64	1,587	1,602	15	1%	0.36	1,608	1,530	-78	-5%	1.97
	6,178	6,178	0	0%	0.00	2,896	3,018	122	4%	2.25	3,039	3,117	78	3%	1.41	3,139	3,061	-78	-2%	1.40	3,127	2,982	-145	-5%	2.62
Wainuiomata	1,295	1,238	-57	-4%	1.14	525	582	57	11%	2.42	608	619	11	2%	0.43	687	619	-68	-10%	2.66	727	601	-126	-17%	4.89
	1,238	1,397	159	13%	3.09	668	687	19	3%	0.73	646	687	41	6%	1.60	593	710	117	20%	4.60	628	688	60	10%	2.34
	2,533	2,635	102	4%	1.41	1,193	1,269	76	6%	2.17	1,254	1,306	52	4%	1.46	1,280	1,329	49	4%	1.37	1,355	1,289	-66	-5%	1.81
SH2 South	4,166	4,103	-63	-2%	0.70	1,882	1,937	55	3%	1.26	2,044	2,041	-3	0%	0.07	2,122	2,062	-60	-3%	1.31	2,158	2,107	-51	-2%	1.10
	4,039	3,931	-108	-3%	1.21	2,014	1,803	-211	-10%	4.83	1,998	1,931	-67	-3%	1.51	2,041	2,000	-41	-2%	0.91	2,017	2,026	9	0%	0.20
	8,205	8,034	-171	-2%	1.34	3,896	3,740	-156	-4%	2.52	4,042	3,972	-70	-2%	1.11	4,163	4,062	-101	-2%	1.57	4,175	4,133	-42	-1%	0.65
SH58	852	823	-29	-3%	0.72	494	449	-45	-9%	2.09	425	416	-9	-2%	0.41	428	407	-21	-5%	1.02	451	410	-41	-9%	1.97
	870	815	-55	-6%	1.33	425	424	-1	0%	0.05	419	397	-22	-5%	1.07	451	418	-33	-7%	1.58	487	371	-116	-24%	5.59
	1,722	1,638	-84	-5%	1.45	919	873	-46	-5%	1.55	843	813	-30	-4%	1.05	879	825	-54	-6%	1.84	938	781	-157	-17%	5.34

Directional counts on screenlines GEH– light vehicles – hybrid layer– IP

Individual counts on screenlines GEH– light vehicles – hybrid layer– IP

Screenline	PM 2hour 1600-1800					PM Hour 1 1500-1600					PM Hour 2 1600-1700					PM Hour 3 1700-1800					PM Hour 4 1800-1900				
	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH	Observed	Modelled	Diff	% Diff	GEH
Eastern Hills	2,170	2,753	583	27%	8.31	1,089	1,271	182	17%	5.29	1,030	1,242	212	21%	6.29	1,140	1,511	371	33%	10.18	866	963	97	11%	3.21
	3,453	3,226	-227	-7%	2.78	1,392	1,412	20	1%	0.54	1,635	1,612	-23	-1%	0.58	1,818	1,614	-204	-11%	4.92	1,223	1,098	-125	-10%	3.66
	5,623	5,979	356	6%	3.30	2,481	2,683	202	8%	3.98	2,665	2,854	189	7%	3.59	2,958	3,125	167	6%	3.02	2,089	2,061	-28	-1%	0.61
Railway	8,345	8,055	-290	-3%	2.26	3,960	4,099	139	4%	2.19	4,376	4,295	-81	-2%	1.23	3,968	3,760	-208	-5%	3.35	2,890	2,921	31	1%	0.58
	9,198	9,307	109	1%	0.80	4,455	4,559	104	2%	1.55	4,750	4,866	116	2%	1.68	4,449	4,441	-8	0%	0.11	3,364	3,389	25	1%	0.43
	17,543	17,362	-181	-1%	0.97	8,415	8,658	243	3%	2.63	9,126	9,161	35	0%	0.37	8,417	8,201	-216	-3%	2.37	6,254	6,310	56	1%	0.71
Riverbank	9,929	9,807	-122	-1%	0.87	4,616	4,800	184	4%	2.68	5,028	4,988	-40	-1%	0.56	4,901	4,819	-82	-2%	1.18	3,530	3,529	-1	0%	0.01
	8,908	8,378	-530	-6%	4.03	4,368	4,352	-16	0%	0.24	4,696	4,557	-139	-3%	2.04	4,212	3,821	-391	-9%	6.17	3,238	2,871	-367	-11%	6.63
	18,837	18,185	-652	-3%	3.39	8,984	9,152	168	2%	1.76	9,724	9,545	-179	-2%	1.82	9,114	8,640	-474	-5%	5.03	6,767	6,400	-367	-5%	4.53
Fairway/Daysh	5,292	5,184	-108	-2%	1.05	2,384	2,491	107	4%	2.17	2,743	2,698	-45	-2%	0.87	2,548	2,486	-62	-2%	1.24	1,712	1,940	228	13%	5.34
	4,417	4,265	-152	-3%	1.63	2,107	2,315	208	10%	4.43	2,312	2,328	16	1%	0.33	2,105	1,937	-168	-8%	3.73	1,532	1,576	44	3%	1.11
	9,708	9,449	-259	-3%	1.87	4,491	4,806	315	7%	4.62	5,055	5,026	-29	-1%	0.41	4,653	4,423	-230	-5%	3.41	3,244	3,516	272	8%	4.68
Wainuiomata	3,450	3,210	-240	-7%	2.94	1,330	1,461	131	10%	3.52	1,811	1,647	-164	-9%	3.95	1,639	1,563	-76	-5%	1.89	1,007	1,103	96	10%	2.97
	1,540	1,380	-160	-10%	2.96	715	659	-56	-8%	2.15	828	741	-87	-10%	3.10	712	639	-73	-10%	2.81	576	539	-37	-6%	1.57
	4,990	4,590	-400	-8%	4.08	2,045	2,120	75	4%	1.64	2,639	2,388	-251	-10%	5.01	2,351	2,202	-149	-6%	3.11	1,583	1,642	59	4%	1.48
SH2 South	6,062	5,863	-199	-3%	1.82	3,060	3,226	166	5%	2.96	3,287	3,121	-166	-5%	2.93	2,775	2,742	-33	-1%	0.62	2,337	2,243	-94	-4%	1.97
	5,519	5,174	-345	-6%	3.34	2,380	2,494	114	5%	2.30	2,910	2,703	-207	-7%	3.90	2,609	2,471	-138	-5%	2.74	1,872	1,748	-124	-7%	2.91
	11,581	11,037	-544	-5%	3.62	5,440	5,720	280	5%	3.74	6,197	5,824	-373	-6%	4.81	5,384	5,213	-171	-3%	2.35	4,209	3,991	-218	-5%	3.41
SH58	1,752	1,558	-194	-11%	3.37	689	727	38	5%	1.42	923	826	-97	-11%	3.29	829	732	-97	-12%	3.47	394	500	106	27%	5.00
	2,007	1,711	-296	-15%	4.86	756	853	97	13%	3.41	1,011	905	-196	-18%	6.19	906	806	-100	-11%	3.42	412	556	144	35%	6.53
	3,759	3,269	-490	-13%	5.85	1,446	1,580	134	9%	3.45	2,024	1,731	-293	-14%	6.77	1,735	1,538	-197	-11%	4.87	807	1,056	249	31%	8.17

Directional counts on screenlines GEH– light vehicles – hybrid layer– PM

Individual counts on screenlines GEH– light vehicles – hybrid layer– PM

Appendix B

Travel Time Profile Comparisons

The following figures show the profile of travel time against the distance for each route of the middle 2-hour peak.

Tomtom vs Modelled Travel Time
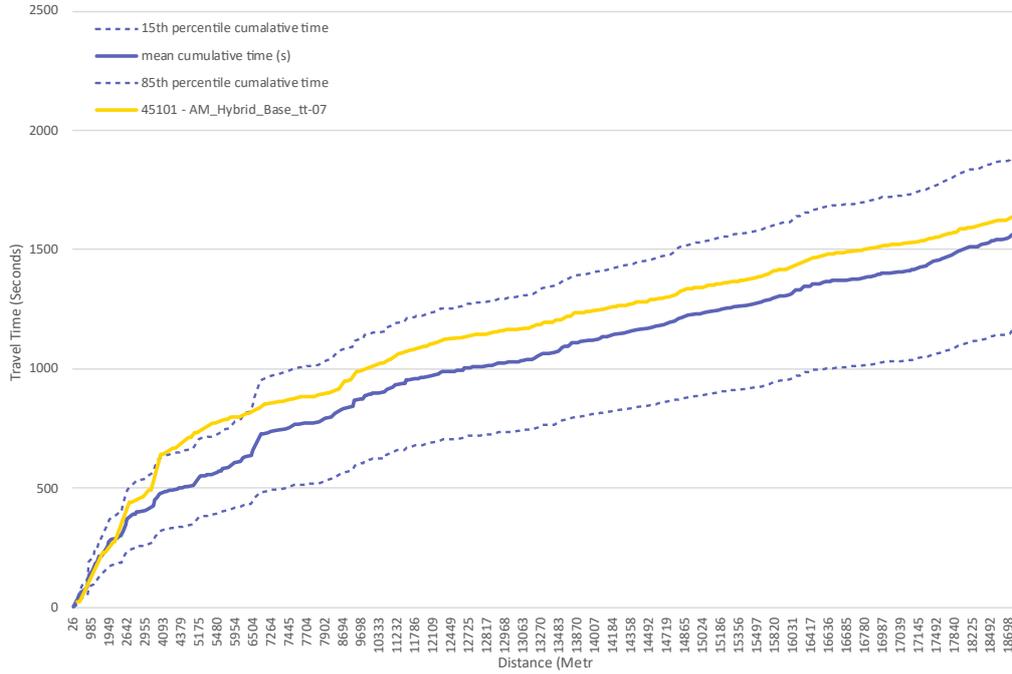
Travel time profile: Grenada – Seaview (7-8)

Tomtom vs Modelled Travel Time
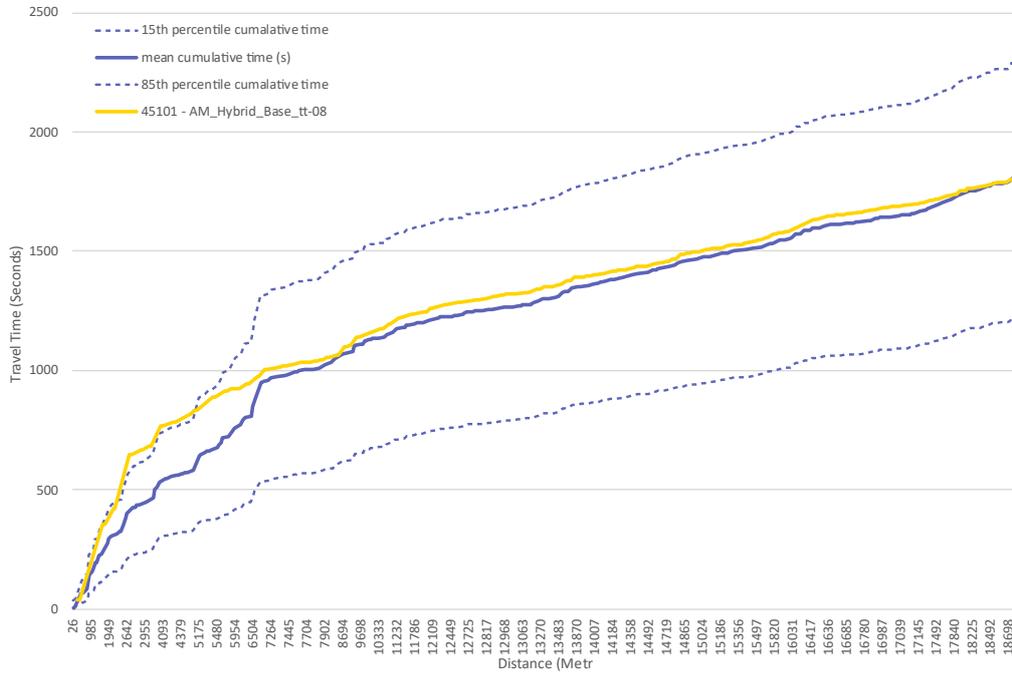
Travel time profile: Grenada – Seaview (8-9)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 43822978 - IP_Hybrid_Base_tt-11
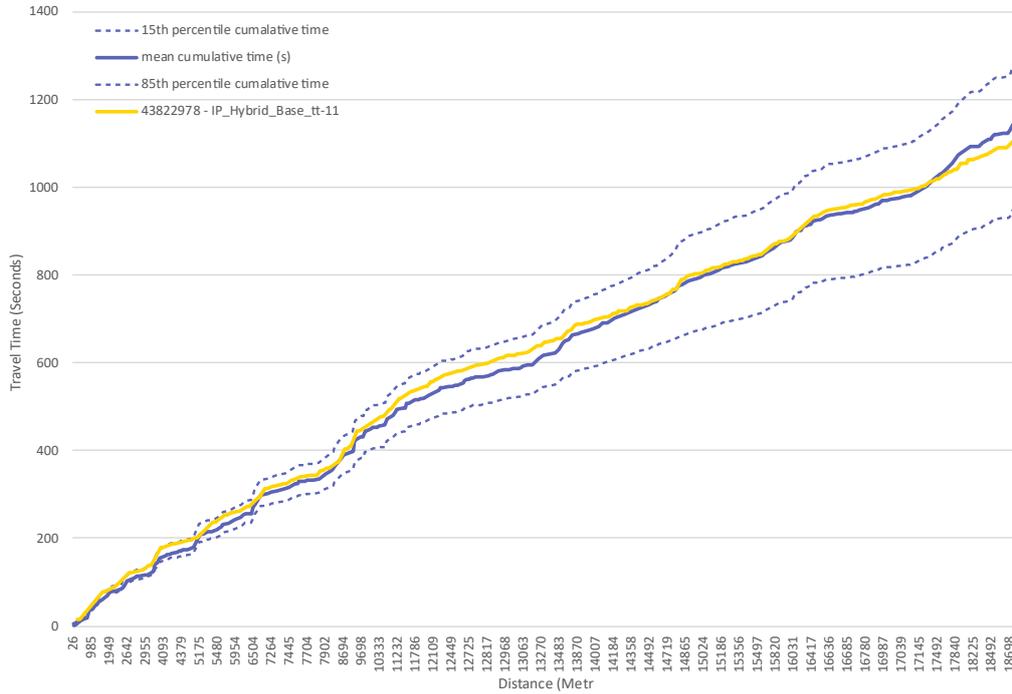
Travel time profile: Grenada – Seaview (11-12)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 43822978 - IP_Hybrid_Base_tt-12
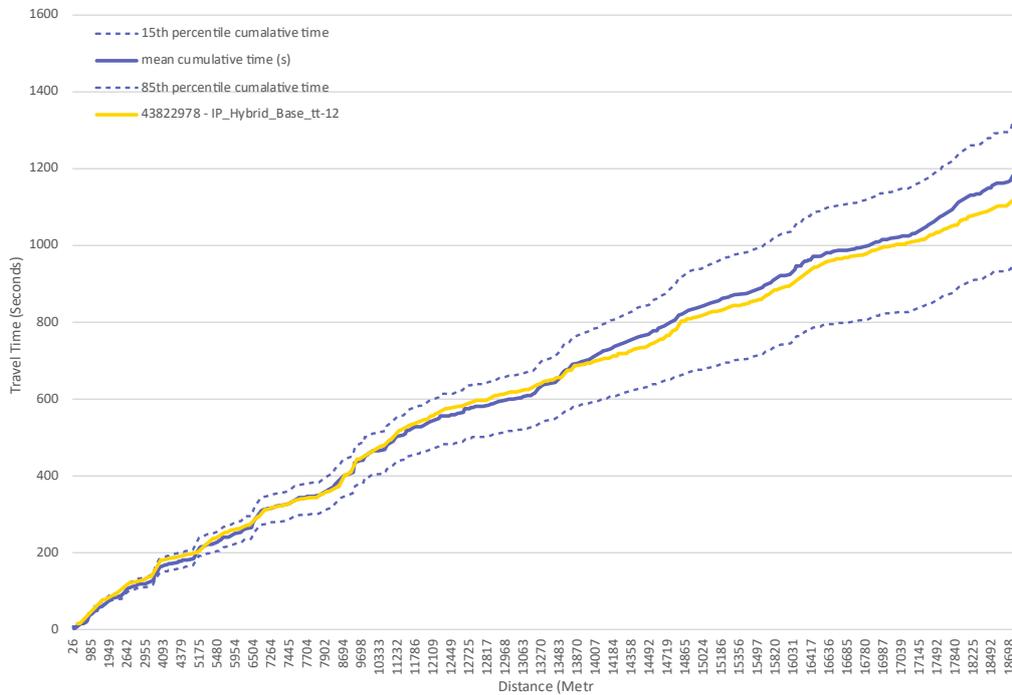
Travel time profile: Grenada – Seaview (12-13)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 43822988 - PM_Hybrid_Base_tt-16
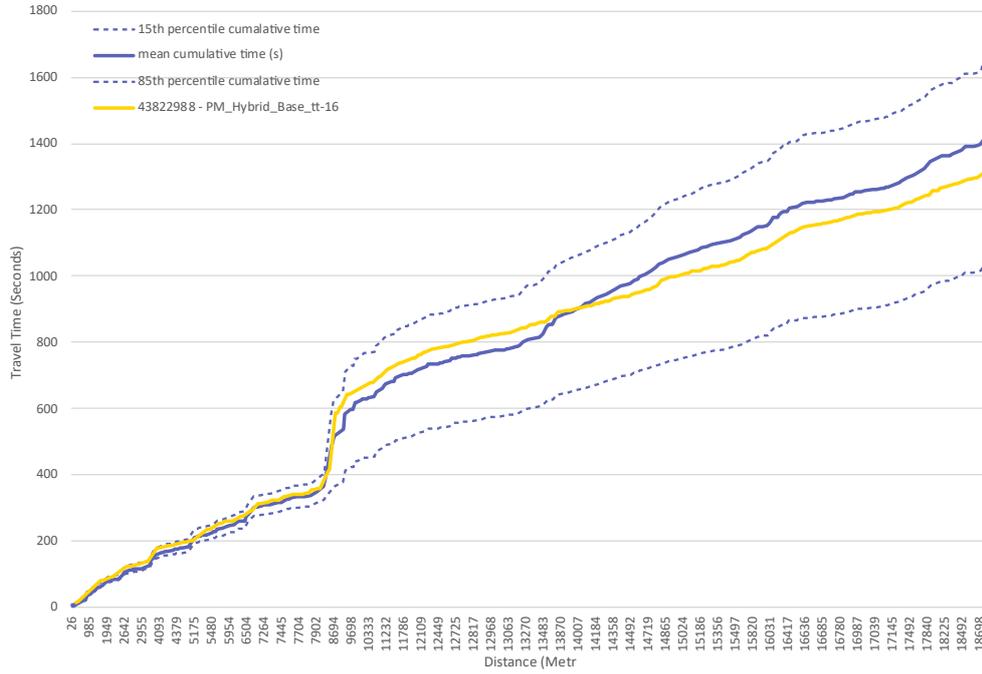
Travel time profile: Grenada – Seaview (16-17)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 43822988 - PM_Hybrid_Base_tt-17
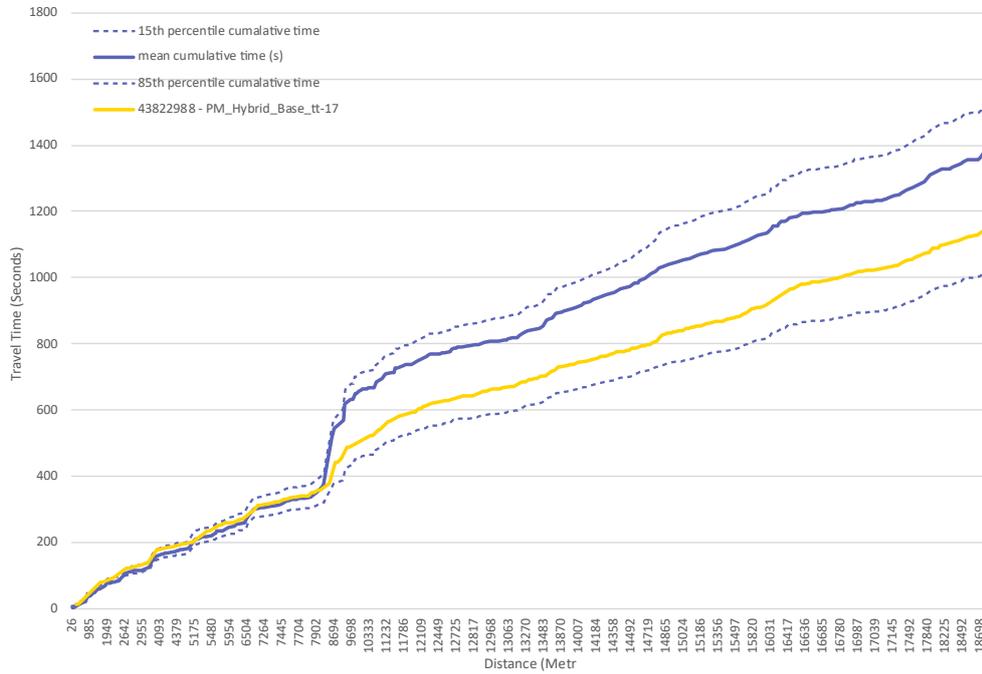
Travel time profile: Grenada – Seaview (17-18)

Tomtom vs Modelled Travel Time
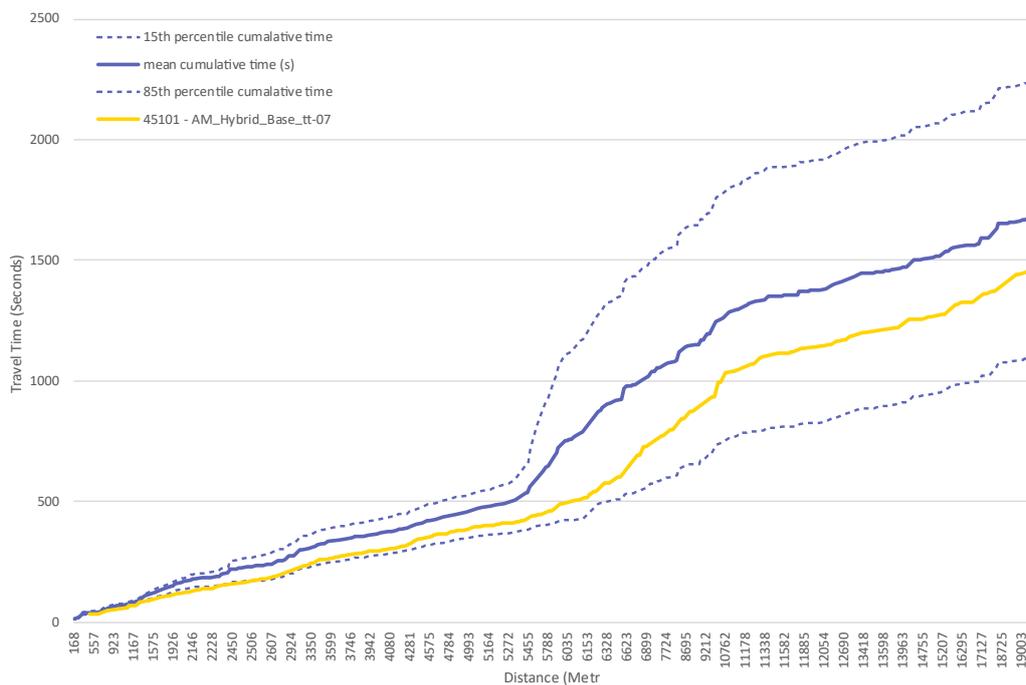
Travel time profile: Seaview – Grenada (7-8)

Tomtom vs Modelled Travel Time
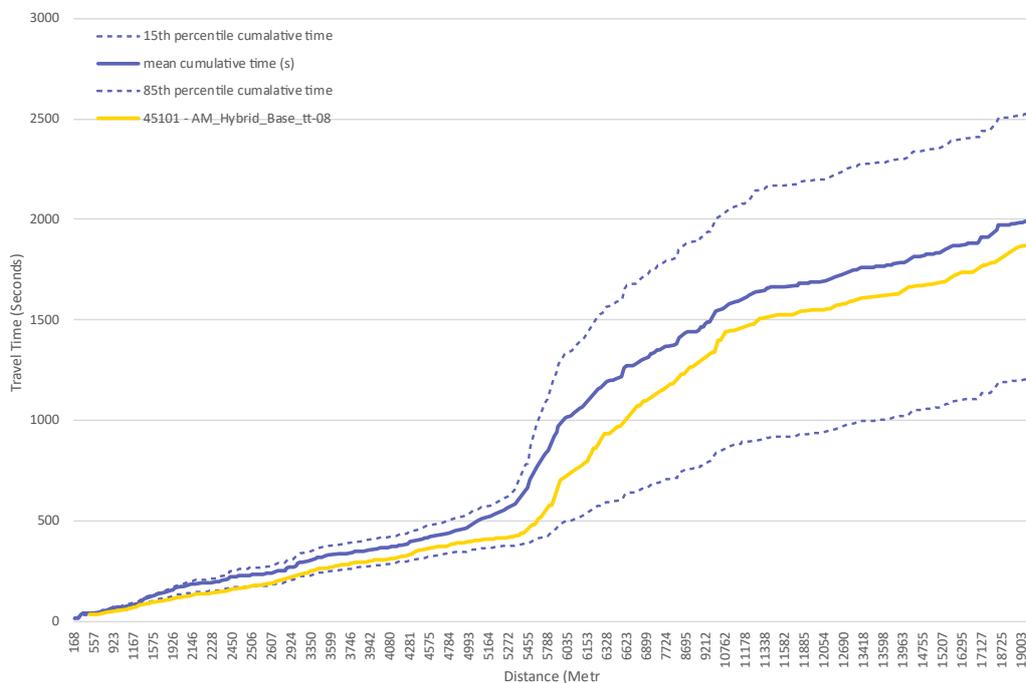
Travel time profile: Seaview – Grenada (8-9)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
───── mean cumulative time (s)
- - - - 85th percentile cumalative time
───── 43822978 - IP_Hybrid_Base_tt-11

Travel Time (Seconds)

Distance (Metr
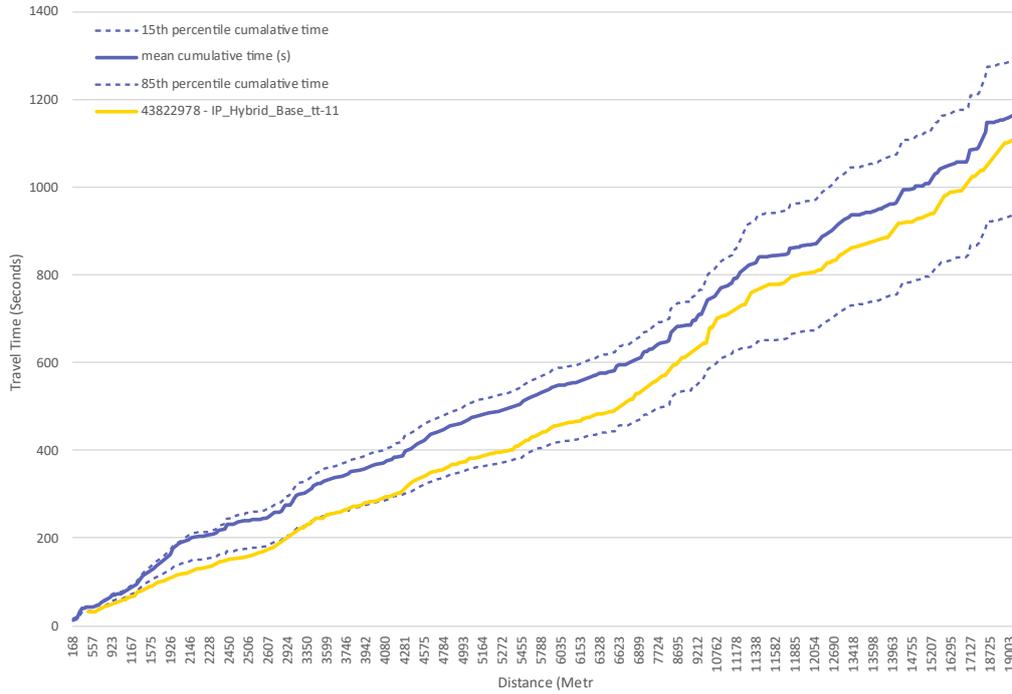
Travel time profile: Seaview – Grenada (11-12)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
───── mean cumulative time (s)
- - - - 85th percentile cumalative time
───── 43822978 - IP_Hybrid_Base_tt-12

Travel Time (Seconds)

Distance (Metr
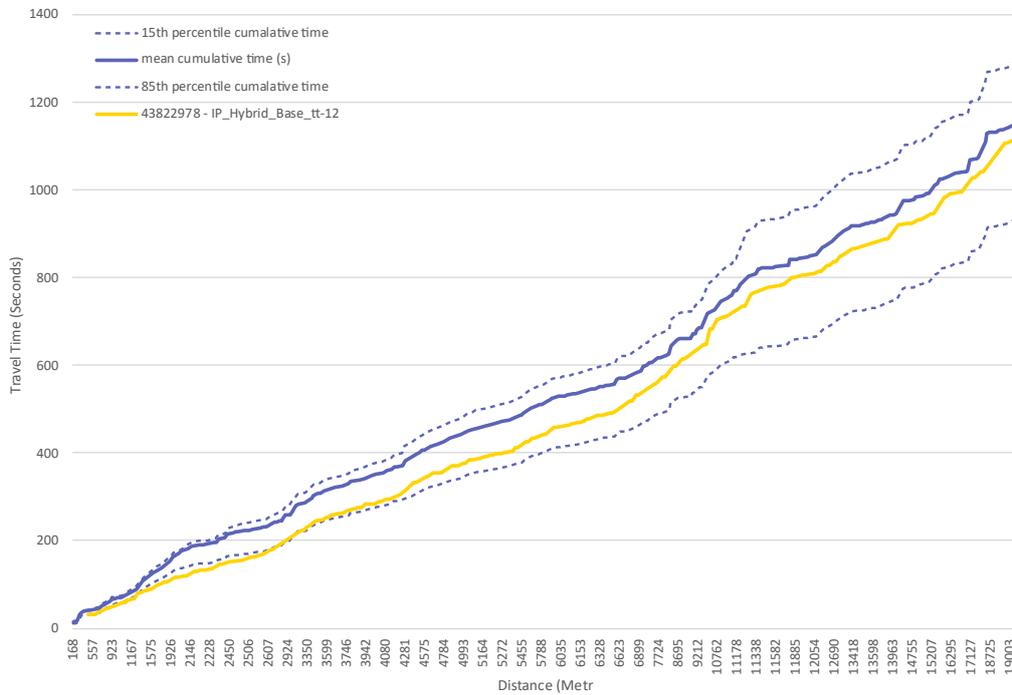
Travel time profile: Seaview – Grenada (12-13)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - - 85th percentile cumulative time
—— 43822988 - PM_Hybrid_Base_tt-16
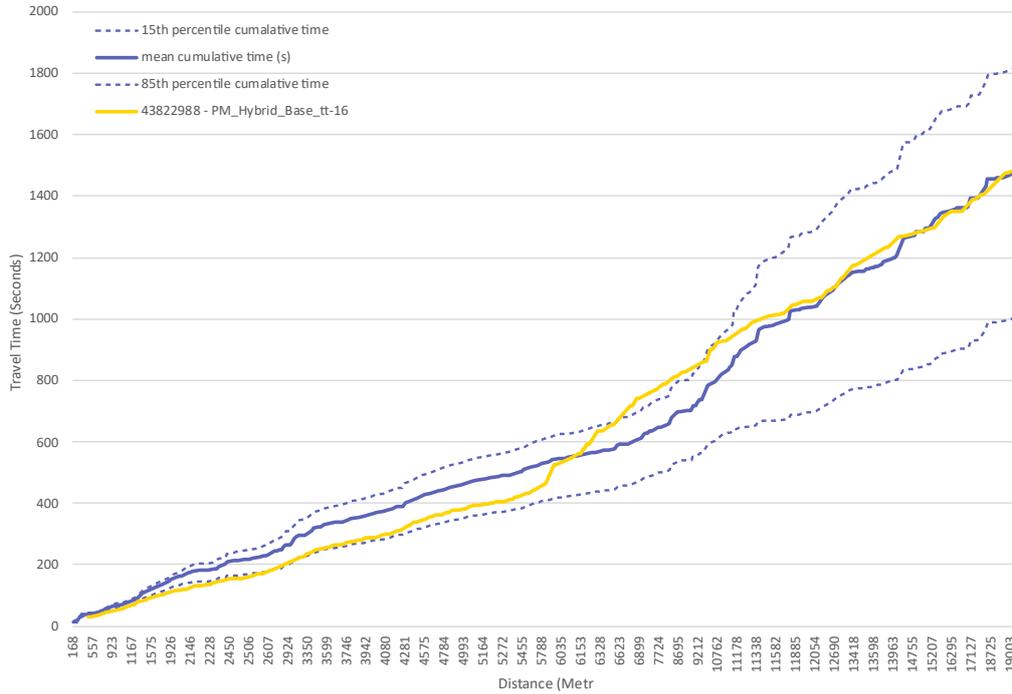
Travel time profile: Seaview – Grenada (16-17)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - - 85th percentile cumulative time
—— 43822988 - PM_Hybrid_Base_tt-17
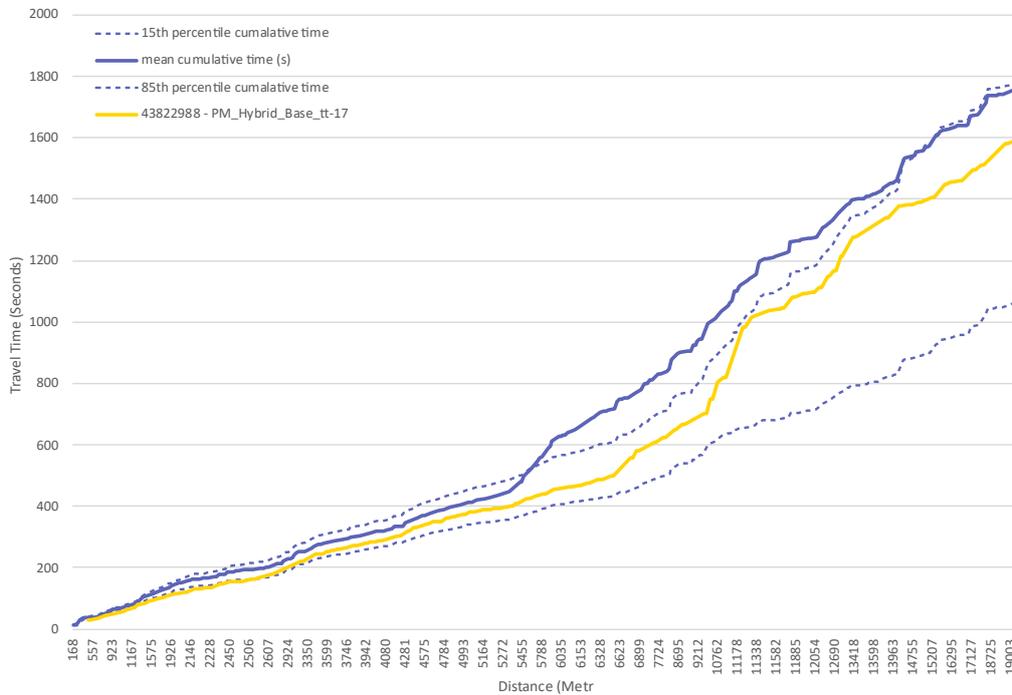
Travel time profile: Seaview – Grenada (17-18)

Tomtom vs Modelled Travel Time
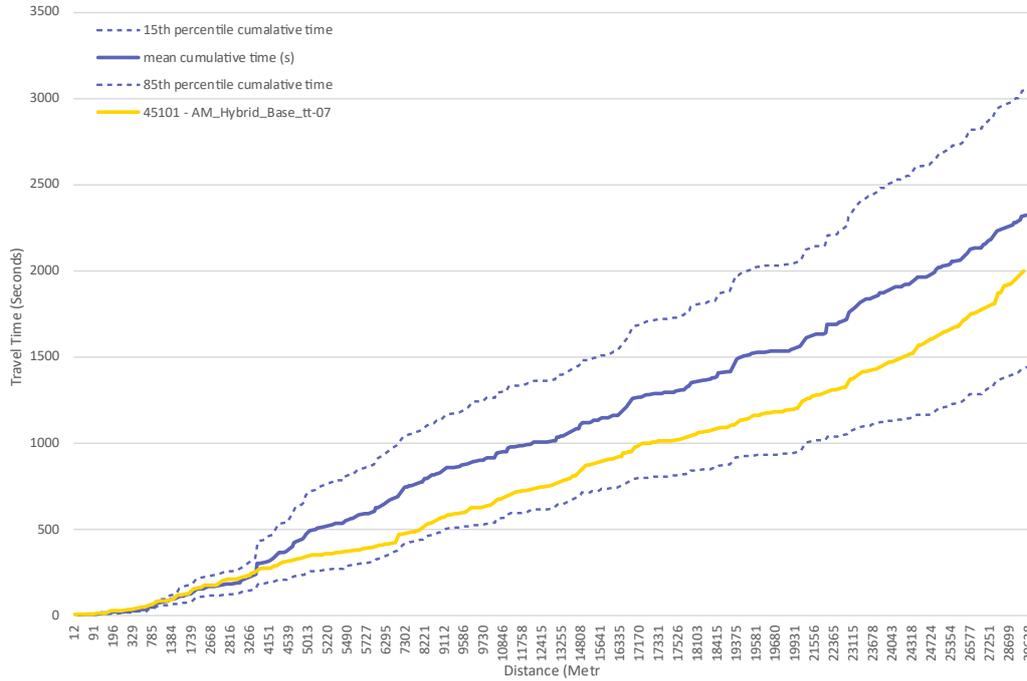
Travel time profile: SH2: Maoribank - Ngauranga (7-8)

Tomtom vs Modelled Travel Time
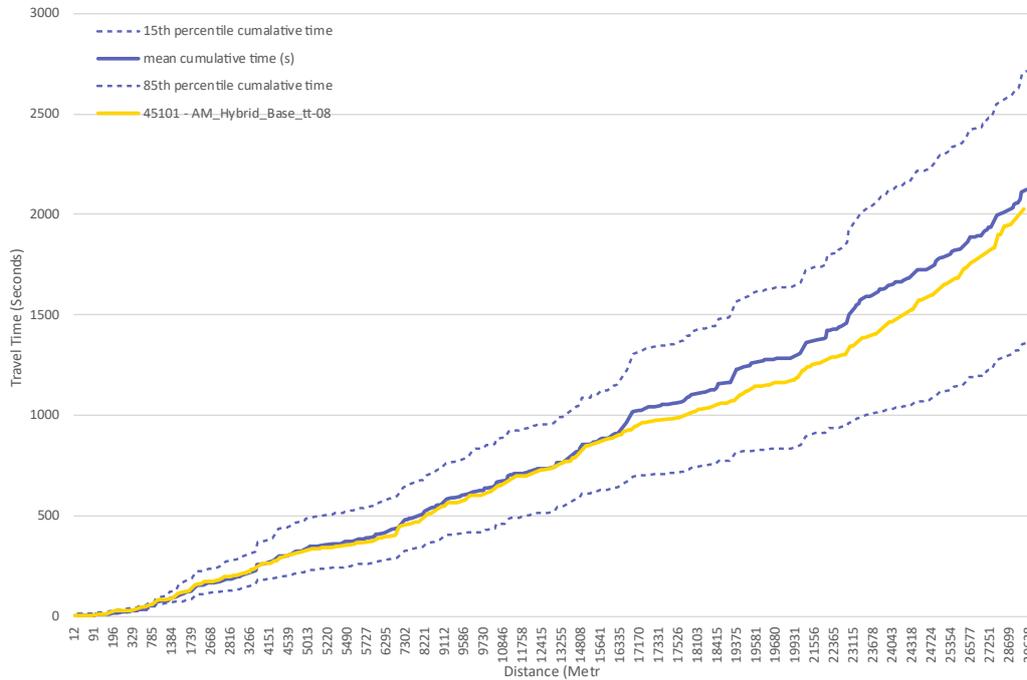
Travel time profile: SH2: Maoribank - Ngauranga (8-9)

Tomtom vs Modelled Travel Time
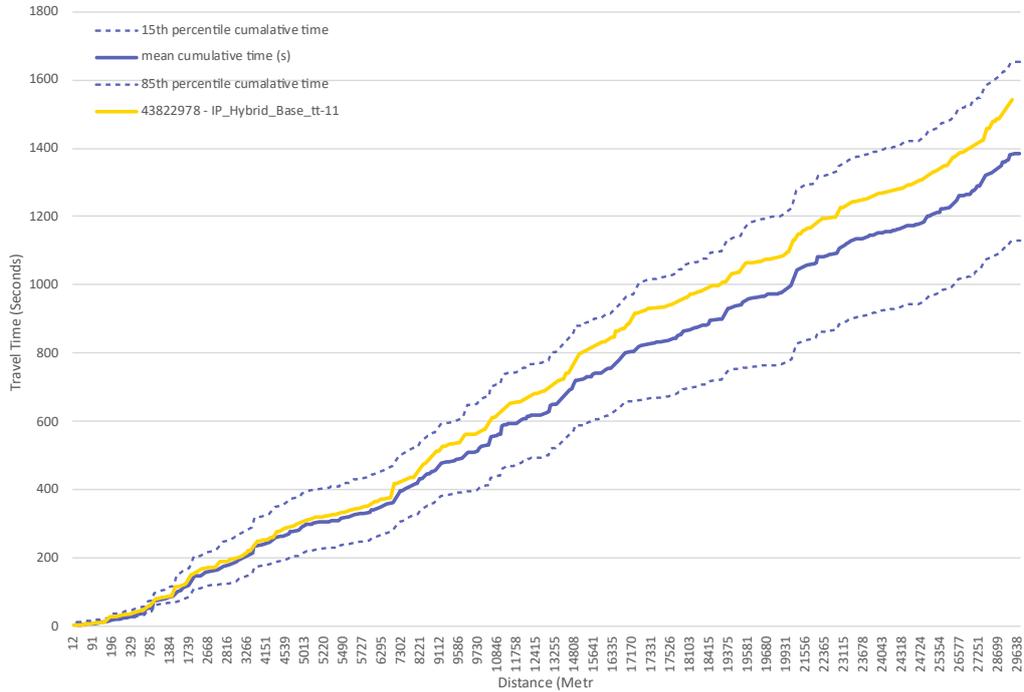
Travel time profile: SH2: Maoribank - Ngauranga (11-12)

Tomtom vs Modelled Travel Time
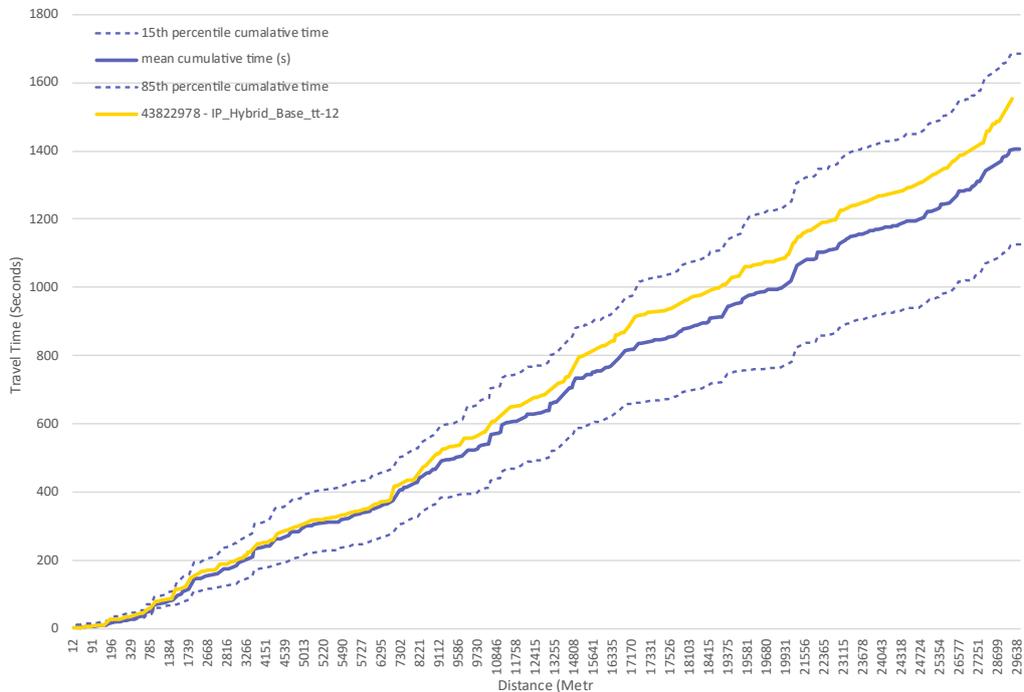
Travel time profile: SH2: Maoribank - Ngauranga (12-13)

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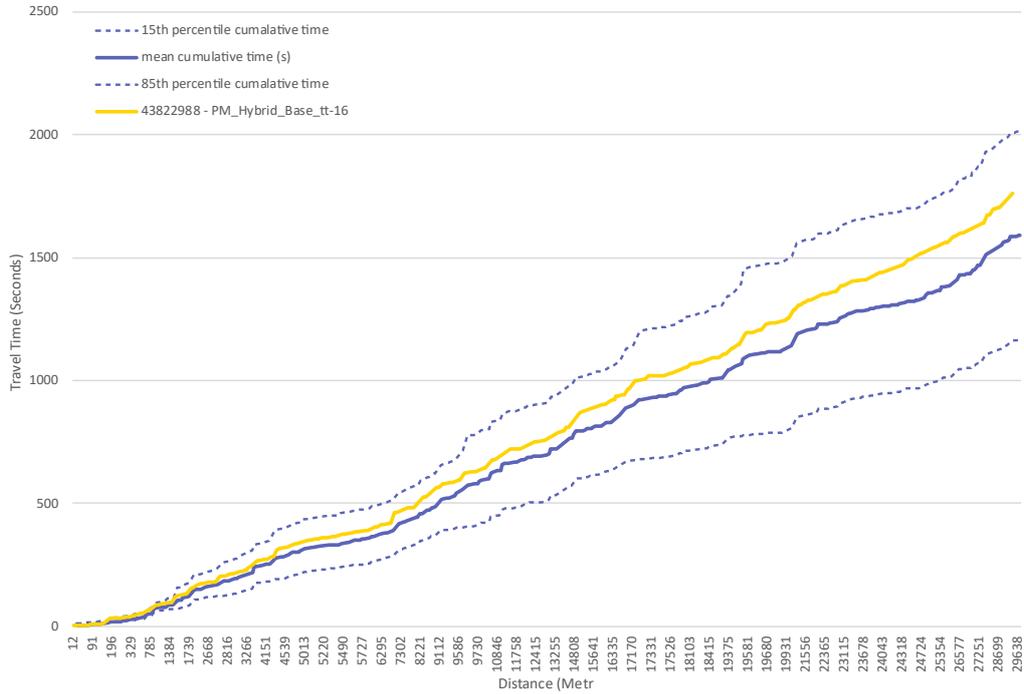
Travel time profile: SH2: Maoribank - Ngauranga (16-17)

Tomtom vs Modelled Travel Time
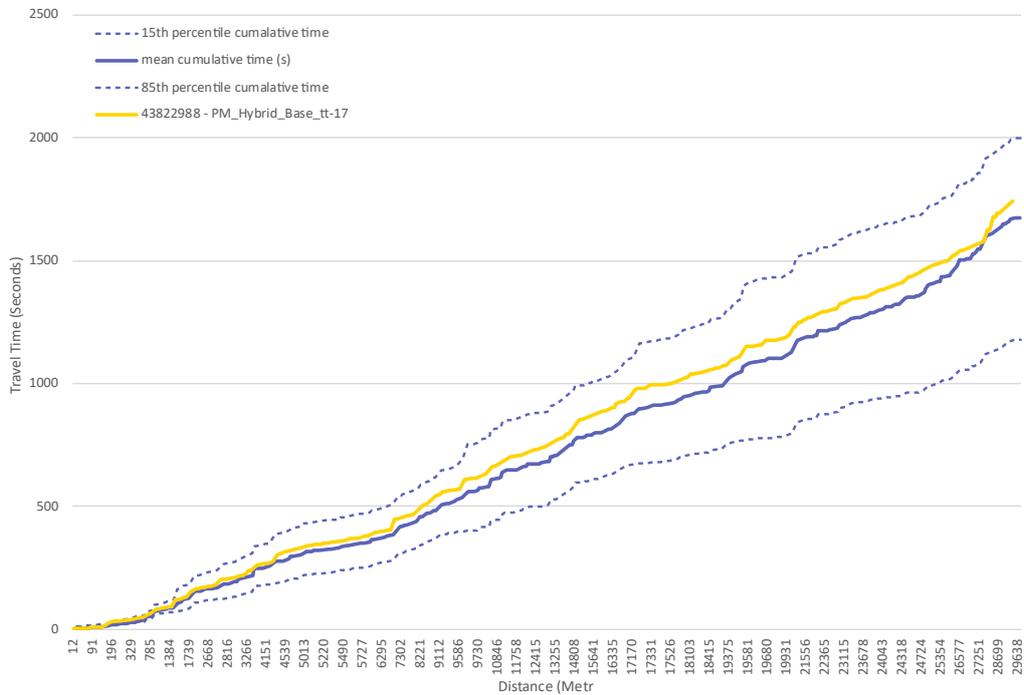
Travel time profile: SH2: Maoribank - Ngauranga (17-18)

Tomtom vs Modelled Travel Time
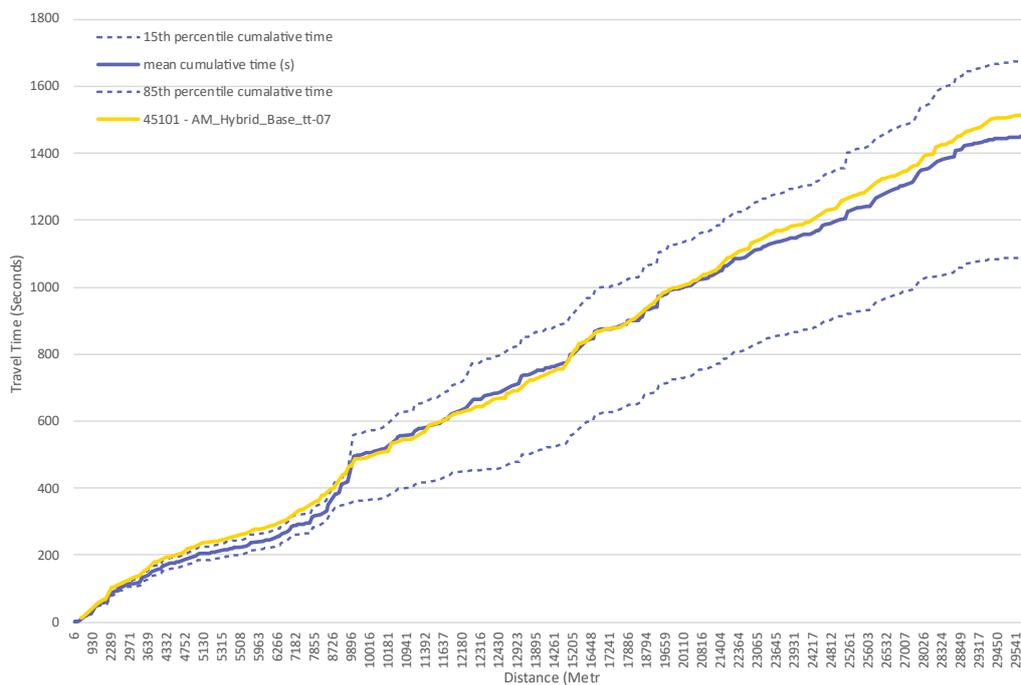
Travel time profile: SH2: Ngauranga – Maoribank (7-8)

Tomtom vs Modelled Travel Time
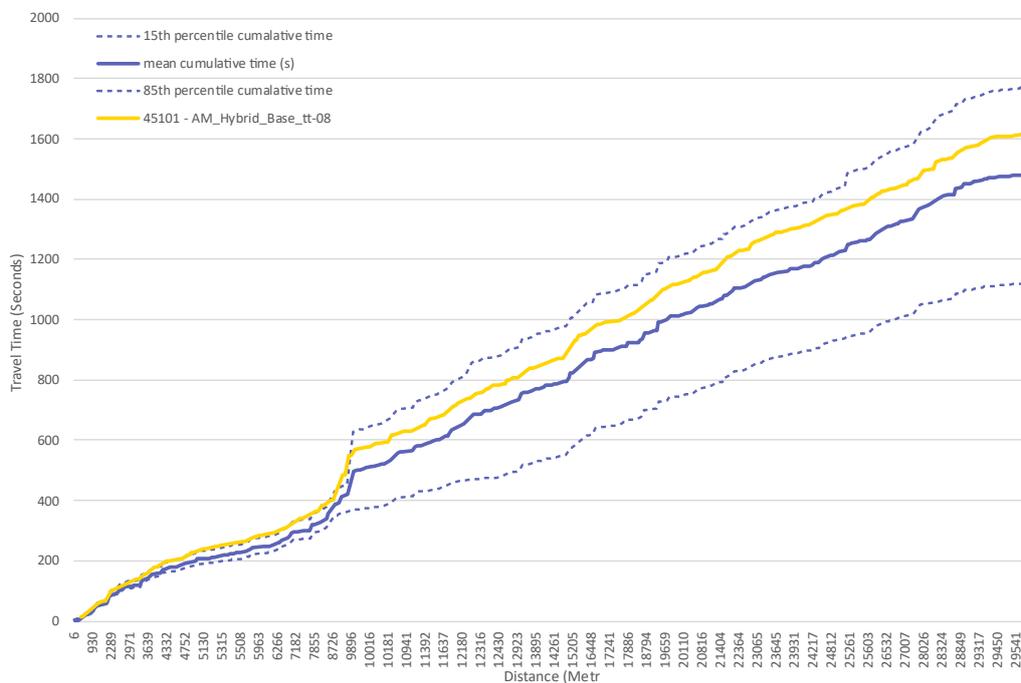
Travel time profile: Ngauranga – Maoribank (8-9)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 43822978 - IP_Hybrid_Base_tt-11

Travel Time (Seconds)

Distance (Metr
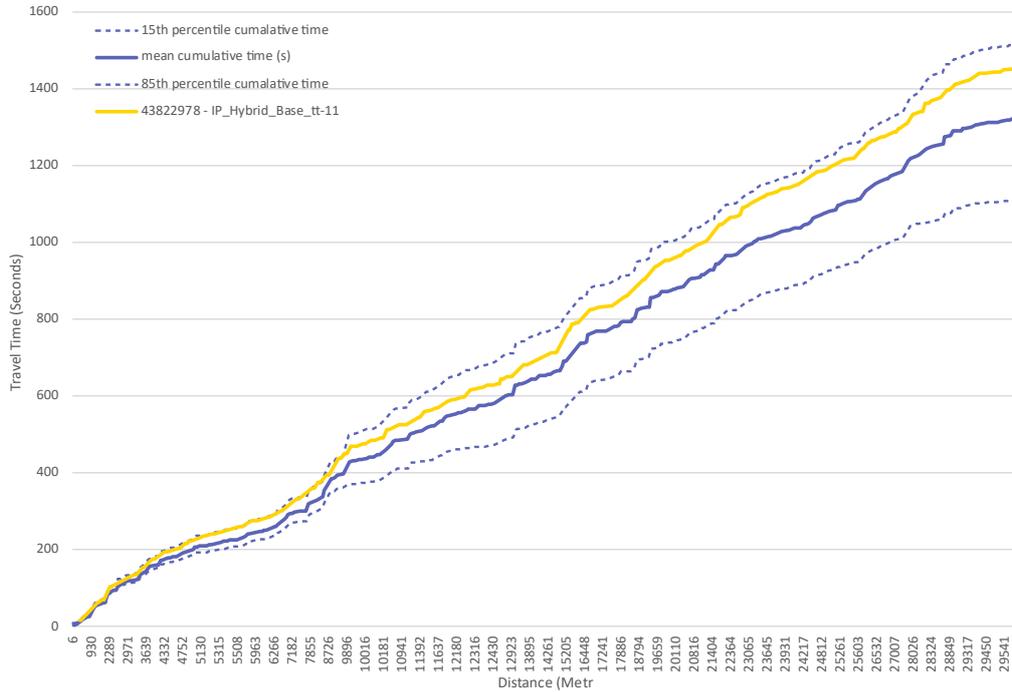
Travel time profile: Ngauranga – Maoribank (11-12)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 43822978 - IP_Hybrid_Base_tt-12

Travel Time (Seconds)

Distance (Metr
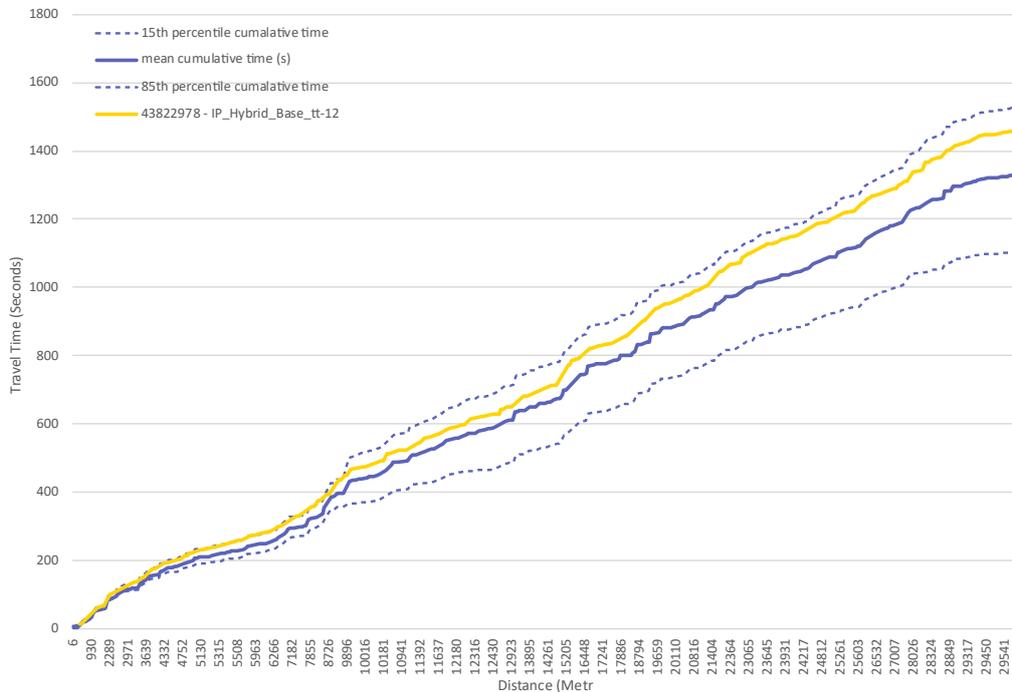
Travel time profile: Ngauranga – Maoribank (12-13)

Tomtom vs Modelled Travel Time
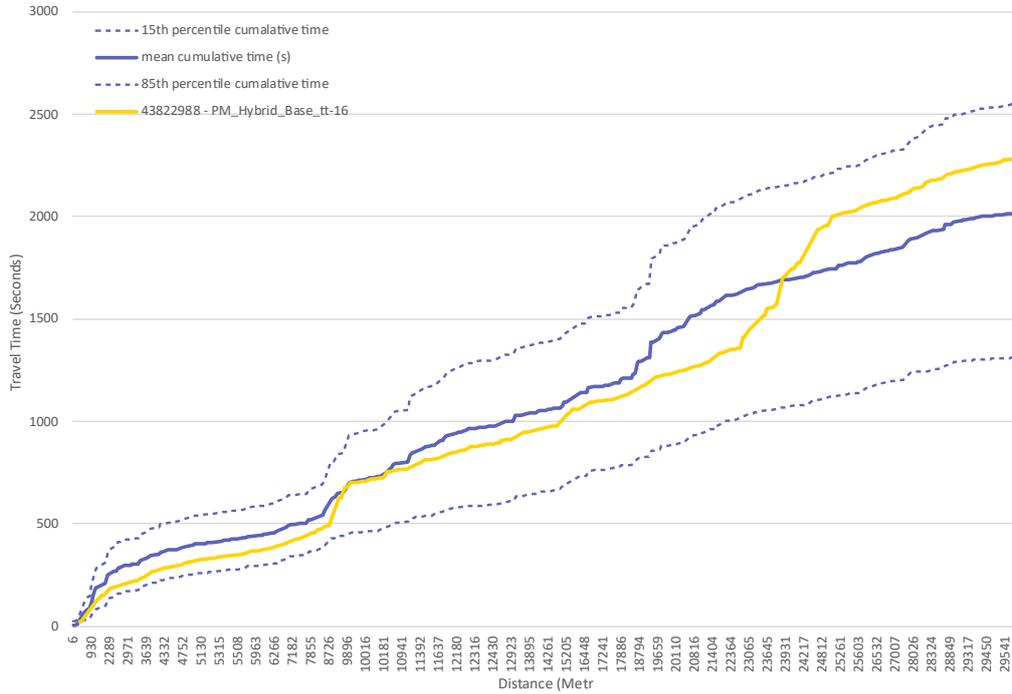
Travel time profile: Ngauranga – Maoribank (16-17)

Tomtom vs Modelled Travel Time
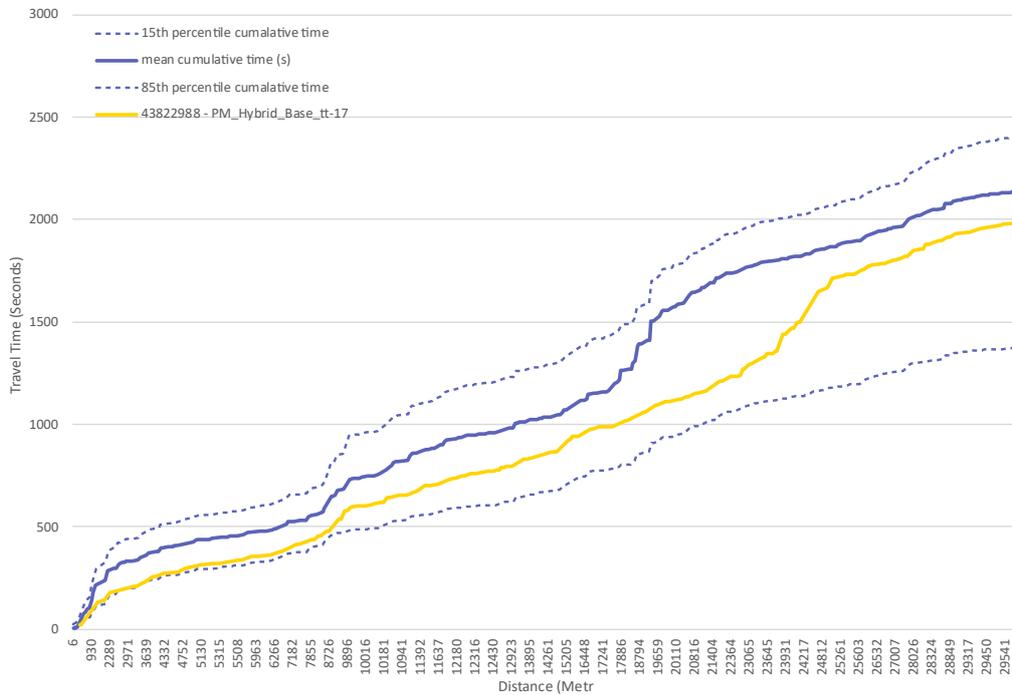
Travel time profile: Ngauranga – Maoribank (17-18)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 45101 - AM_Hybrid_Base_tt-07

Y-axis: Travel Time (Seconds)
X-axis: Distance (Metr
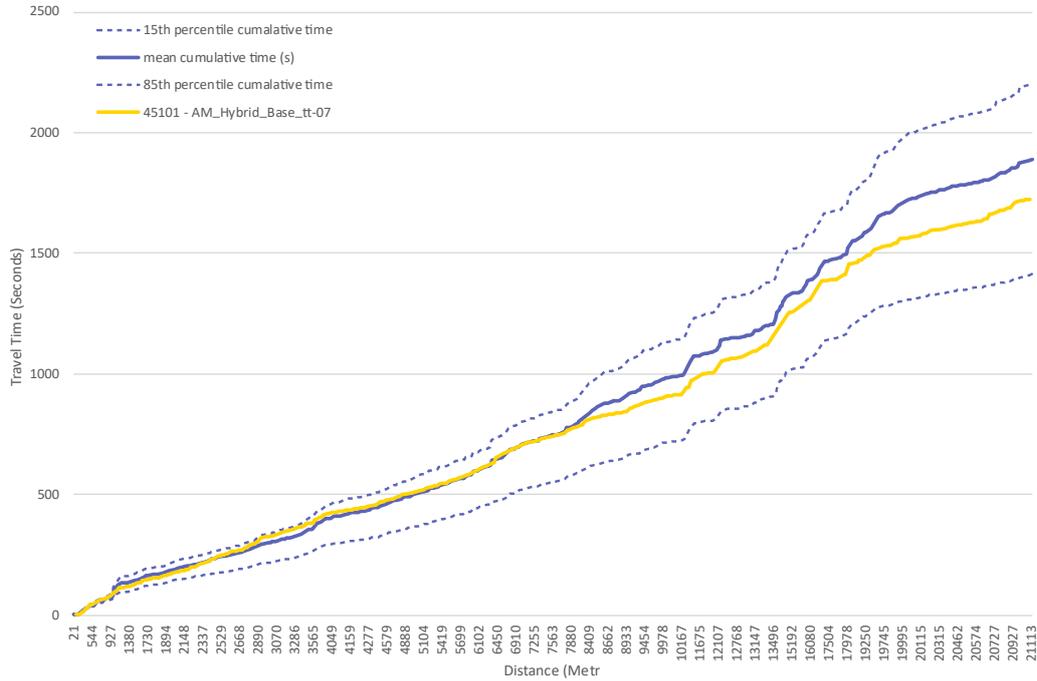
Travel time profile: Fergusson Dr – Harcourt Werry Dr (7-8)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 45101 - AM_Hybrid_Base_tt-08

Y-axis: Travel Time (Seconds)
X-axis: Distance (Metr
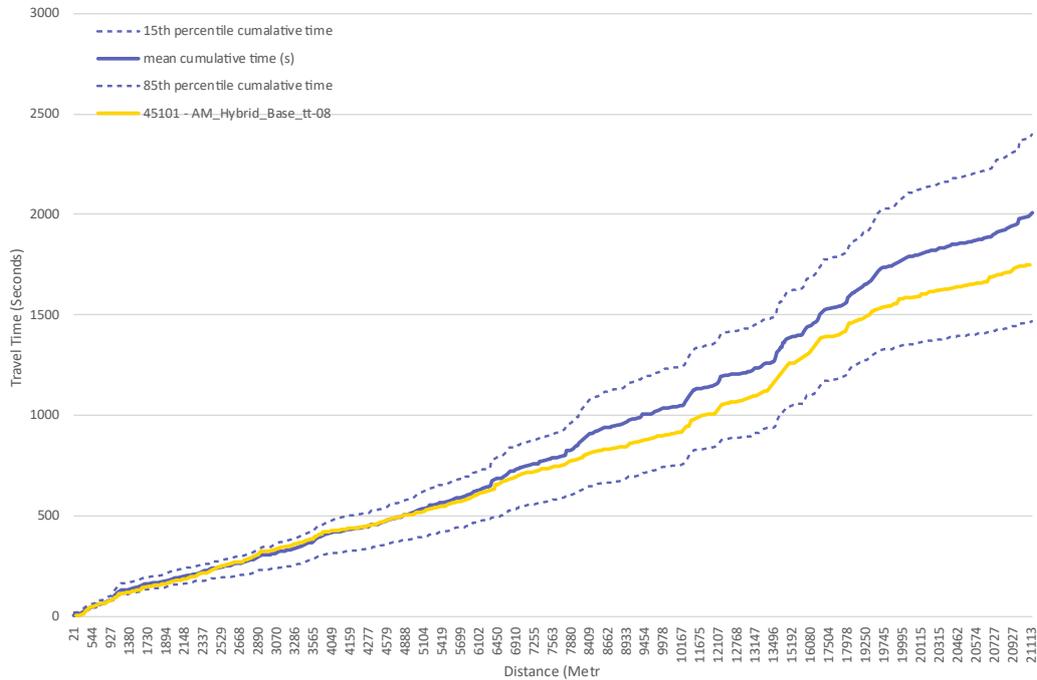
Travel time profile: Fergusson Dr – Harcourt Werry Dr (8-9)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - - 85th percentile cumalative time
—— 43822978 - IP_Hybrid_Base_tt-11

Travel Time (Seconds)

Distance (Metr
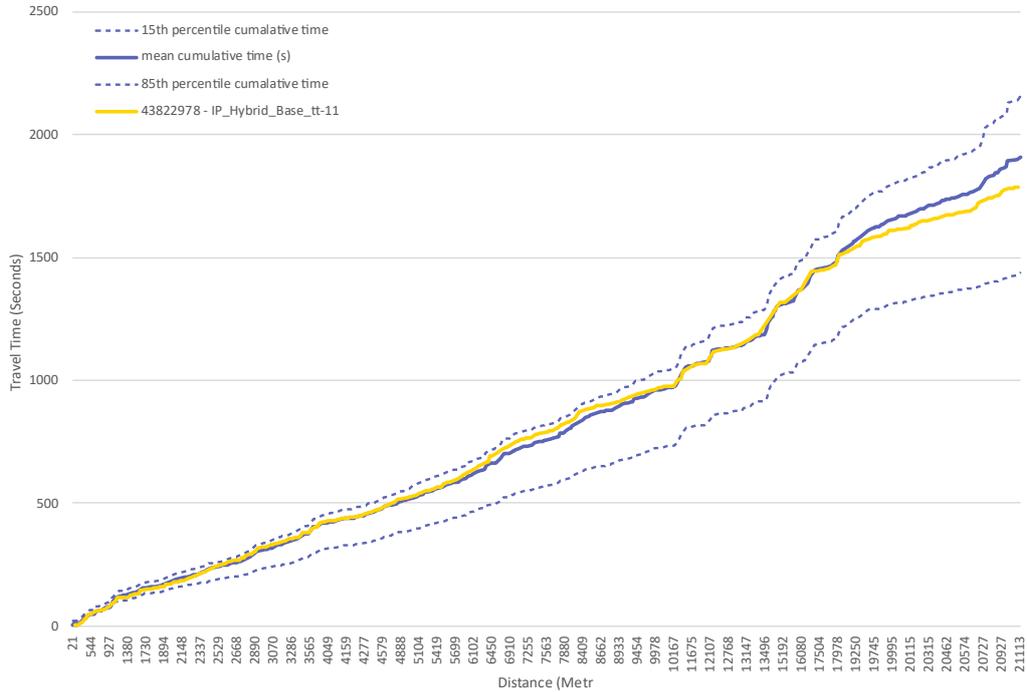
Travel time profile: Fergusson Dr – Harcourt Werry Dr (11-12)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
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- - - - 85th percentile cumalative time
—— 43822978 - IP_Hybrid_Base_tt-12

Travel Time (Seconds)

Distance (Metr
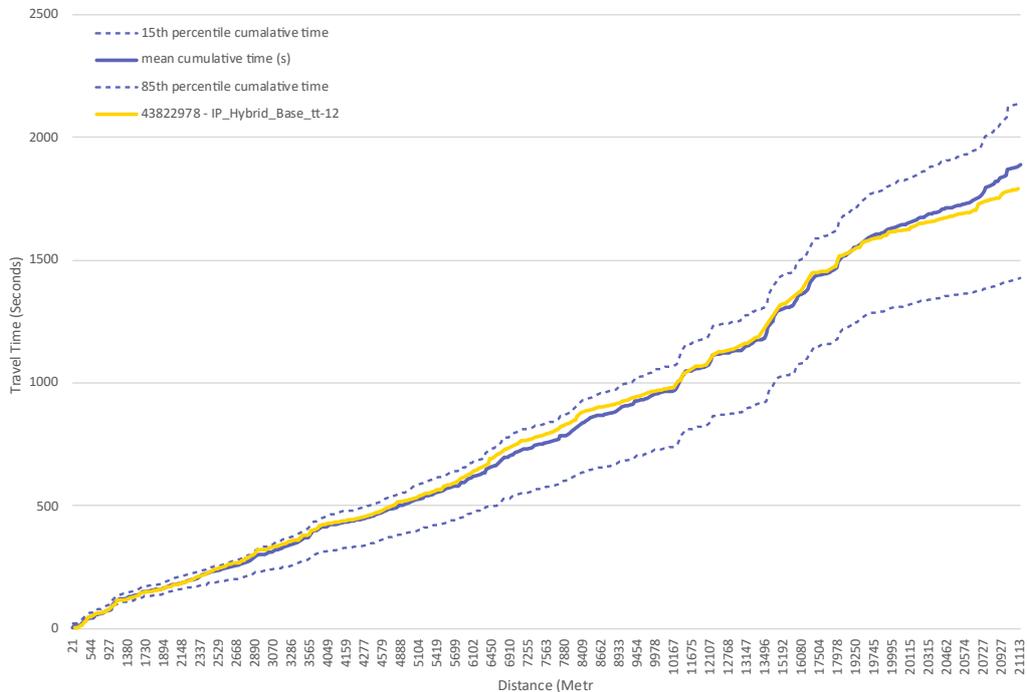
Travel time profile: Fergusson Dr – Harcourt Werry Dr (12-13)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - - 85th percentile cumalative time
—— 43822988 - PM_Hybrid_Base_tt-16

Travel Time (Seconds) / Distance (Metr
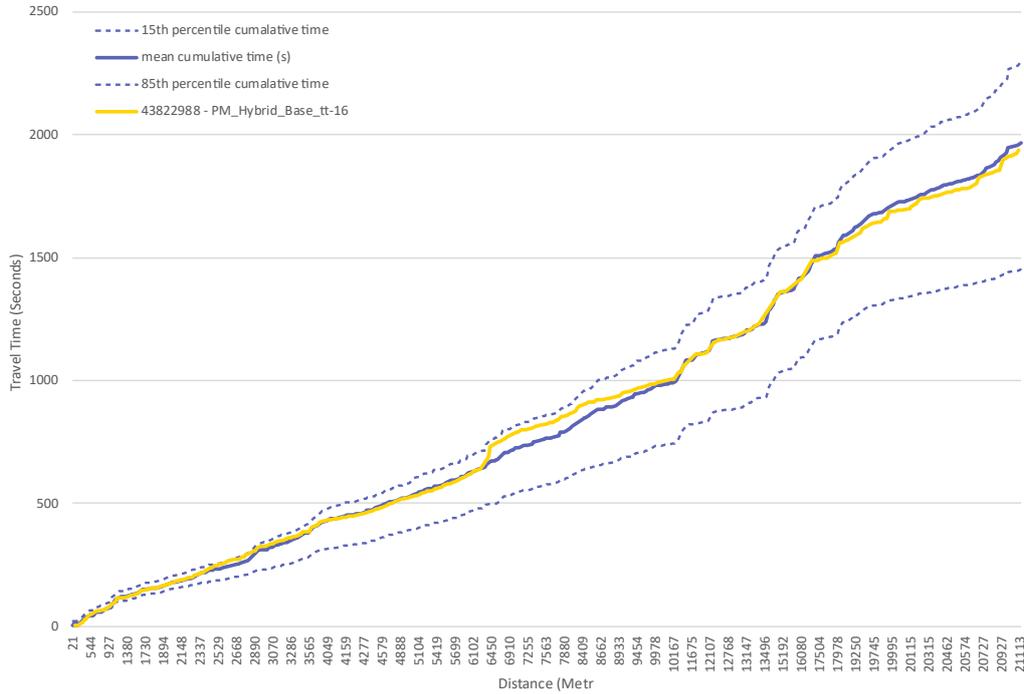
Travel time profile: Fergusson Dr – Harcourt Werry Dr (16-17)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - - 85th percentile cumalative time
—— 43822988 - PM_Hybrid_Base_tt-17

Travel Time (Seconds) / Distance (Metr
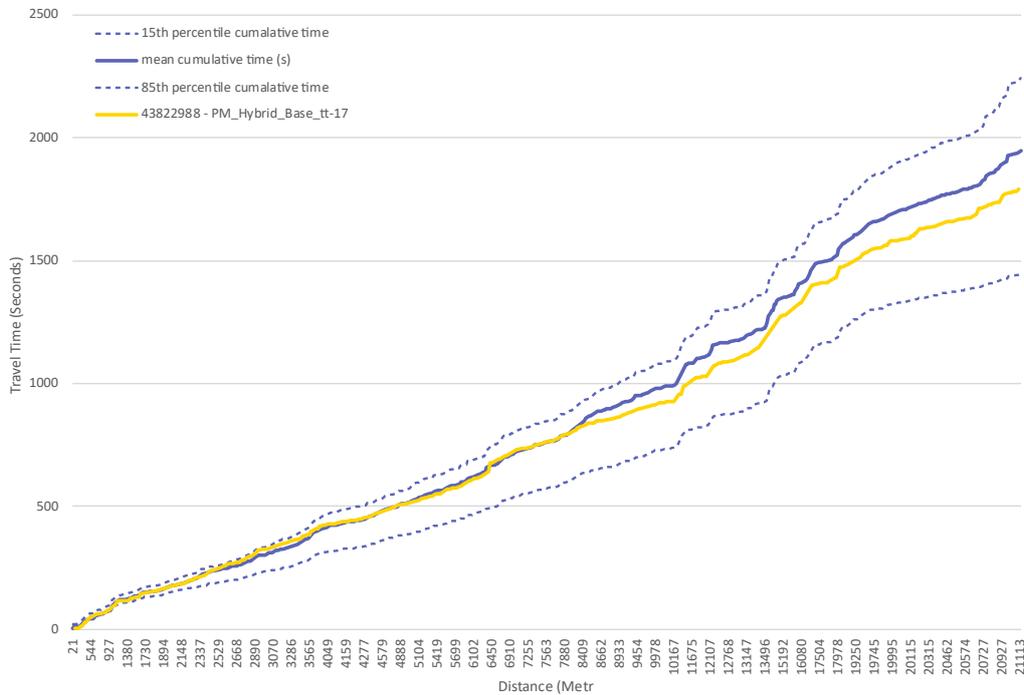
Travel time profile: Fergusson Dr – Harcourt Werry Dr (17-18)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - - 85th percentile cumalative time
—— 45101 - AM_Hybrid_Base_tt-07
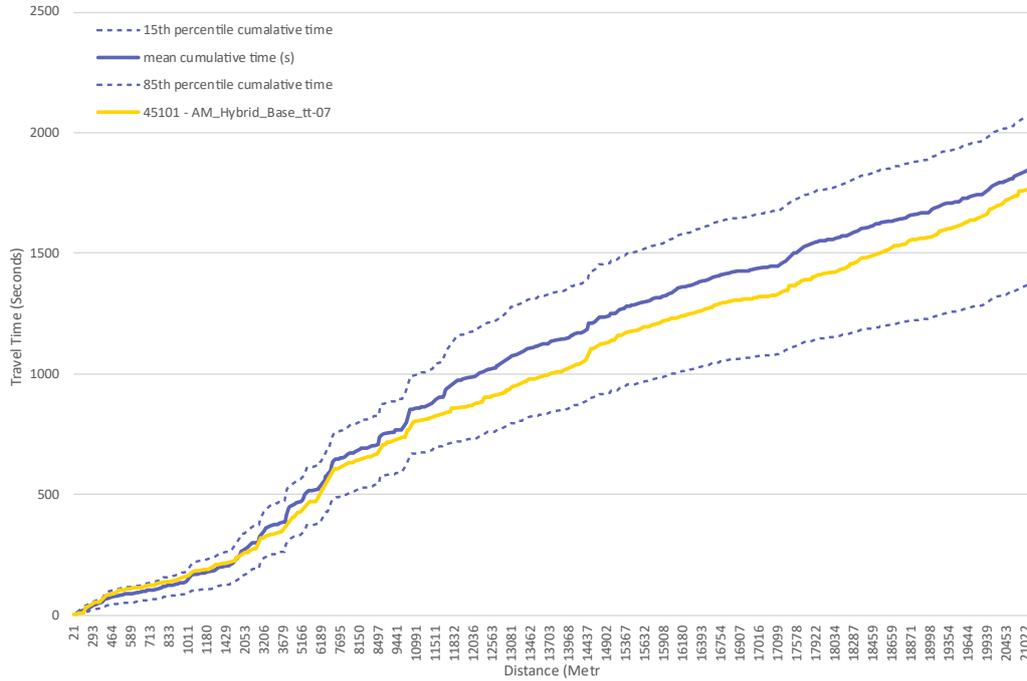
Travel time profile: Harcourt Werry Dr – Fergusson Dr (7-8)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - - 85th percentile cumalative time
—— 45101 - AM_Hybrid_Base_tt-08
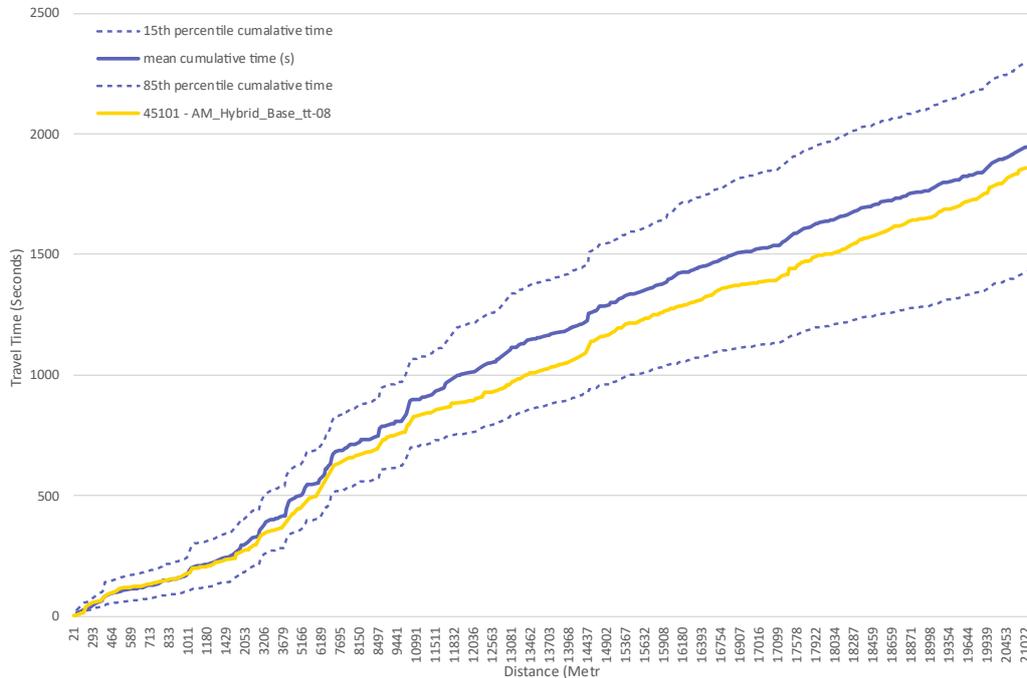
Travel time profile: Harcourt Werry Dr – Fergusson Dr (8-9)

Tomtom vs Modelled Travel Time
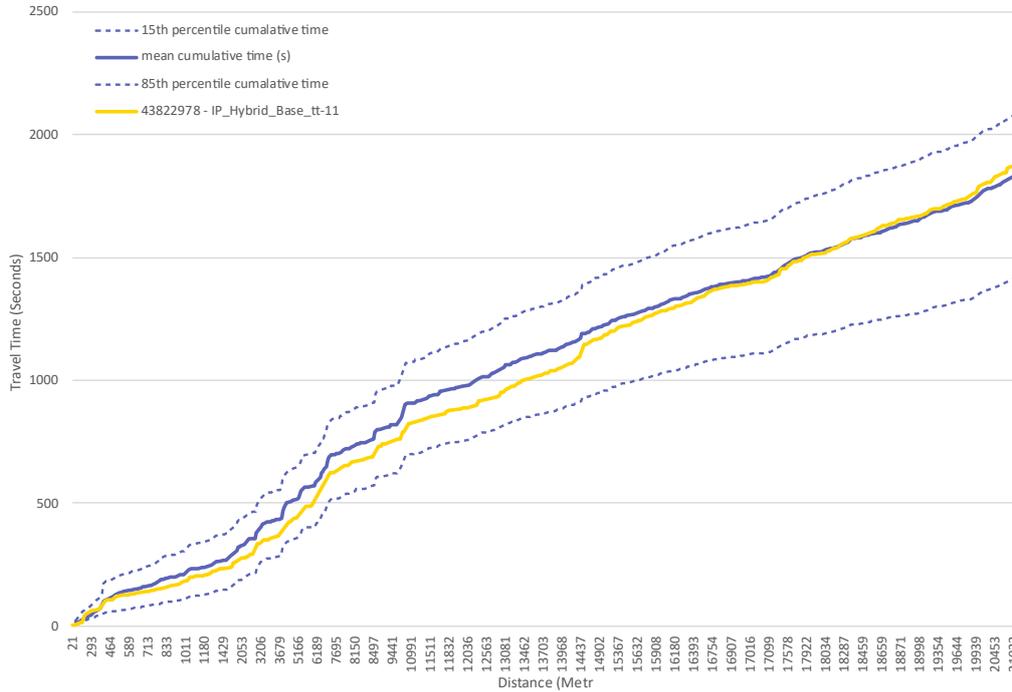
Travel time profile: Harcourt Werry Dr – Fergusson Dr (11-12)

Tomtom vs Modelled Travel Time
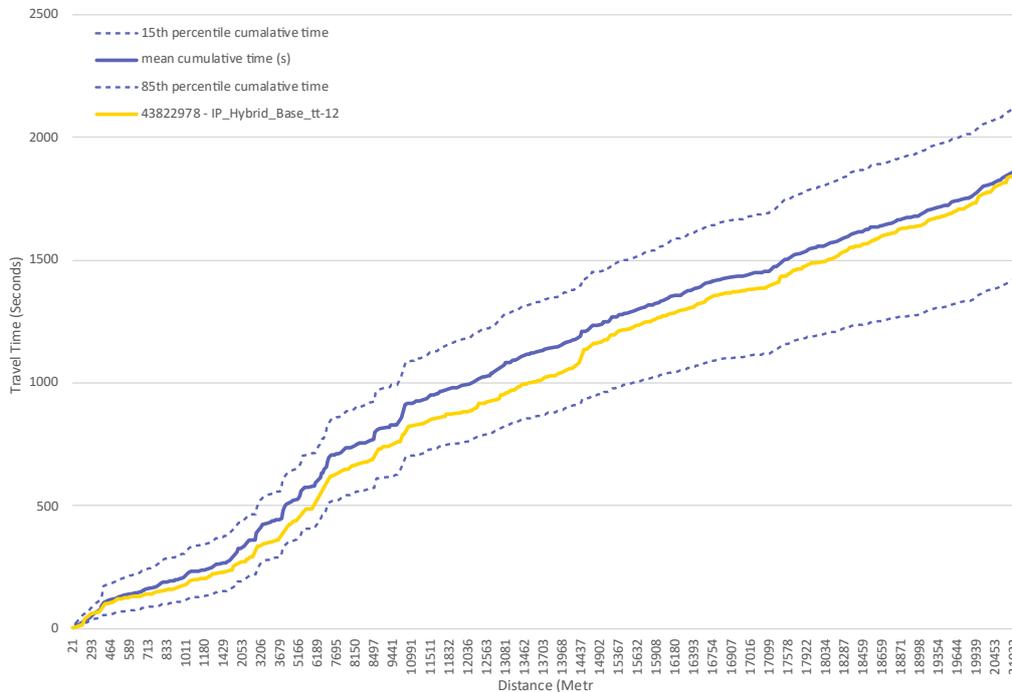
Travel time profile: Harcourt Werry Dr – Fergusson Dr (12-13)

Tomtom vs Modelled Travel Time
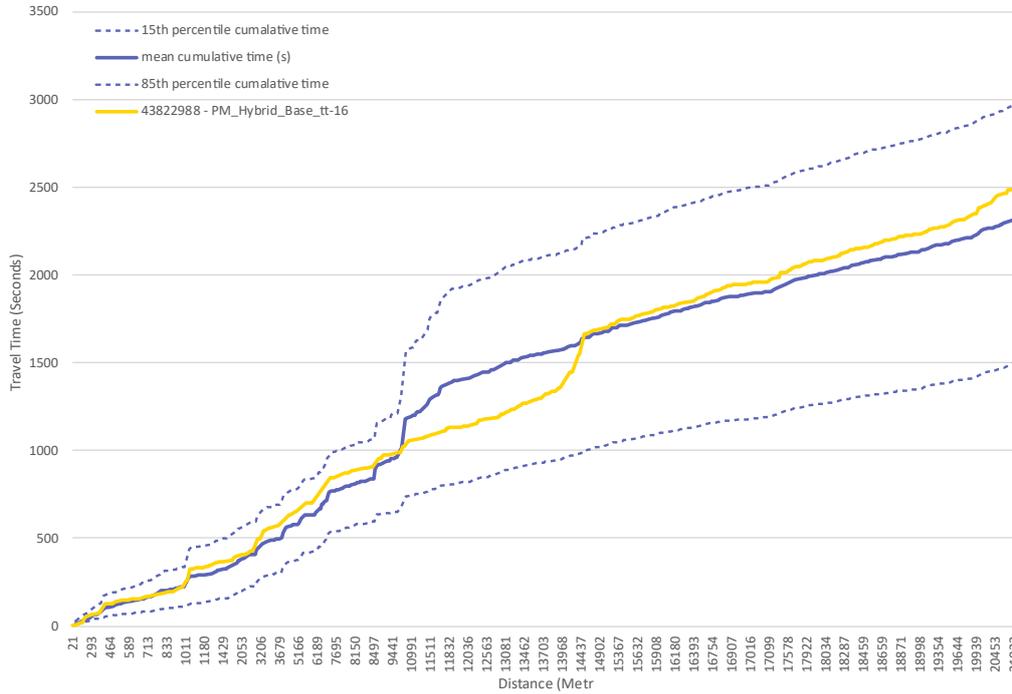
Travel time profile: Harcourt Werry Dr – Fergusson Dr (16-17)

Tomtom vs Modelled Travel Time
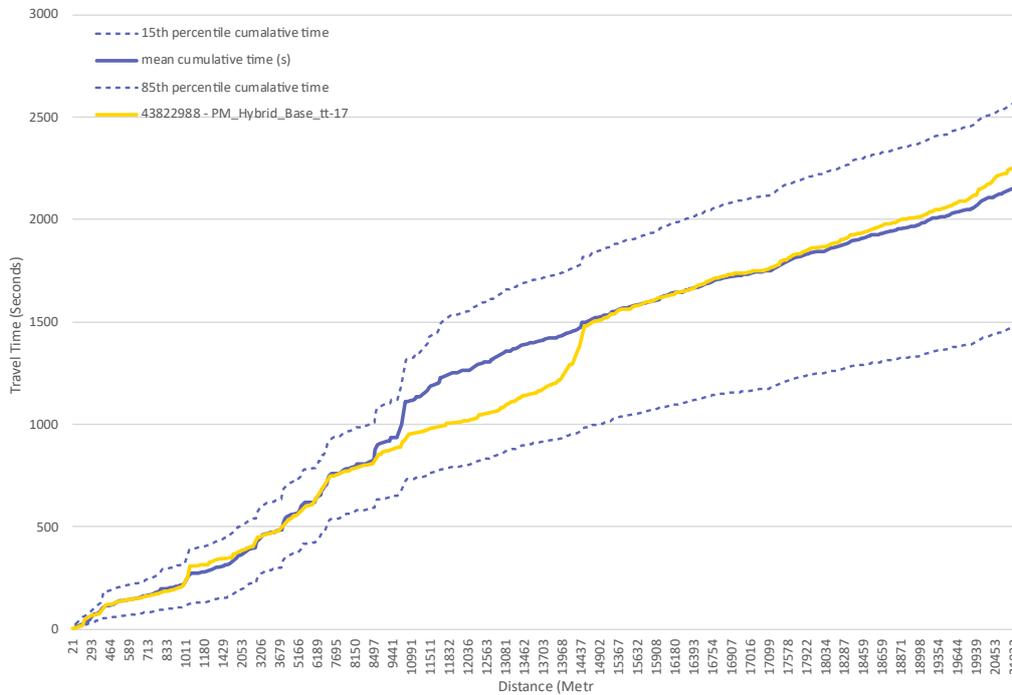
Travel time profile: Harcourt Werry Dr – Fergusson Dr (17-18)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
── mean cumulative time (s)
- - - - 85th percentile cumalative time
── 45101 - AM_Hybrid_Base_tt-07

Travel Time (Seconds) vs *Distance (Metr*
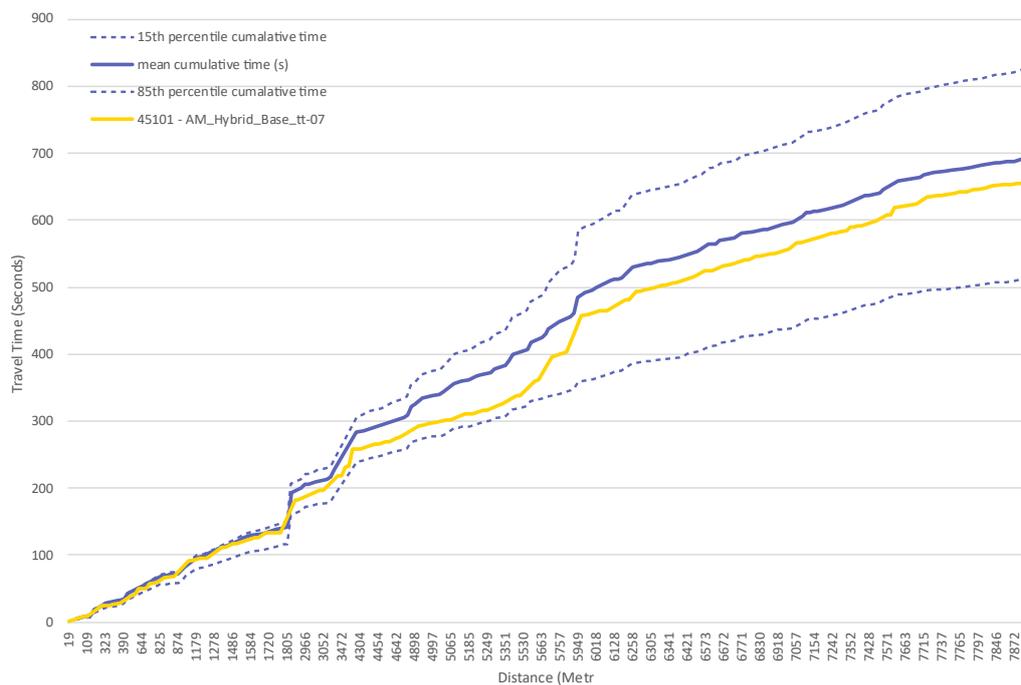
Travel time profile: Wainuiomata – CBD (7-8)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
── mean cumulative time (s)
- - - - 85th percentile cumalative time
── 45101 - AM_Hybrid_Base_tt-08

Travel Time (Seconds) vs *Distance (Metr*
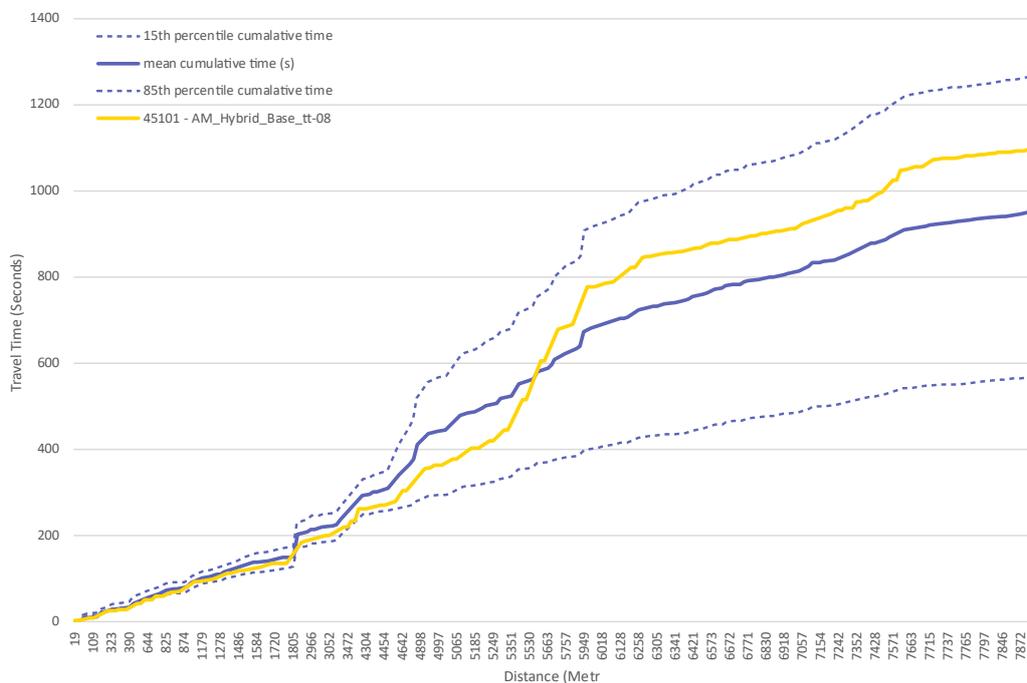
Travel time profile: Wainuiomata – CBD (8-9)

Tomtom vs Modelled Travel Time
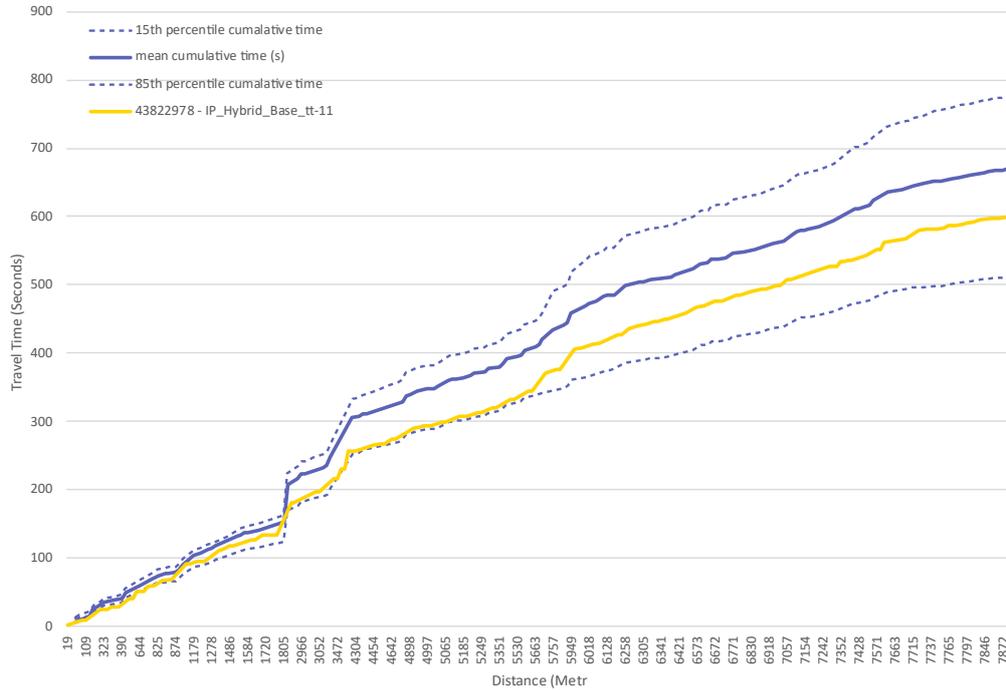
Travel time profile: Wainuiomata – CBD (11-12)

Tomtom vs Modelled Travel Time
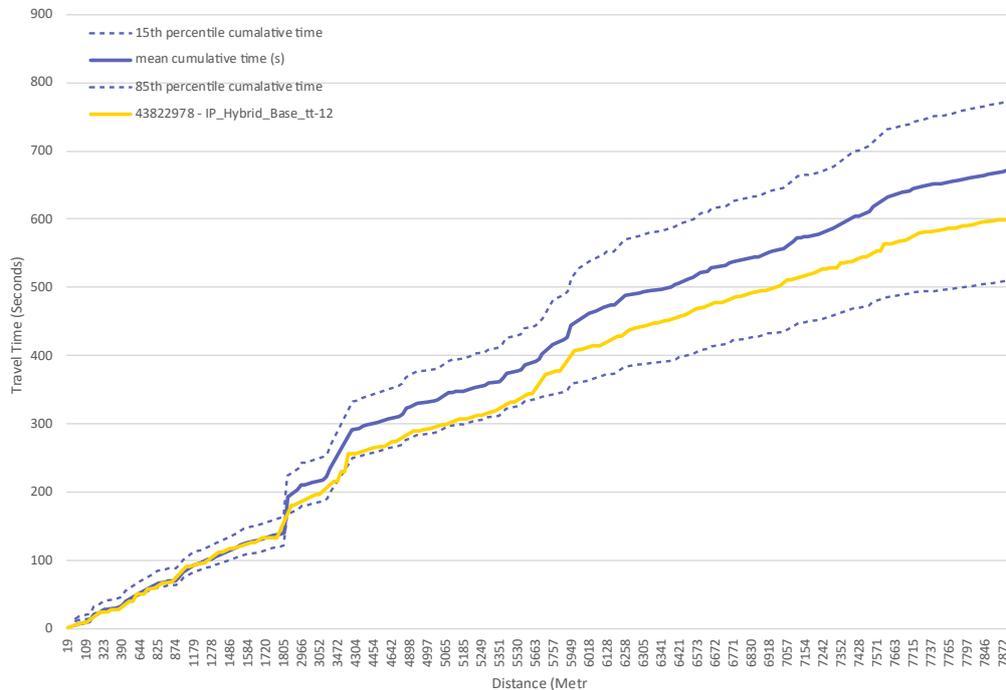
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Tomtom vs Modelled Travel Time
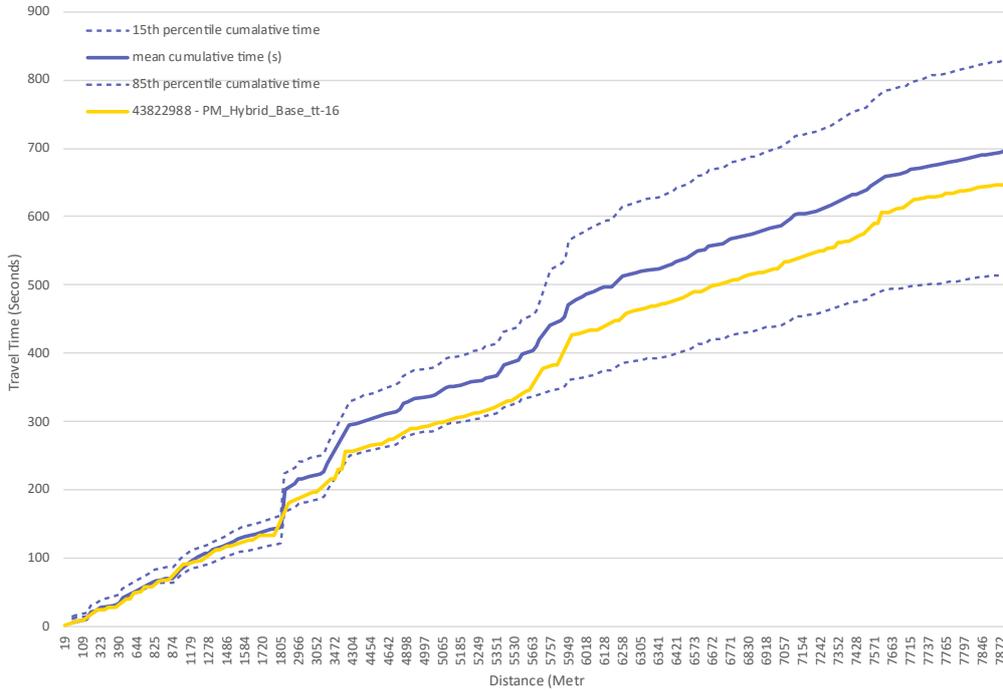
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Tomtom vs Modelled Travel Time
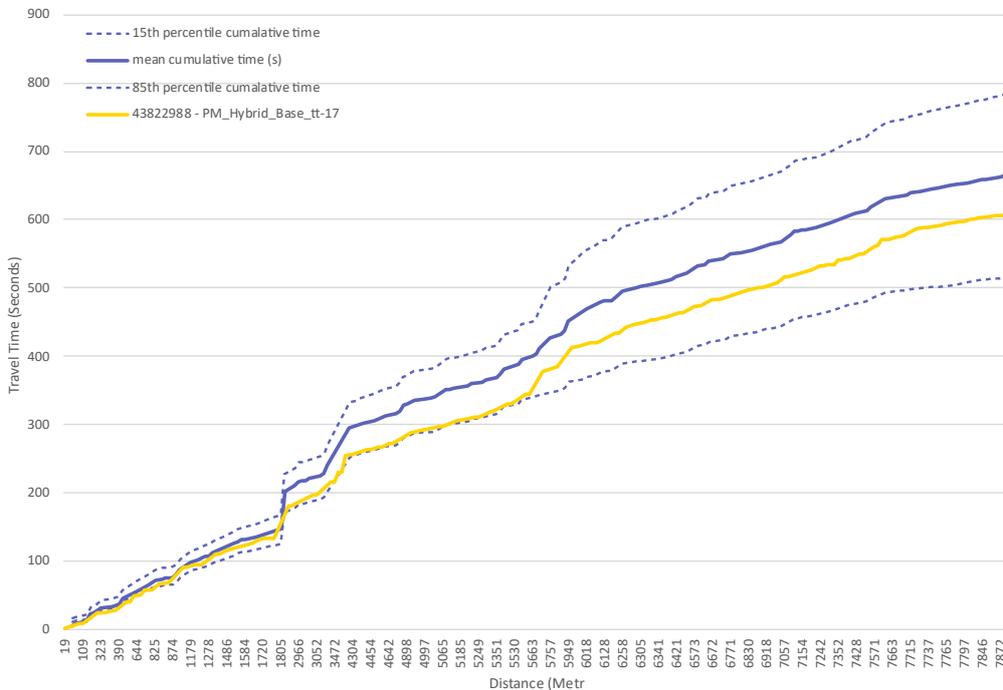
Travel time profile: Wainuiomata – CBD (17-18)

Tomtom vs Modelled Travel Time
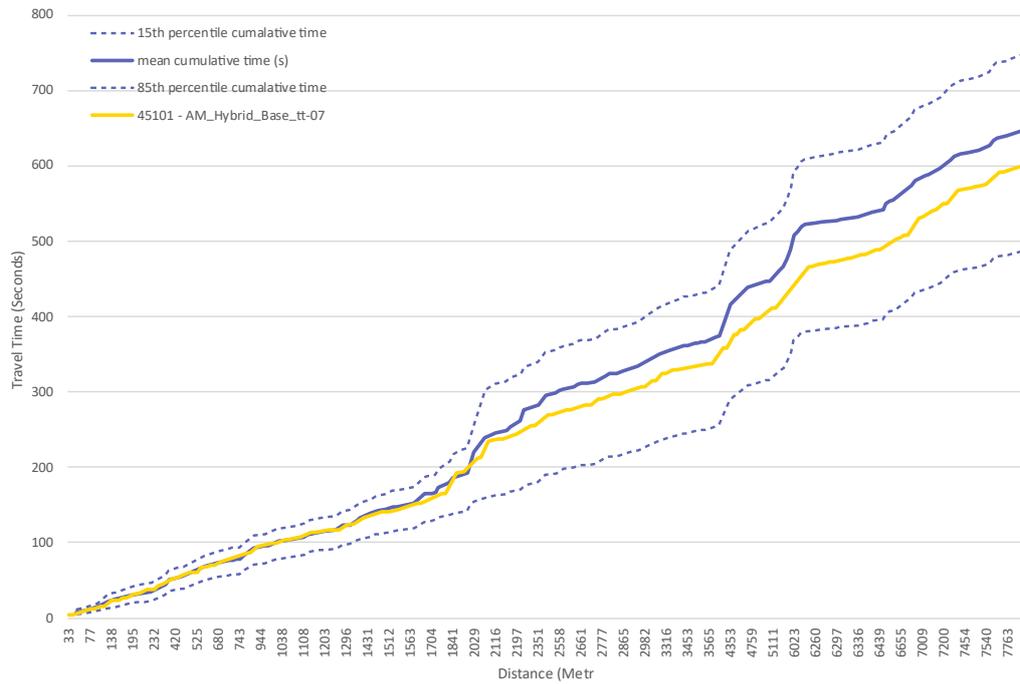
Travel time profile: CBD – Wainuiomata (7-8)

Tomtom vs Modelled Travel Time
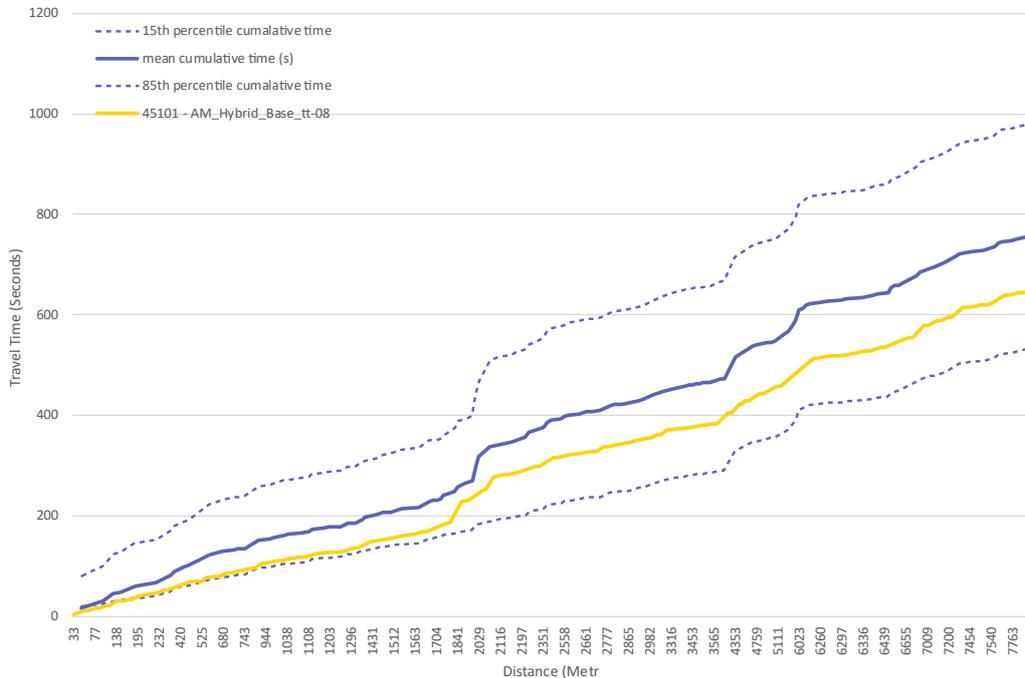
Travel time profile: CBD – Wainuiomata (8-9)

Tomtom vs Modelled Travel Time
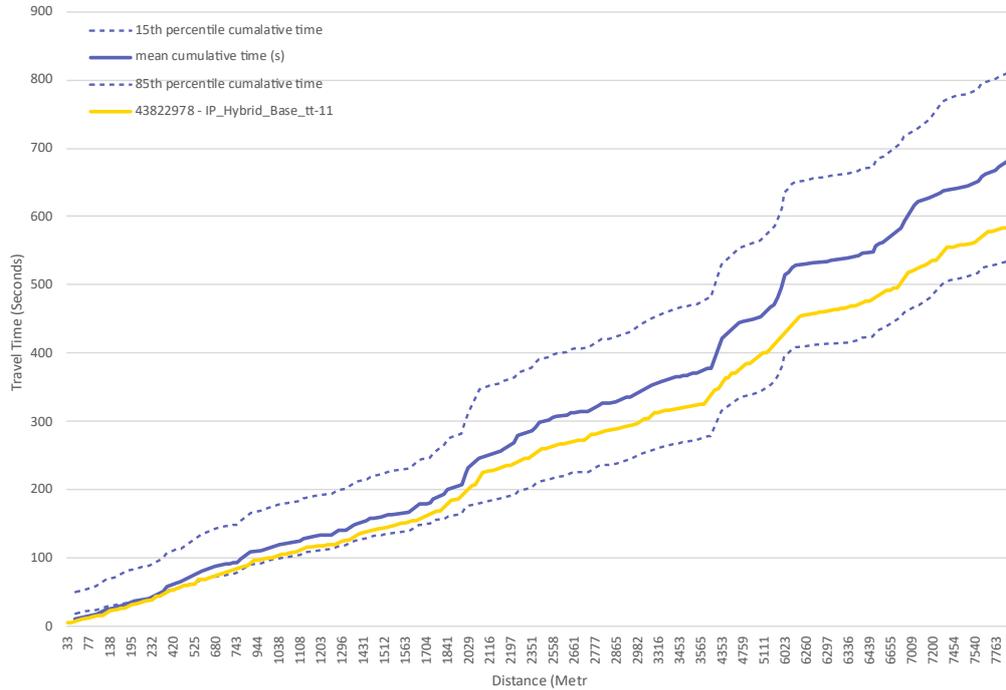
Travel time profile: CBD – Wainuiomata (11-12)

Tomtom vs Modelled Travel Time
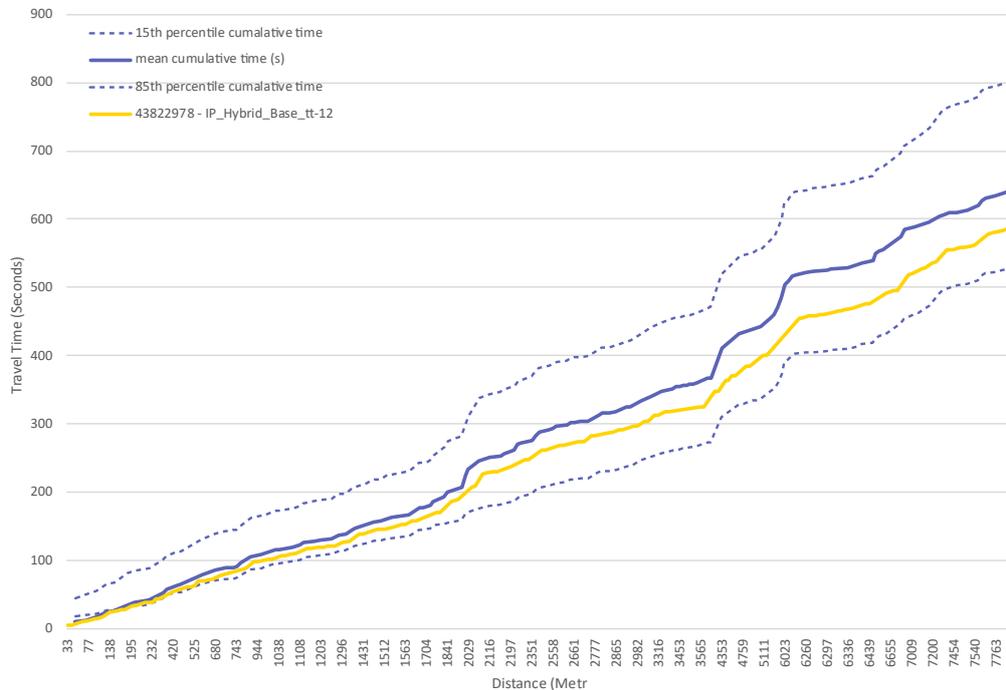
Travel time profile: CBD – Wainuiomata (12-13)

Tomtom vs Modelled Travel Time
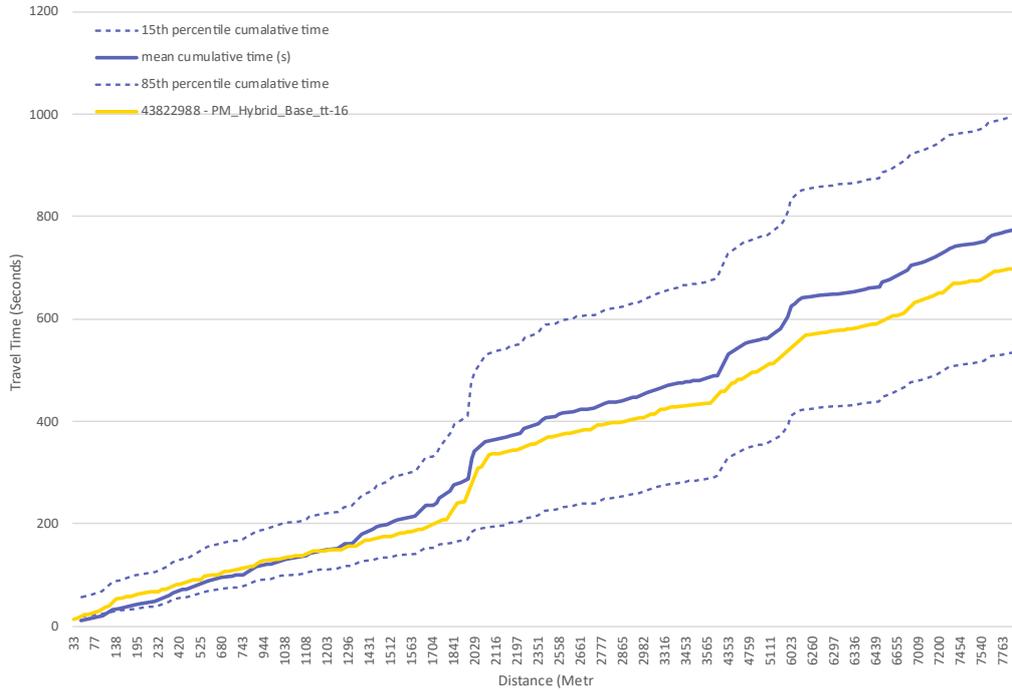
Travel time profile: CBD – Wainuiomata (16-17)

Tomtom vs Modelled Travel Time
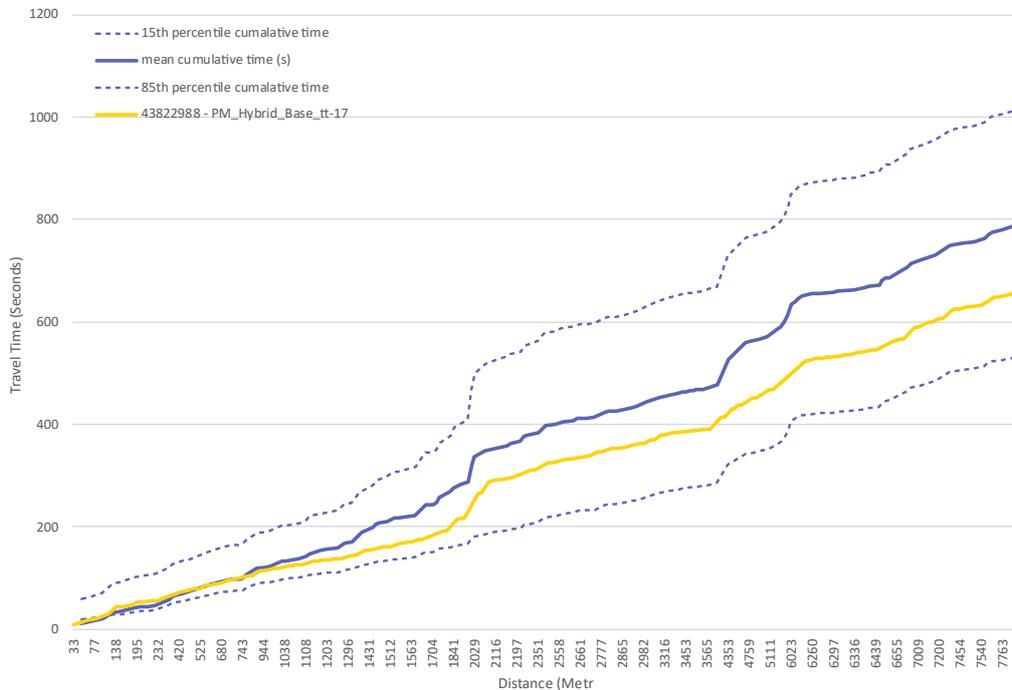
Travel time profile: CBD – Wainuiomata (17-18)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 45101 - AM_Hybrid_Base_tt-07

Travel Time (Seconds) / Distance (Metr
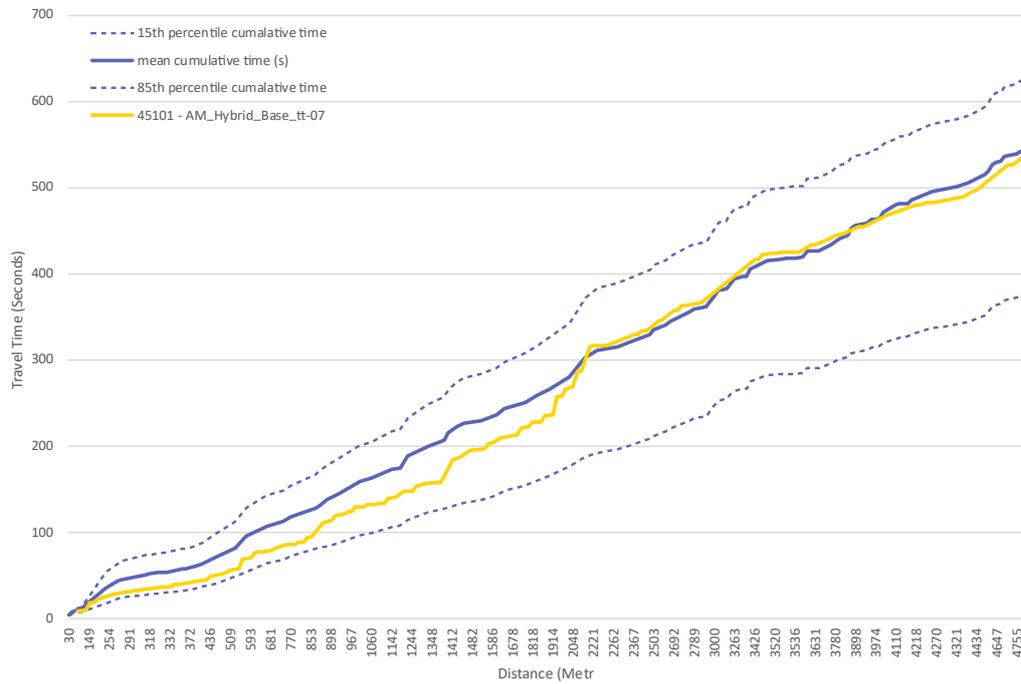
Travel time profile: Jackson St – Randwick Rd (7-8)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 45101 - AM_Hybrid_Base_tt-08

Travel Time (Seconds) / Distance (Metr
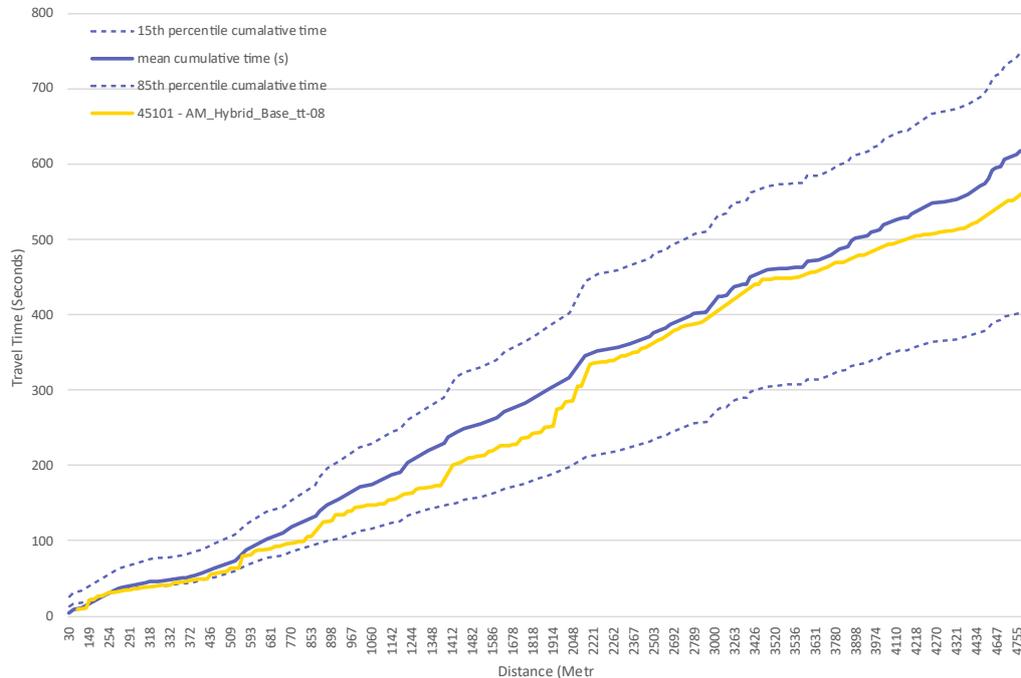
Travel time profile: Jackson St – Randwick Rd (8-9)

Tomtom vs Modelled Travel Time
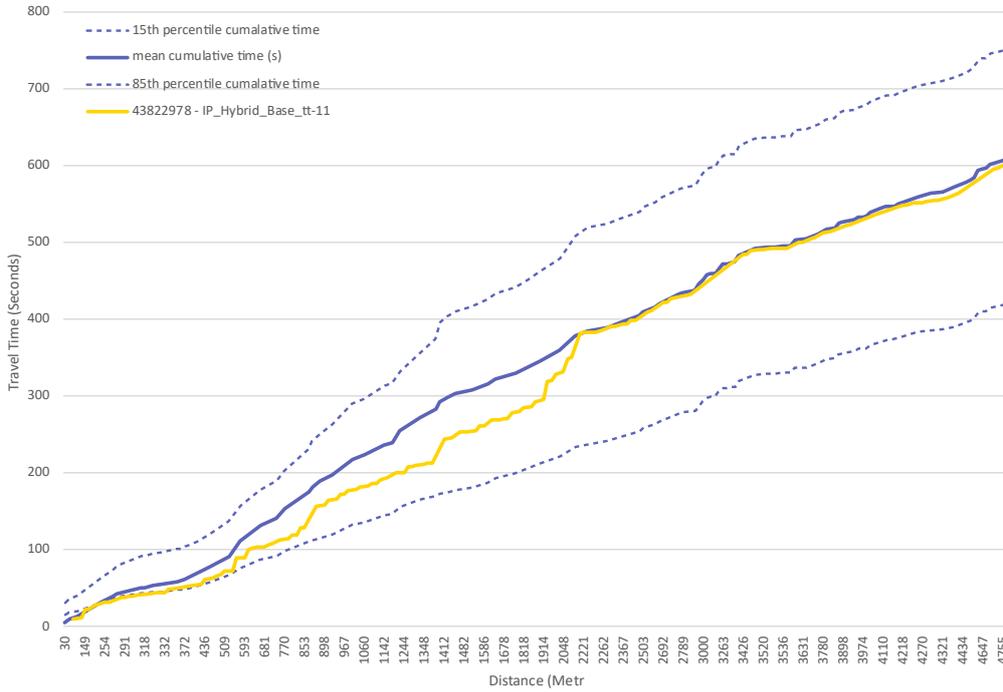
Travel time profile: Jackson St – Randwick Rd (11-12)

Tomtom vs Modelled Travel Time
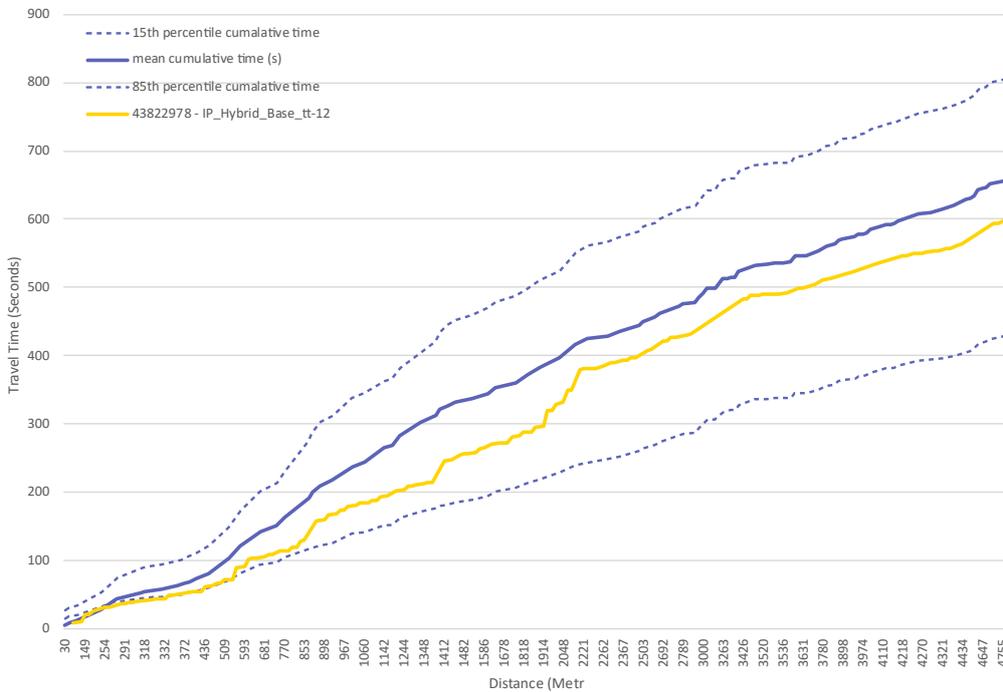
Travel time profile: Jackson St – Randwick Rd (12-13)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 43822988 - PM_Hybrid_Base_tt-16

Y-axis: Travel Time (Seconds)
X-axis: Distance (Metr
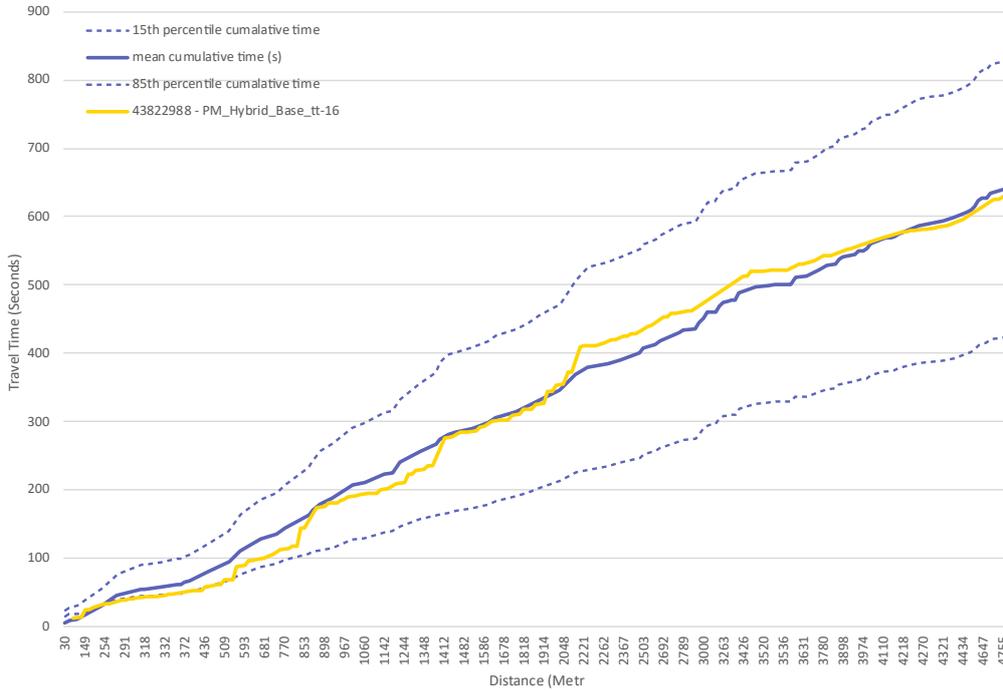
Travel time profile: Jackson St – Randwick Rd (16-17)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 43822988 - PM_Hybrid_Base_tt-17

Y-axis: Travel Time (Seconds)
X-axis: Distance (Metr
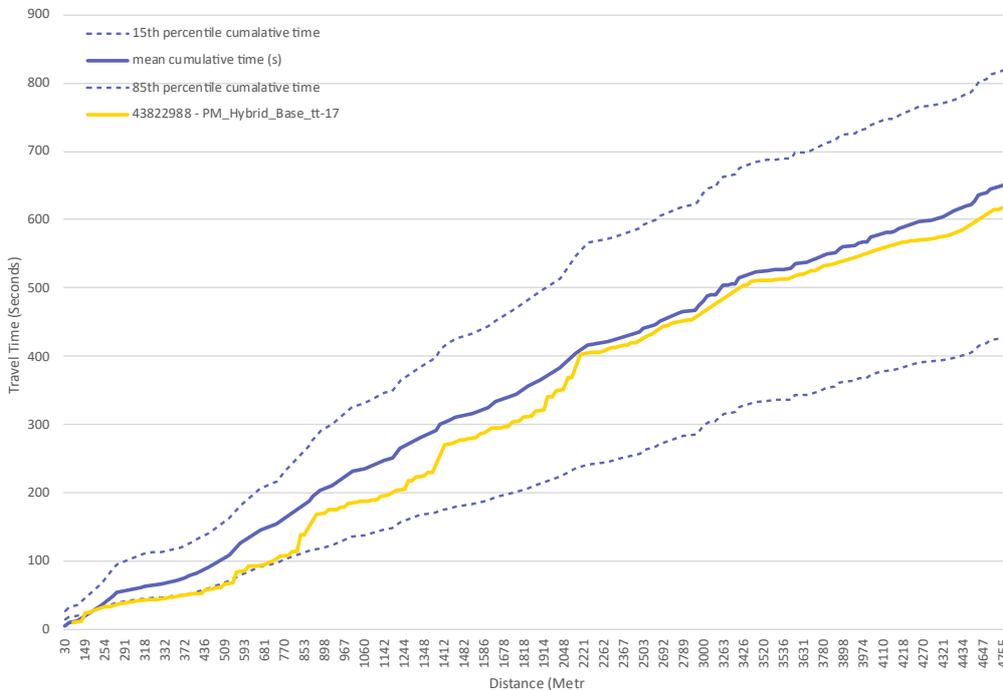
Travel time profile: Jackson St – Randwick Rd (17-18)

Tomtom vs Modelled Travel Time

- - - - - 15th percentile cumalative time
———— mean cumulative time (s)
- - - - - 85th percentile cumalative time
———— 45101 - AM_Hybrid_Base_tt-07
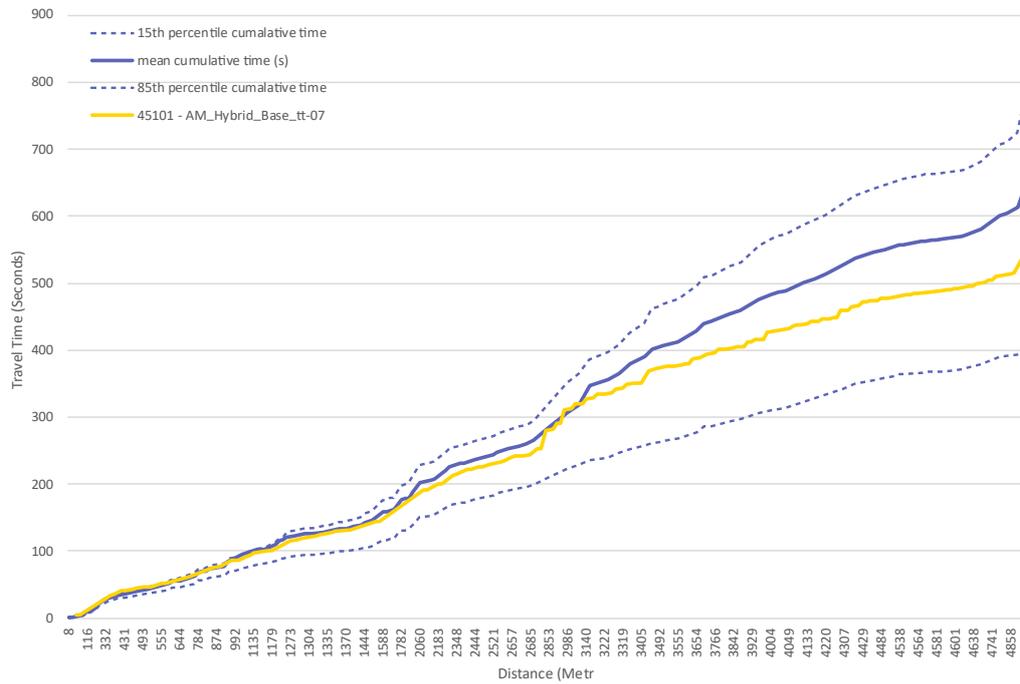
Travel time profile: Randwick Rd – Jackson St (7-8)

Tomtom vs Modelled Travel Time

- - - - - 15th percentile cumalative time
———— mean cumulative time (s)
- - - - - 85th percentile cumalative time
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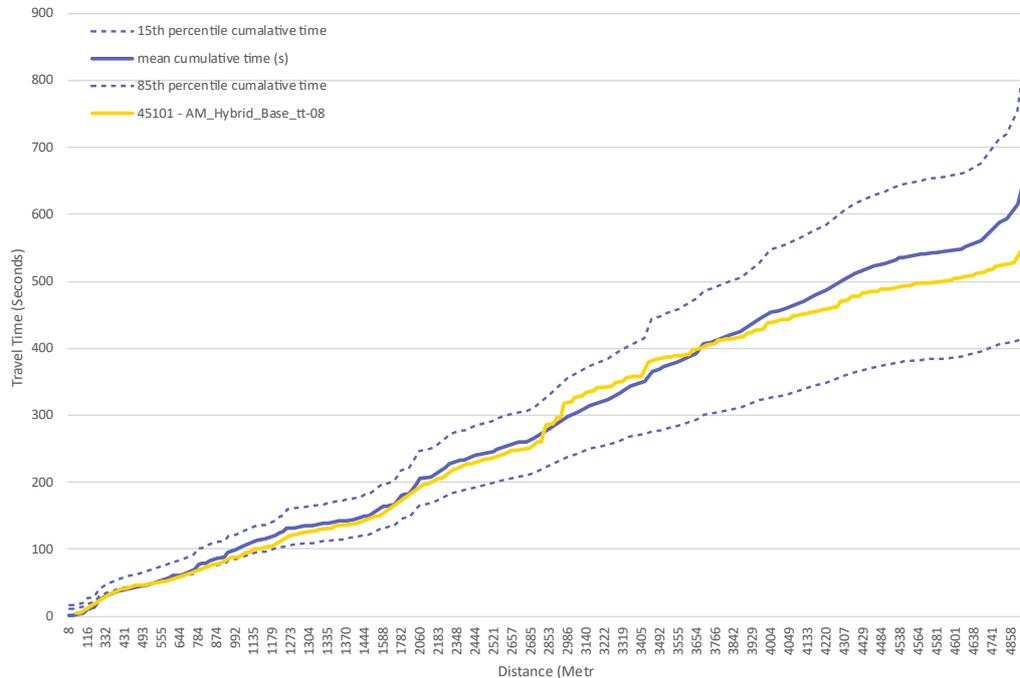
Travel time profile: Randwick Rd – Jackson St (8-9)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
──── mean cumulative time (s)
- - - - 85th percentile cumalative time
──── 43822978 - IP_Hybrid_Base_tt-11
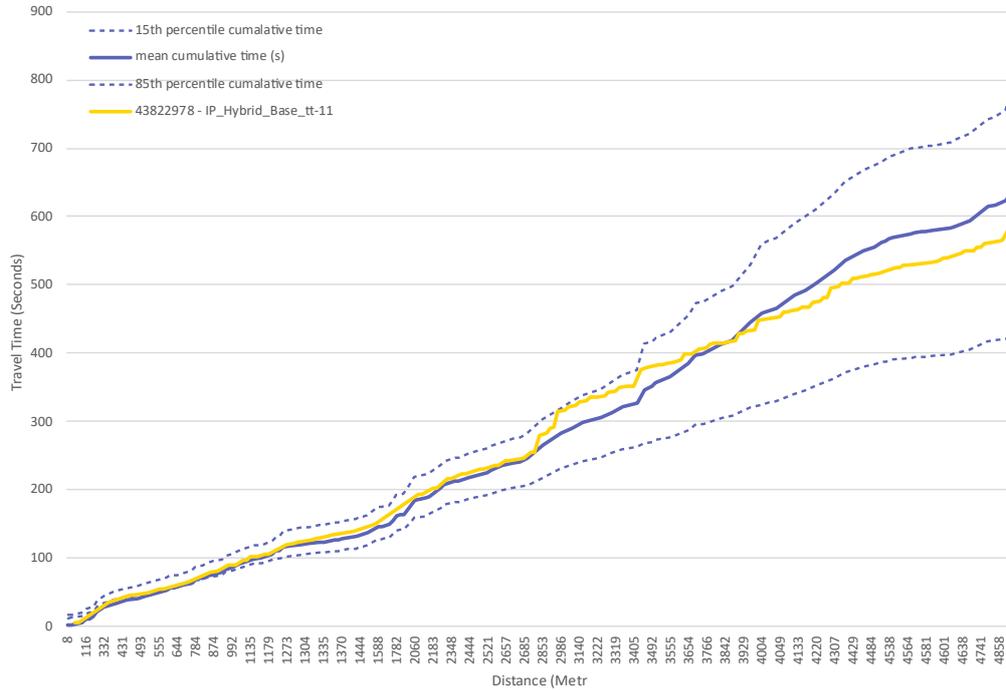
Travel time profile: Randwick Rd – Jackson St (11-12)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
──── mean cumulative time (s)
- - - - 85th percentile cumalative time
──── 43822978 - IP_Hybrid_Base_tt-12
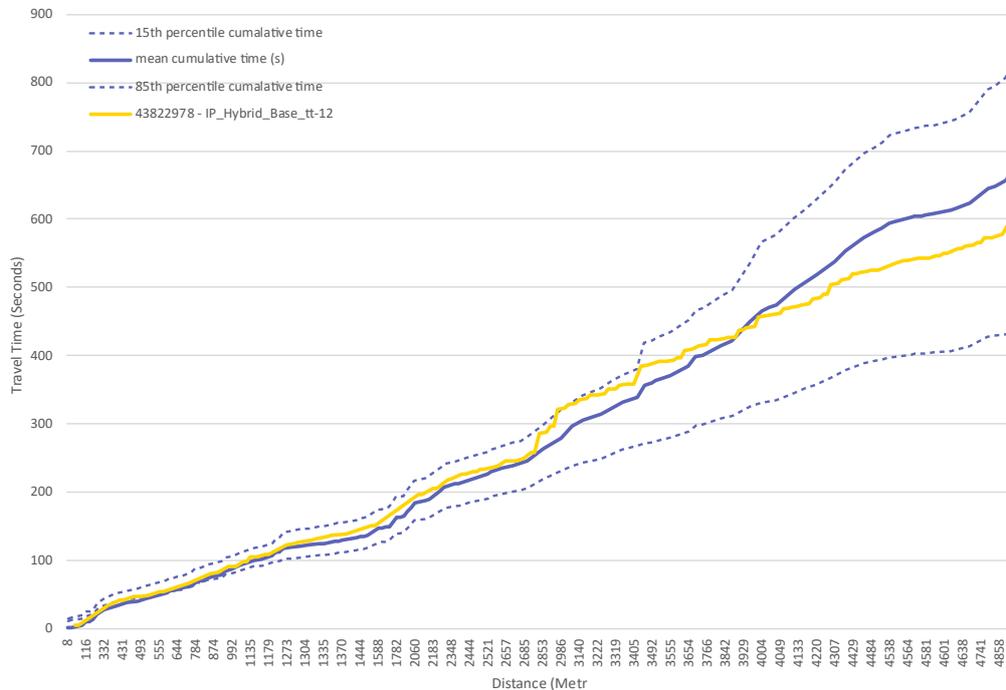
Travel time profile: Randwick Rd – Jackson St (12-13)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - 85th percentile cumulative time
—— 43822988 - PM_Hybrid_Base_tt-16

Y-axis: Travel Time (Seconds)
X-axis: Distance (Metr
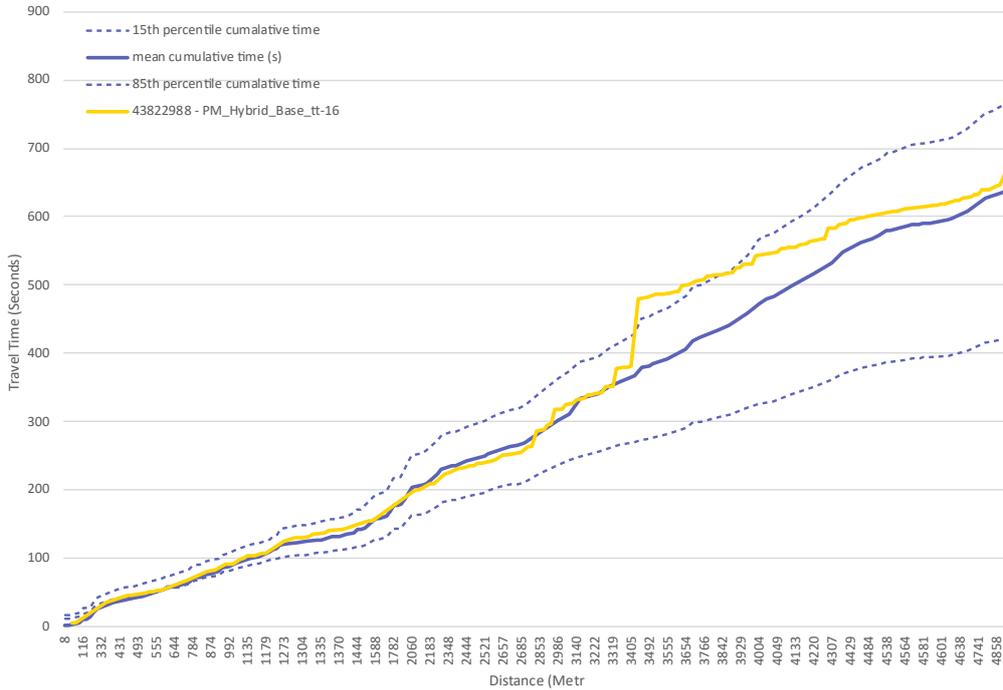
Travel time profile: Randwick Rd – Jackson St (16-17)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - 85th percentile cumulative time
—— 43822988 - PM_Hybrid_Base_tt-17

Y-axis: Travel Time (Seconds)
X-axis: Distance (Metr
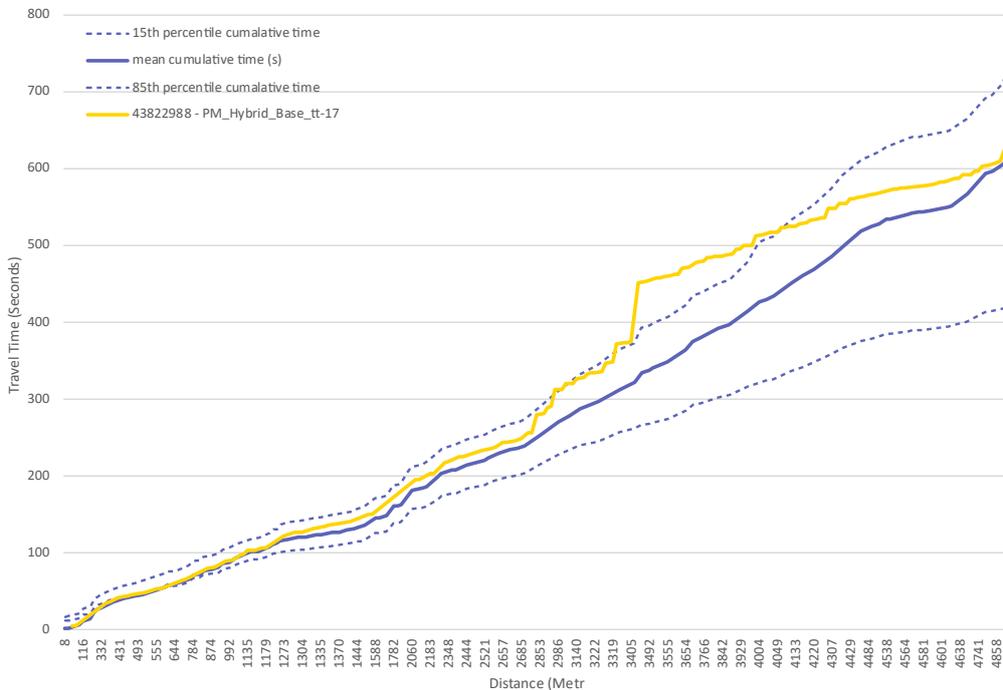
Travel time profile: Randwick Rd – Jackson St (17-18)

Tomtom vs Modelled Travel Time
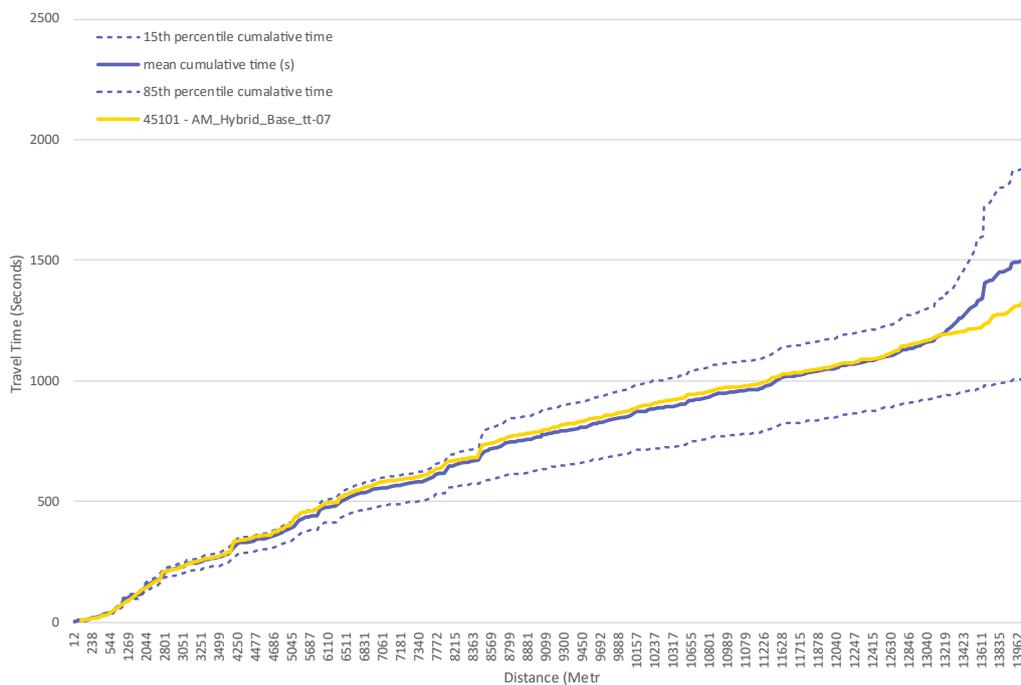
Travel time profile: Cambridge Tce - Petone (7-8)

Tomtom vs Modelled Travel Time
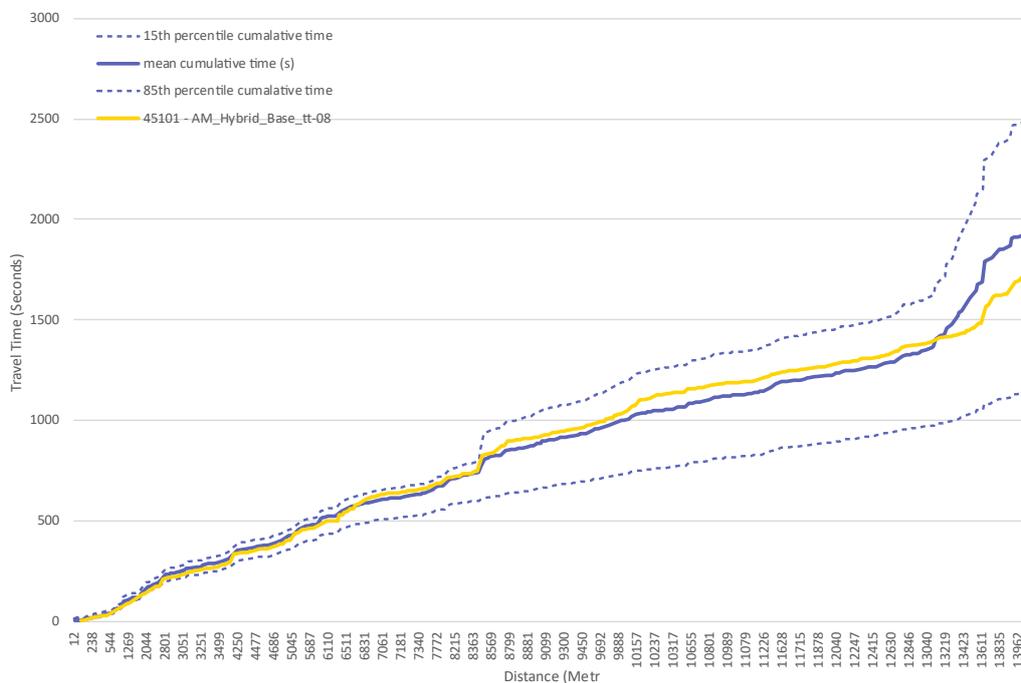
Travel time profile: Cambridge Tce - Petone (8-9)

Tomtom vs Modelled Travel Time
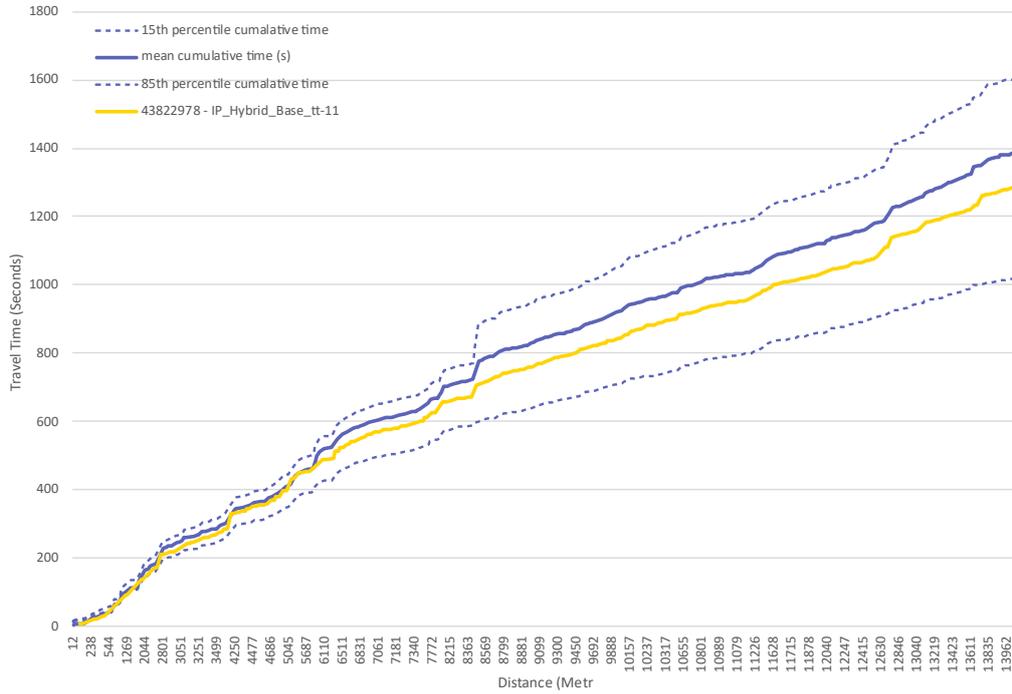
Travel time profile: Cambridge Tce - Petone (11-12)

Tomtom vs Modelled Travel Time
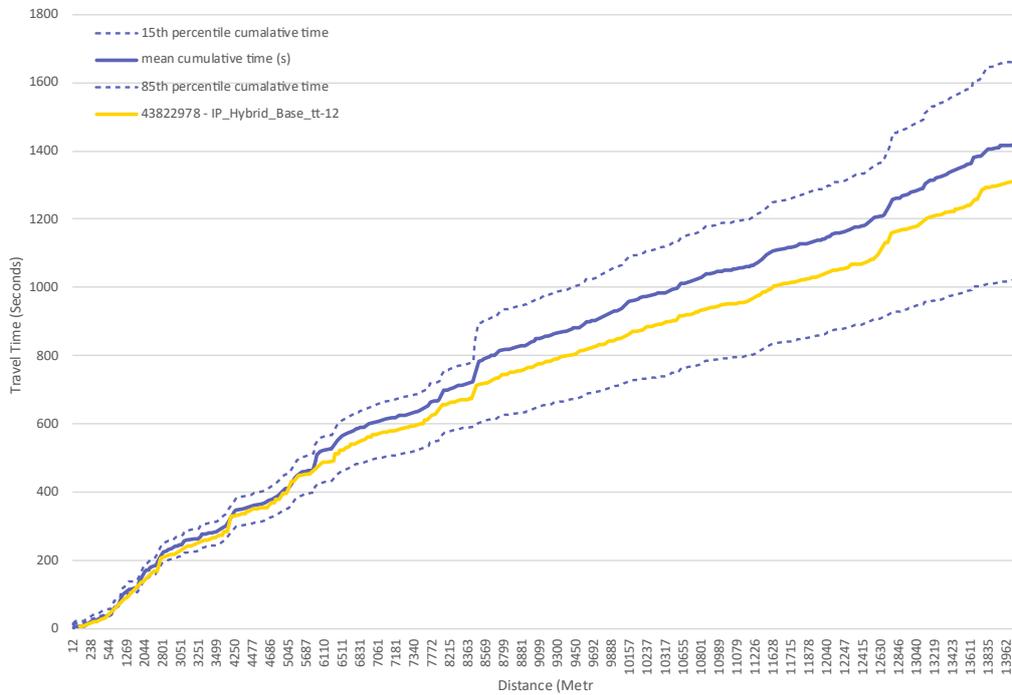
Travel time profile: Cambridge Tce - Petone (12-13)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumulative time
— 43822988 - PM_Hybrid_Base_tt-16
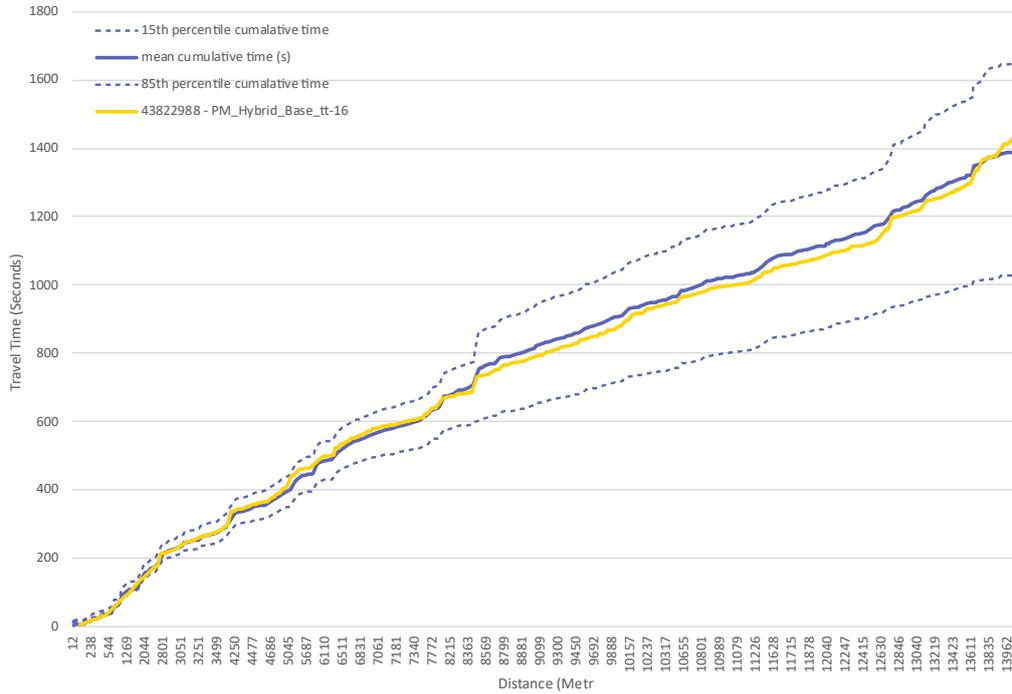
Travel time profile: Cambridge Tce - Petone (16-17)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumulative time
— 43822988 - PM_Hybrid_Base_tt-17
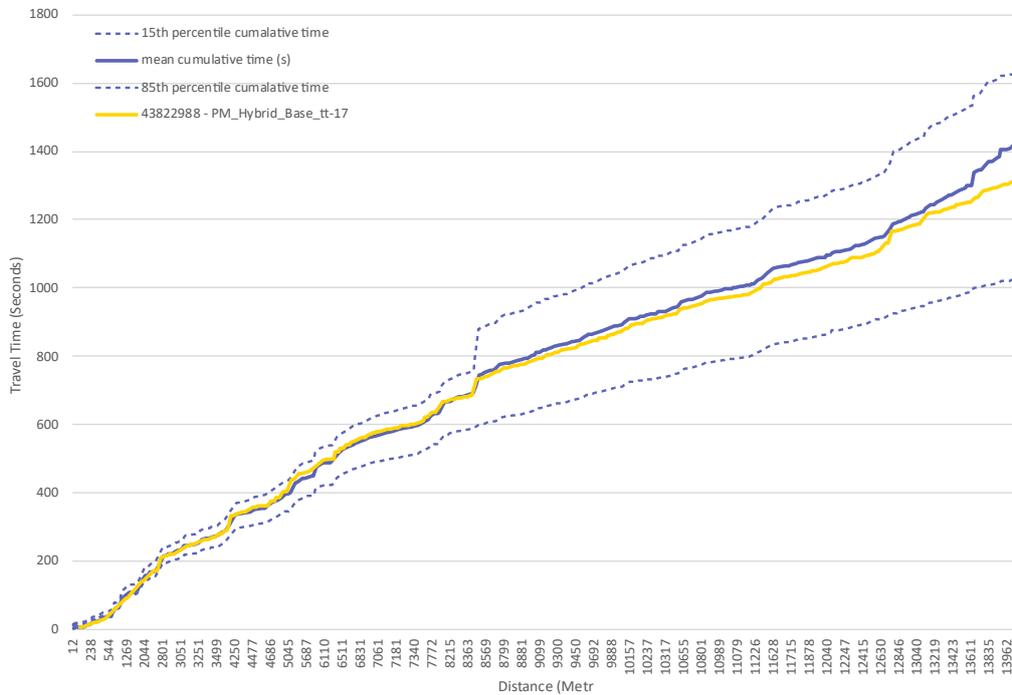
Travel time profile: Cambridge Tce - Petone (17-18)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 45101 - AM_Hybrid_Base_tt-07
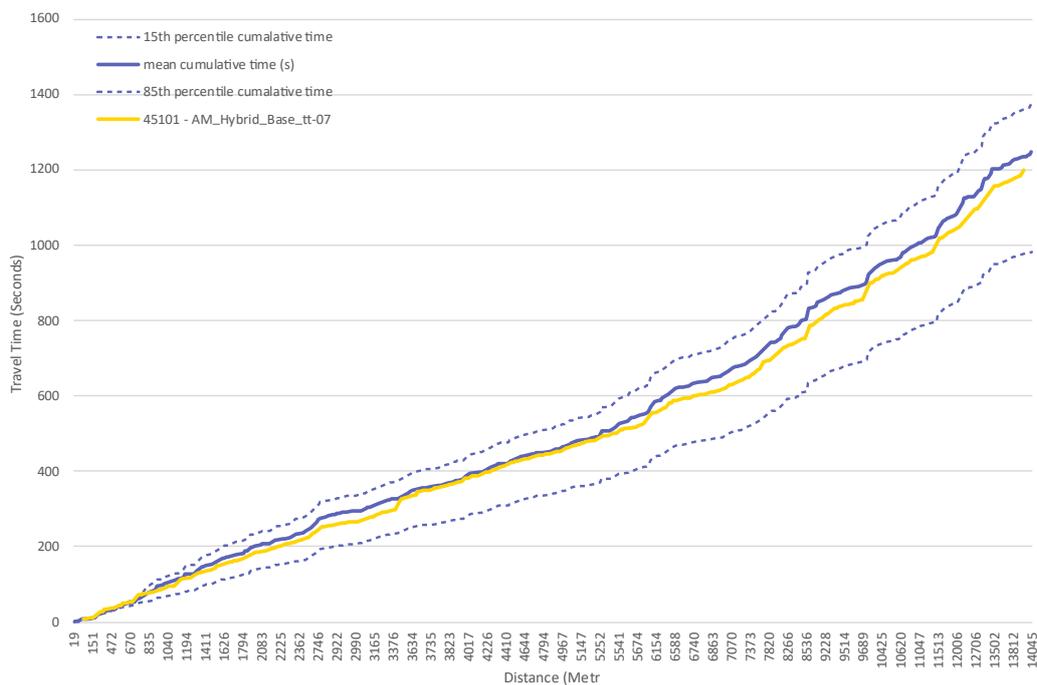
Travel time profile: Petone – Cambridge Tce (7-8)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 45101 - AM_Hybrid_Base_tt-08
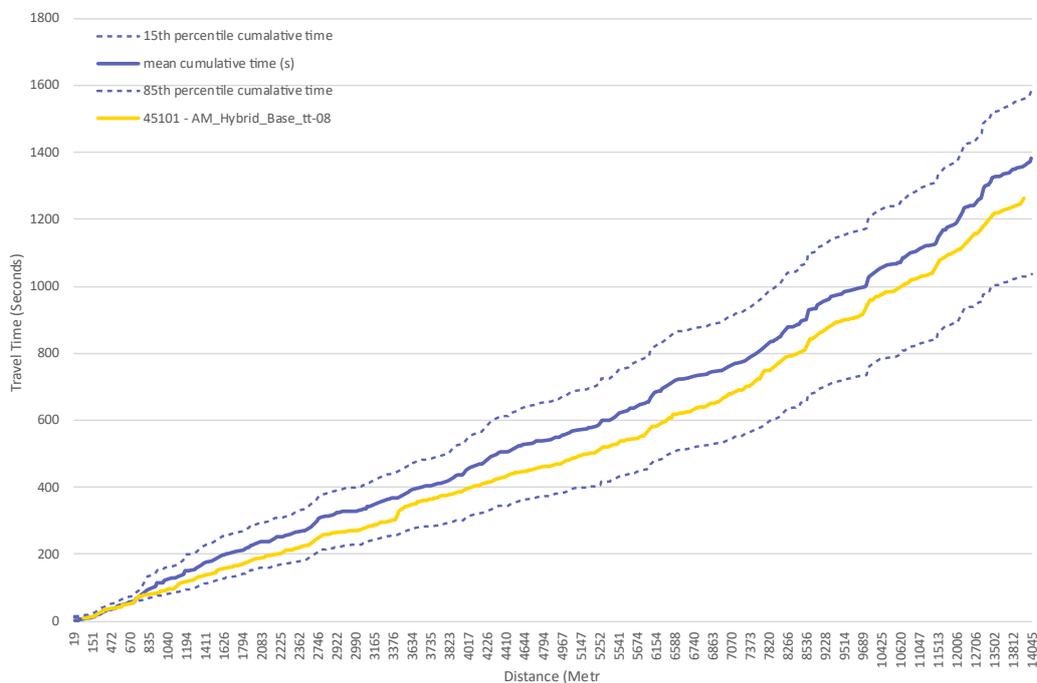
Travel time profile: Petone – Cambridge Tce (8-9)

Tomtom vs Modelled Travel Time
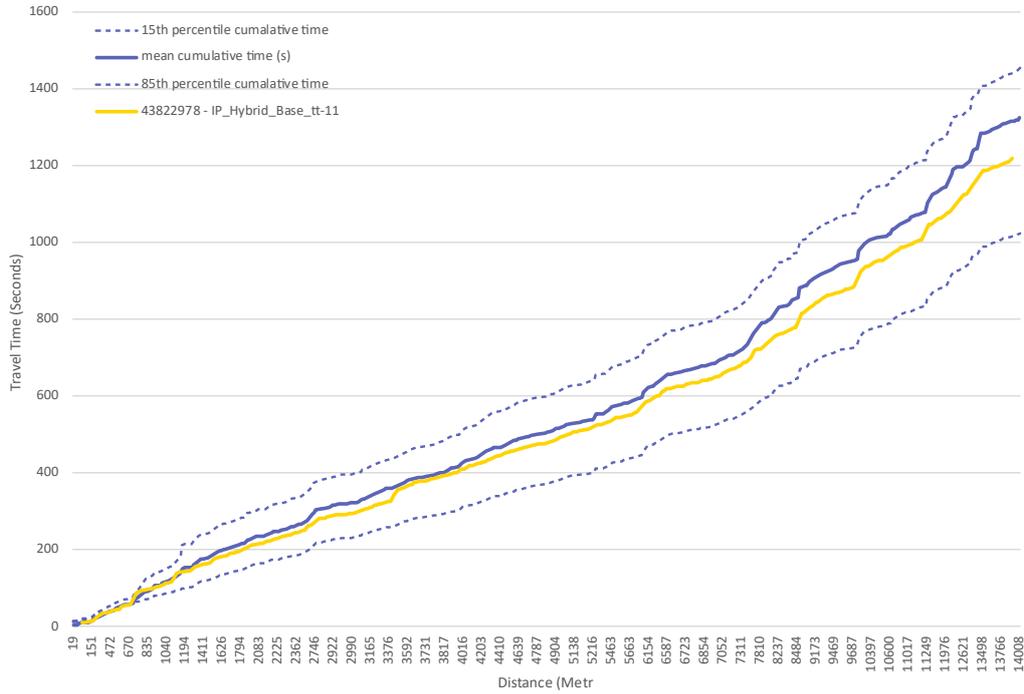
Travel time profile: Petone – Cambridge Tce (11-12)

Tomtom vs Modelled Travel Time
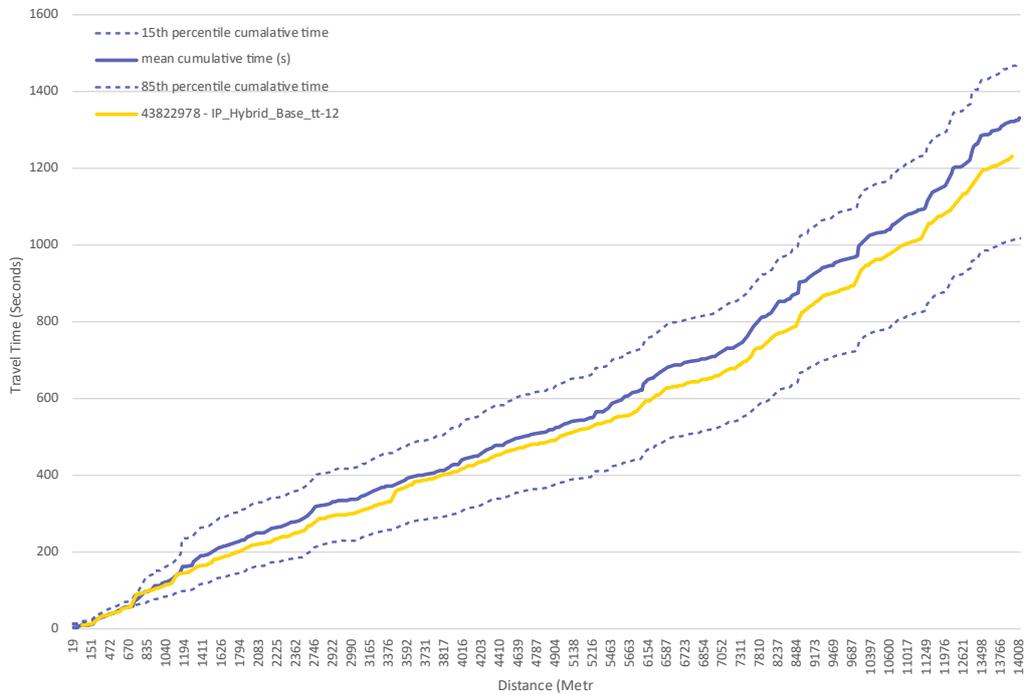
Travel time profile: Petone – Cambridge Tce (12-13)

Tomtom vs Modelled Travel Time
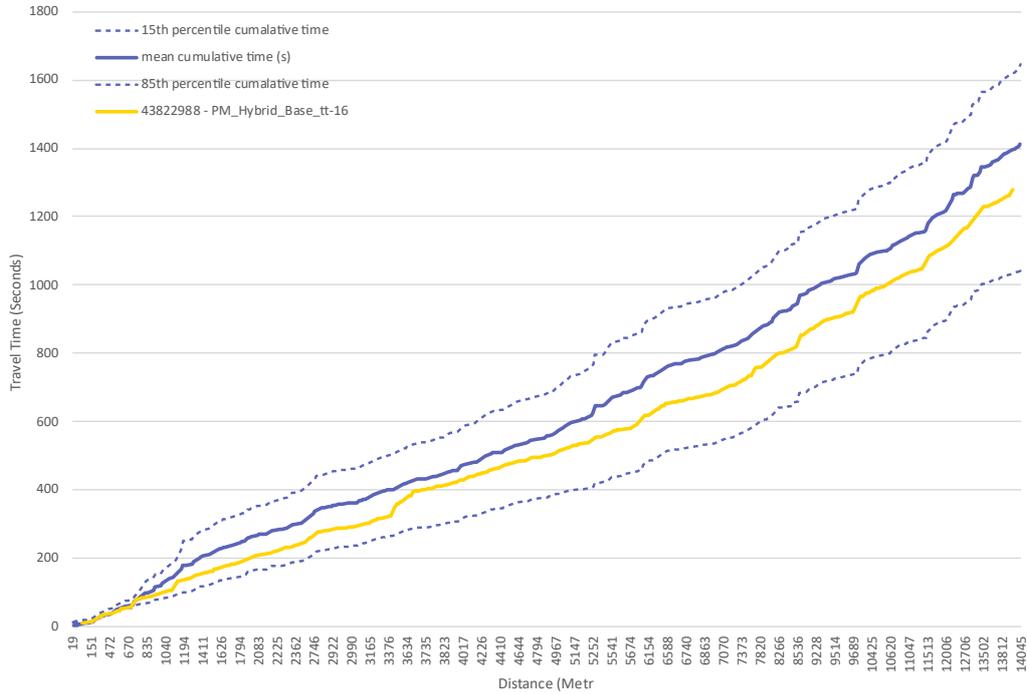
Travel time profile: Petone – Cambridge Tce (16-17)

Tomtom vs Modelled Travel Time
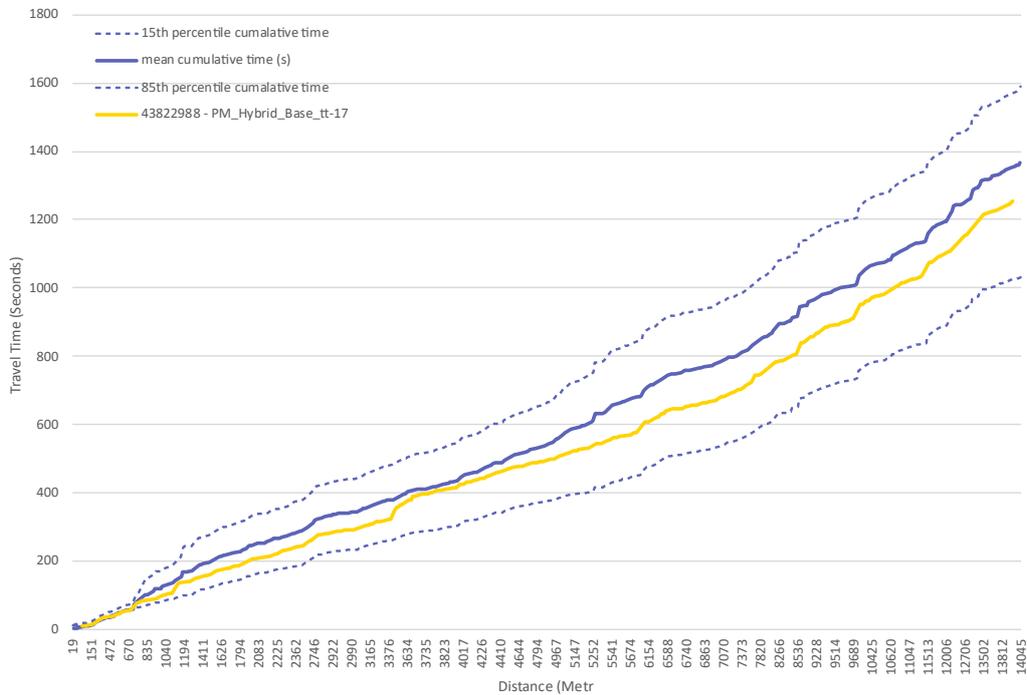
Travel time profile: Petone – Cambridge Tce (17-18)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 45101 - AM_Hybrid_Base_tt-07

Travel Time (Seconds)

Distance (Metr
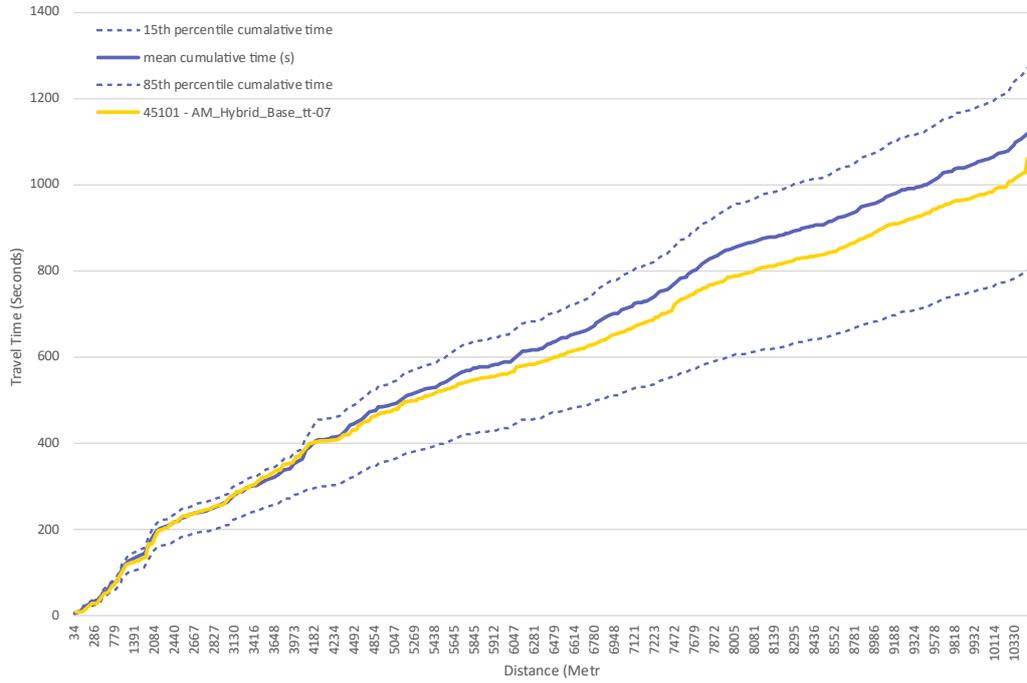
Travel time profile: High St – Cuba St(7-8)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 45101 - AM_Hybrid_Base_tt-08

Travel Time (Seconds)

Distance (Metr
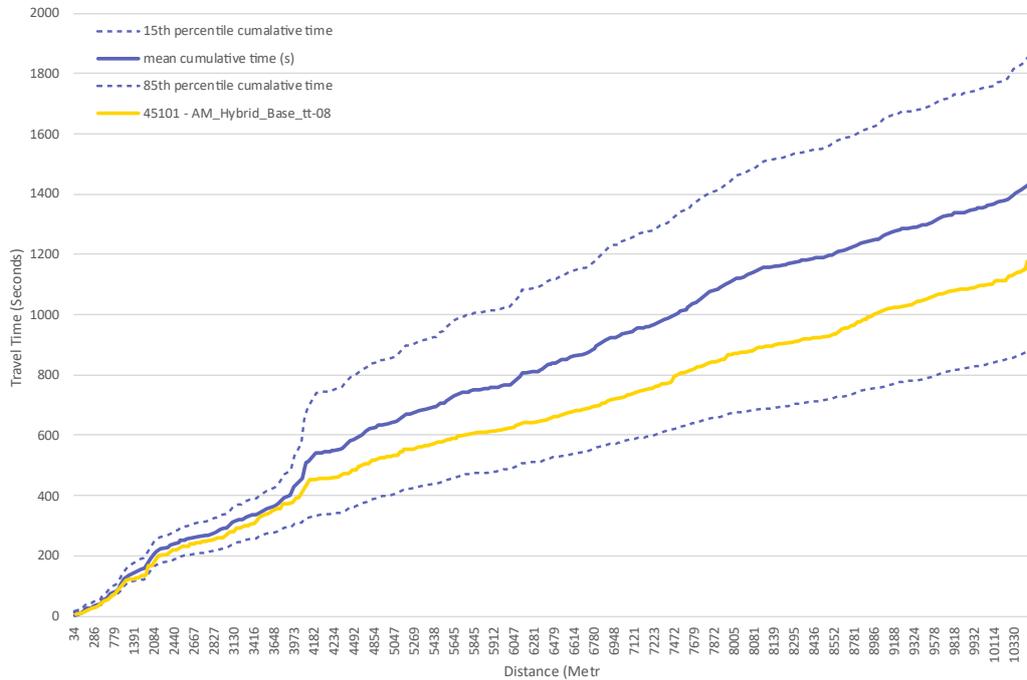
Travel time profile: High St – Cuba St (8-9)

Tomtom vs Modelled Travel Time
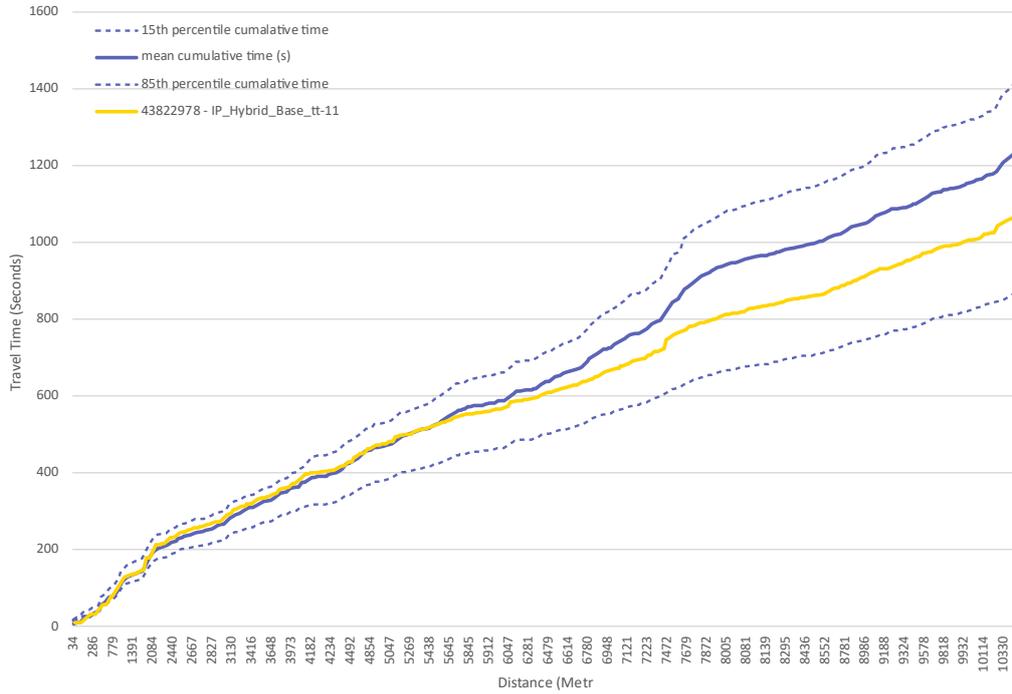
Travel time profile: High St – Cuba St (11-12)

Tomtom vs Modelled Travel Time
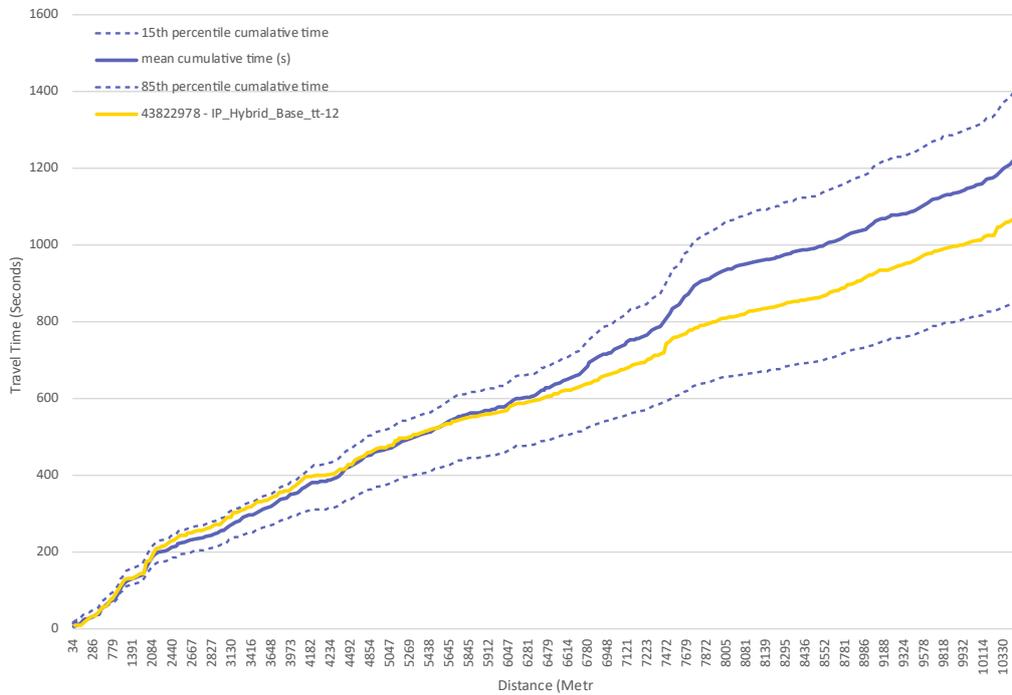
Travel time profile: High St – Cuba St (12-13)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - - 85th percentile cumalative time
—— 43822988 - PM_Hybrid_Base_tt-16

Travel Time (Seconds)

Distance (Metr
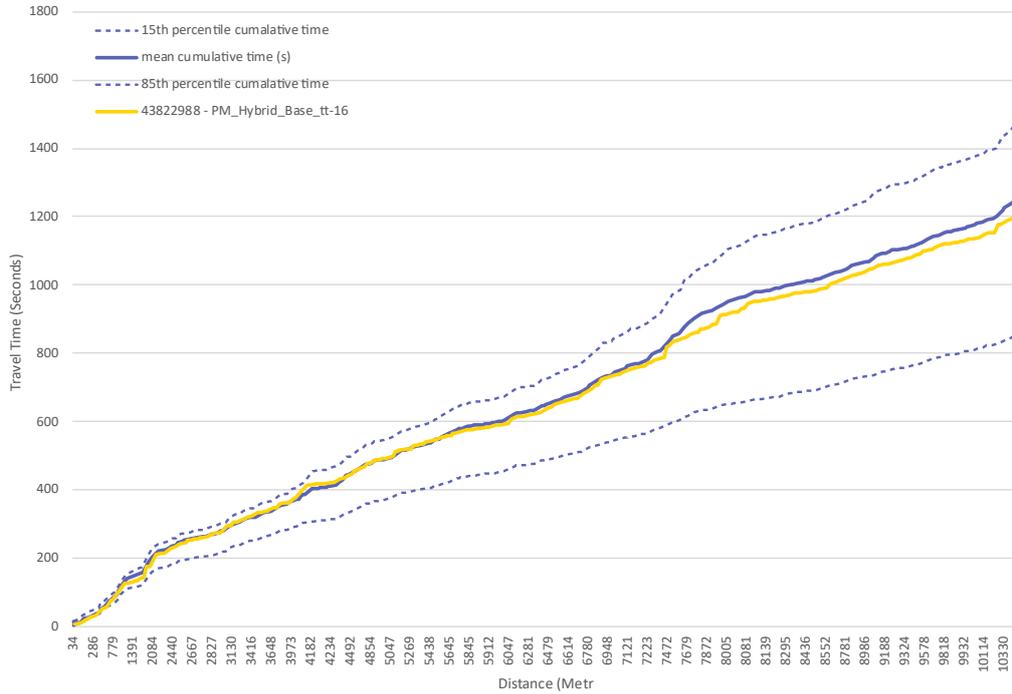
Travel time profile: High St – Cuba St (16-17)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
—— mean cumulative time (s)
- - - - 85th percentile cumalative time
—— 43822988 - PM_Hybrid_Base_tt-17

Travel Time (Seconds)

Distance (Metr
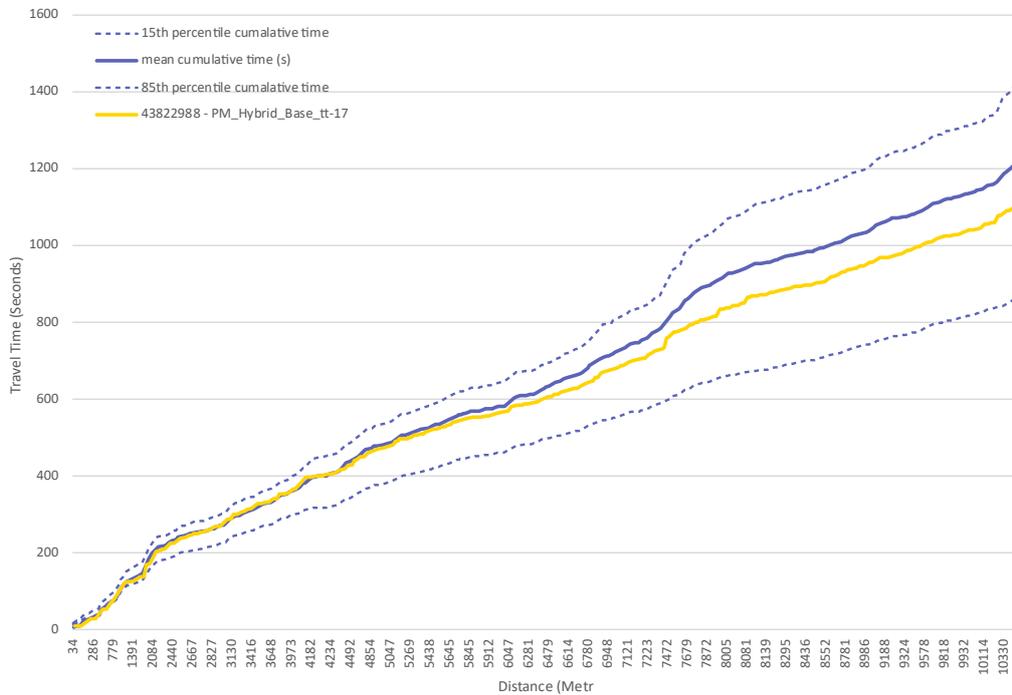
Travel time profile: High St – Cuba St (17-18)

Tomtom vs Modelled Travel Time

- - - - - 15th percentile cumalative time
———— mean cumulative time (s)
- - - - - 85th percentile cumulative time
———— 45101 - AM_Hybrid_Base_tt-07
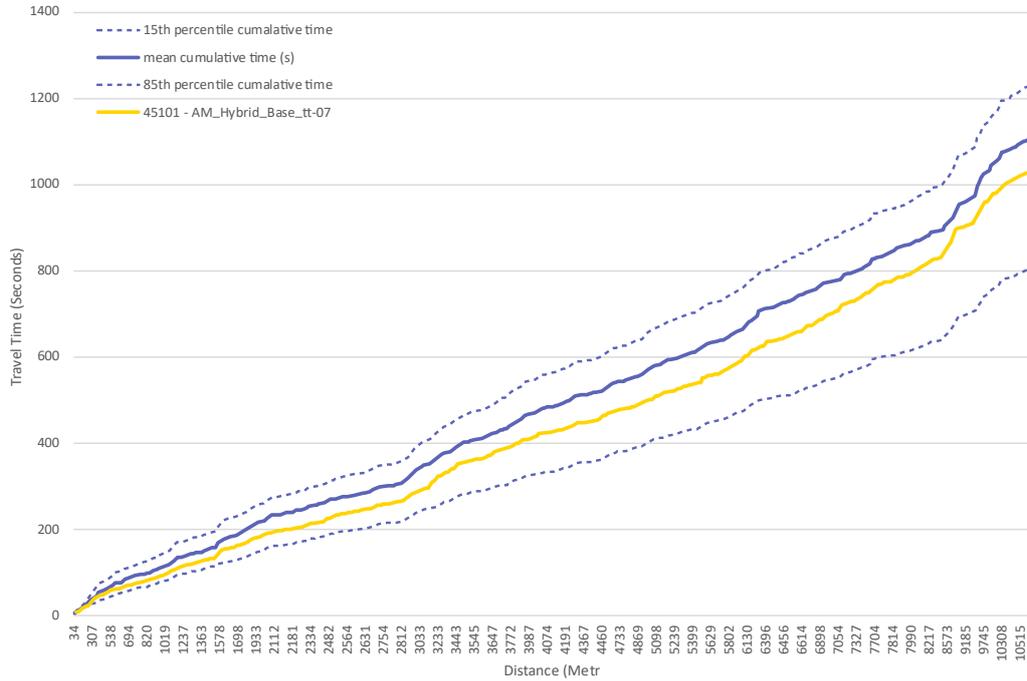
Travel time profile: Cuba St – High St(7-8)

Tomtom vs Modelled Travel Time

- - - - - 15th percentile cumalative time
———— mean cumulative time (s)
- - - - - 85th percentile cumulative time
———— 45101 - AM_Hybrid_Base_tt-08
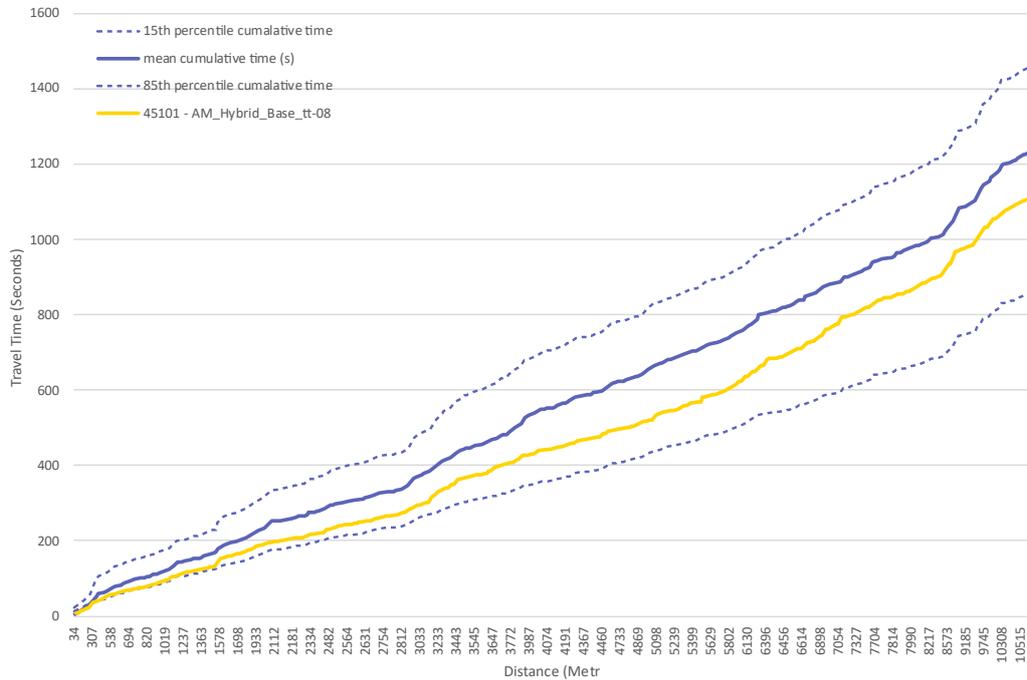
Travel time profile: Cuba St – High St (8-9)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumulative time
——— 43822978 - IP_Hybrid_Base_tt-11

Travel Time (Seconds)

Distance (Metr
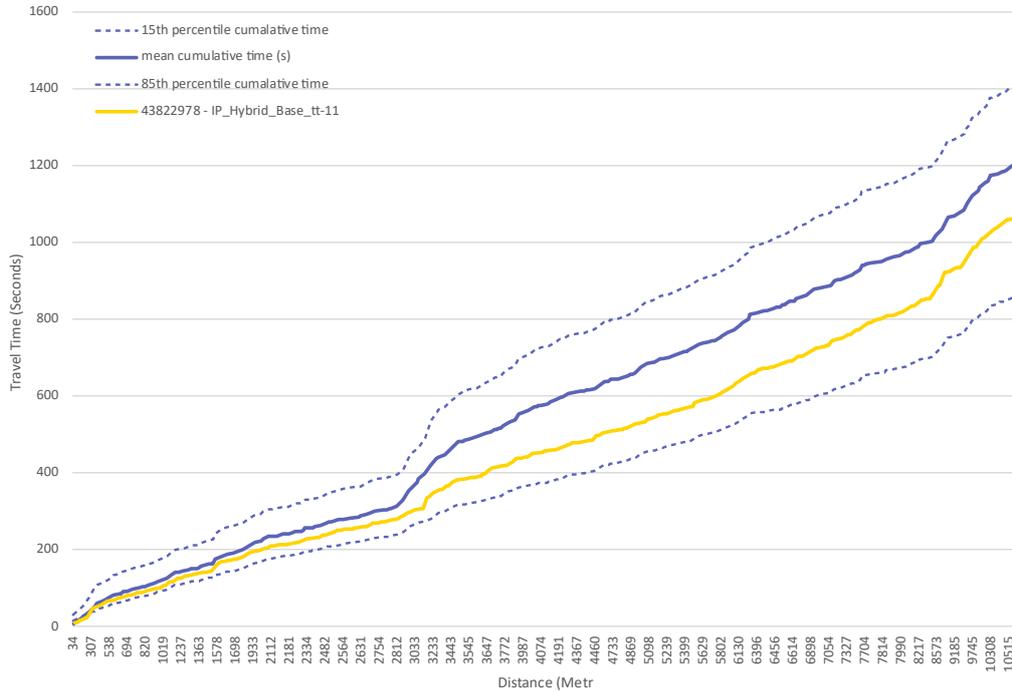
Travel time profile: Cuba St – High St (11-12)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumulative time
——— 43822978 - IP_Hybrid_Base_tt-12

Travel Time (Seconds)

Distance (Metr
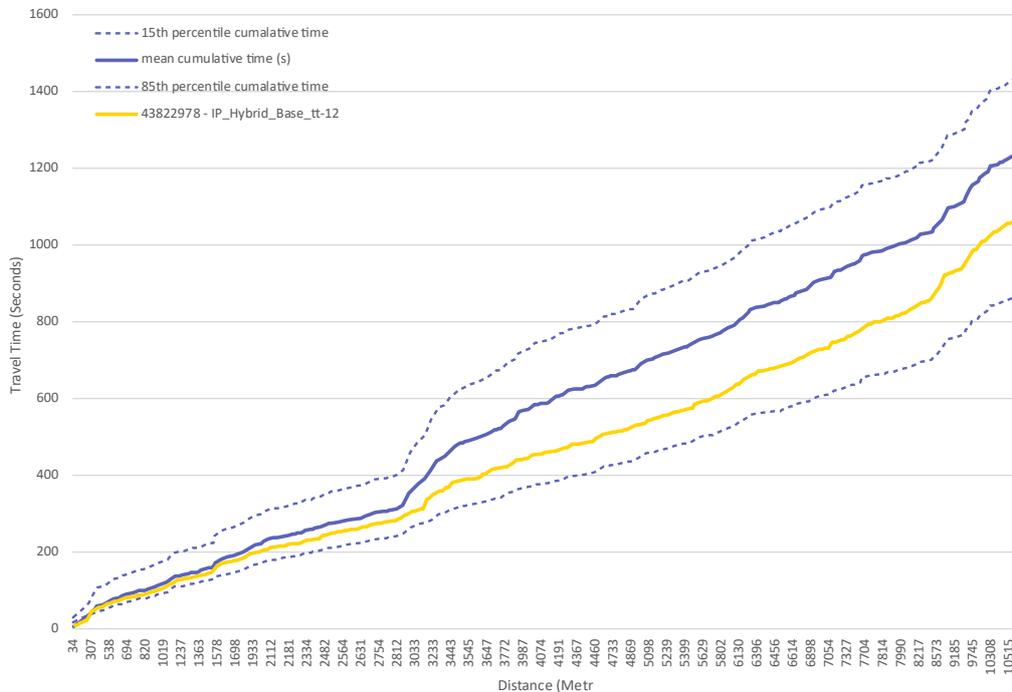
Travel time profile: Cuba St – High St (12-13)

Tomtom vs Modelled Travel Time
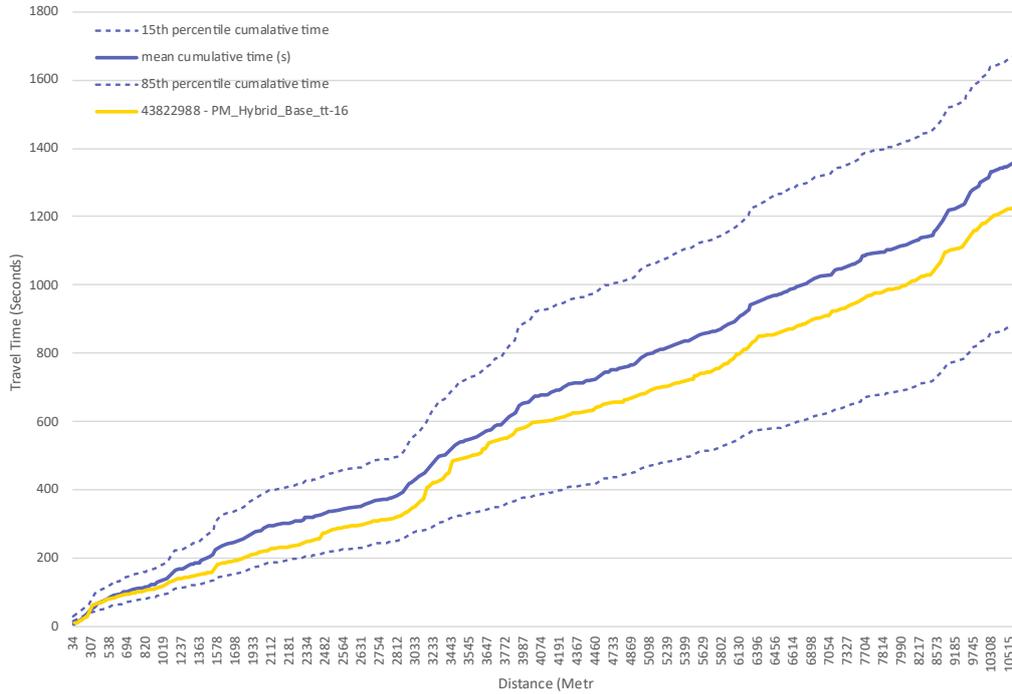
Travel time profile: Cuba St – High St (16-17)

Tomtom vs Modelled Travel Time
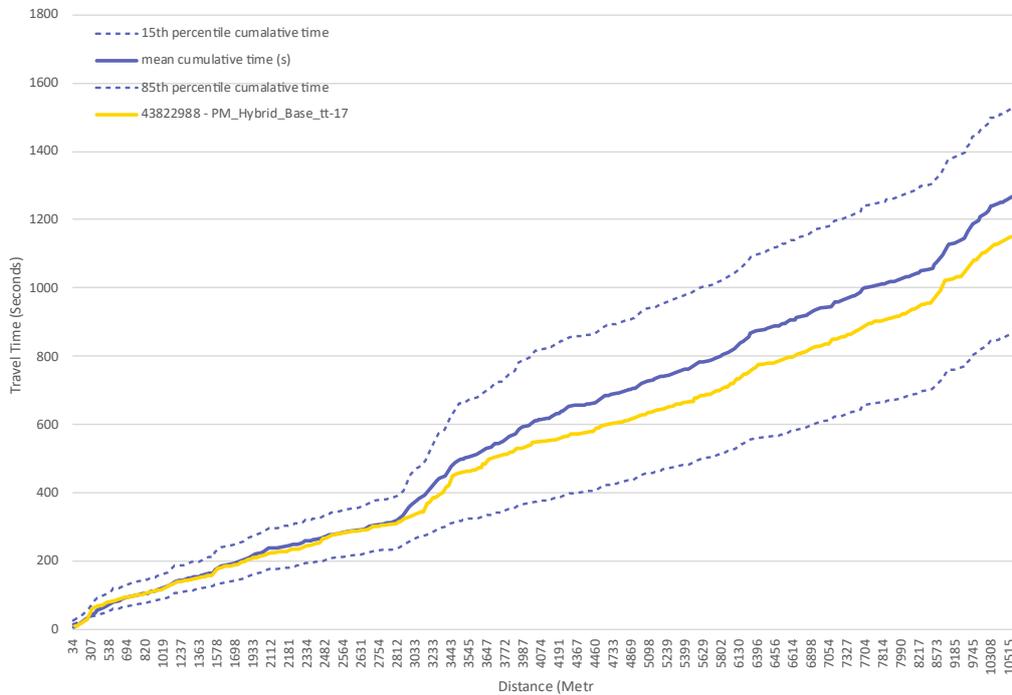
Travel time profile: Cuba St – High St (17-18)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
──── mean cumulative time (s)
- - - - 85th percentile cumalative time
──── 45101 - AM_Hybrid_Base_tt-07
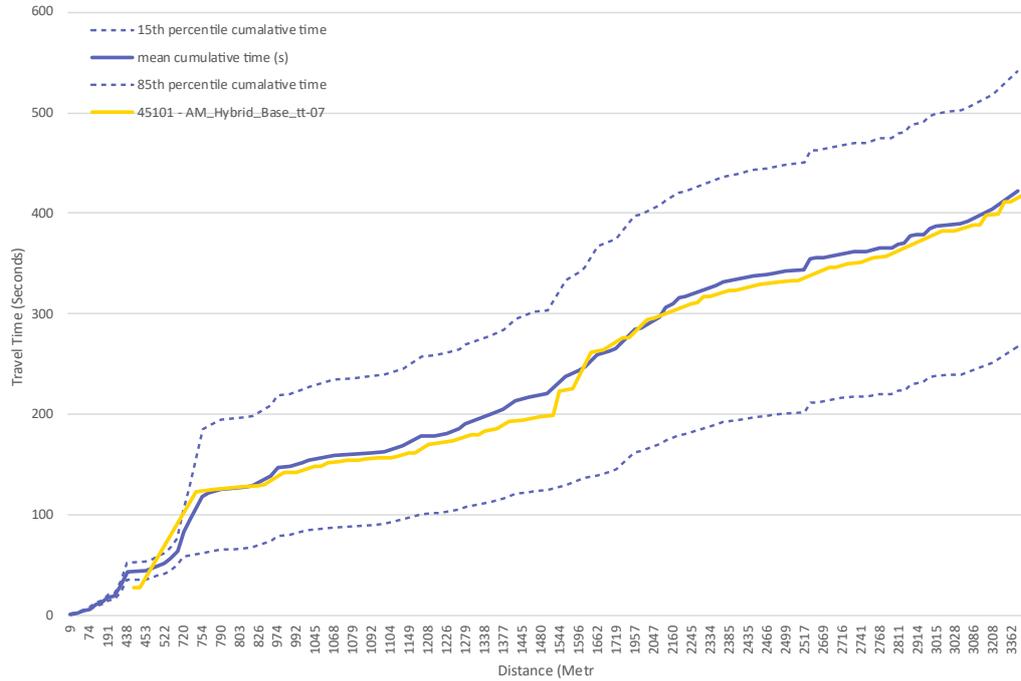
Travel time profile: Harbour View – Waterloo (7-8)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
──── mean cumulative time (s)
- - - - 85th percentile cumalative time
──── 45101 - AM_Hybrid_Base_tt-08
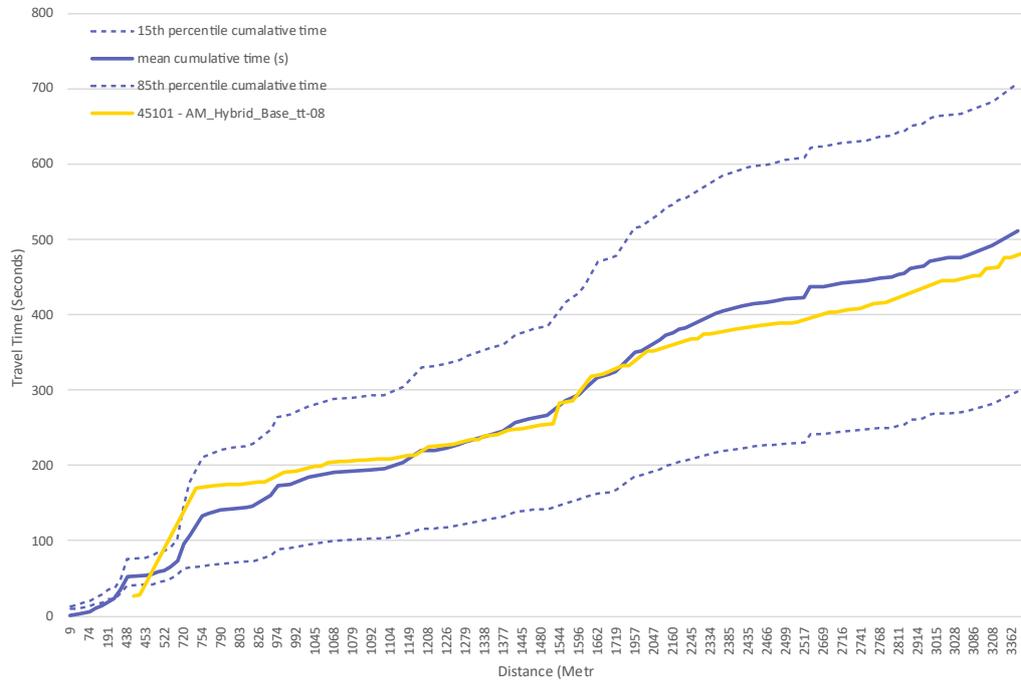
Travel time profile: Harbour View - Waterloo (8-9)

Tomtom vs Modelled Travel Time
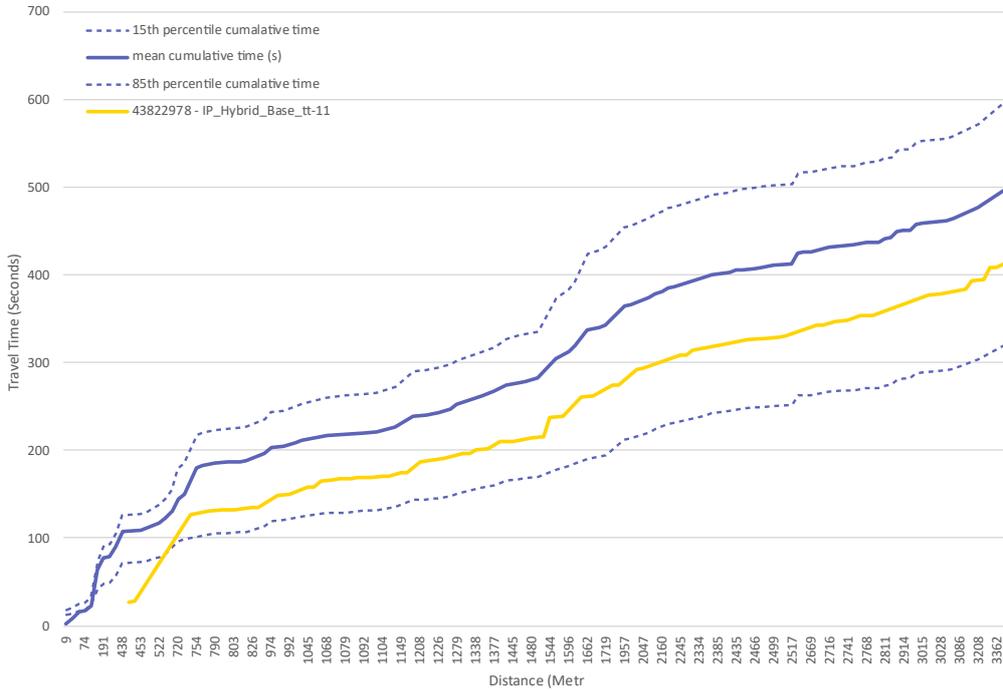
Travel time profile: Harbour View - Waterloo (11-12)

Tomtom vs Modelled Travel Time
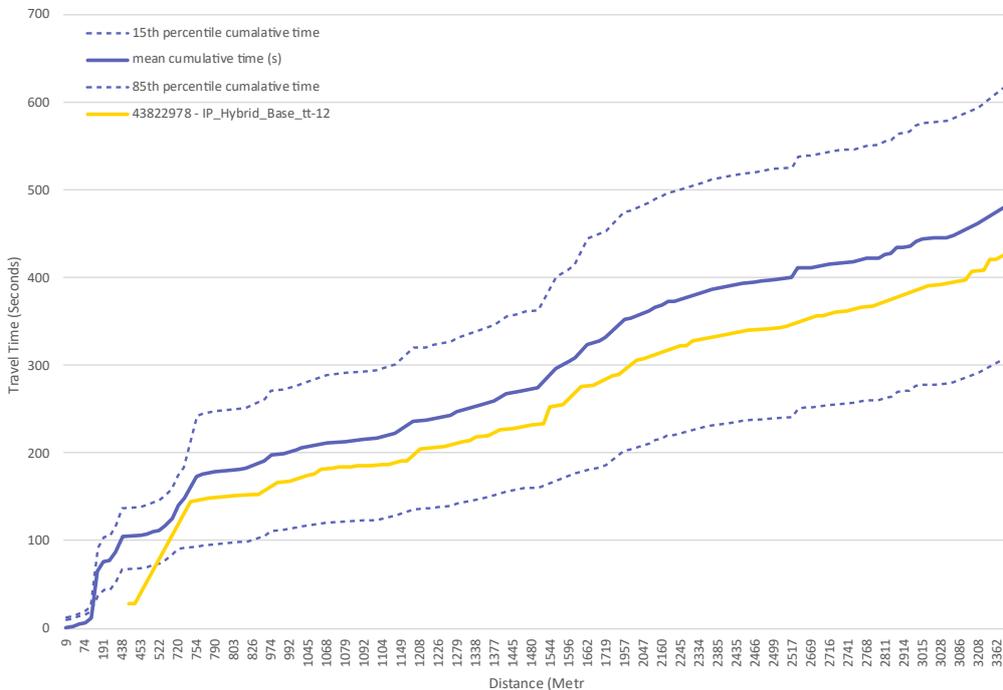
Travel time profile: Harbour View - Waterloo (12-13)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 43822988 - PM_Hybrid_Base_tt-16
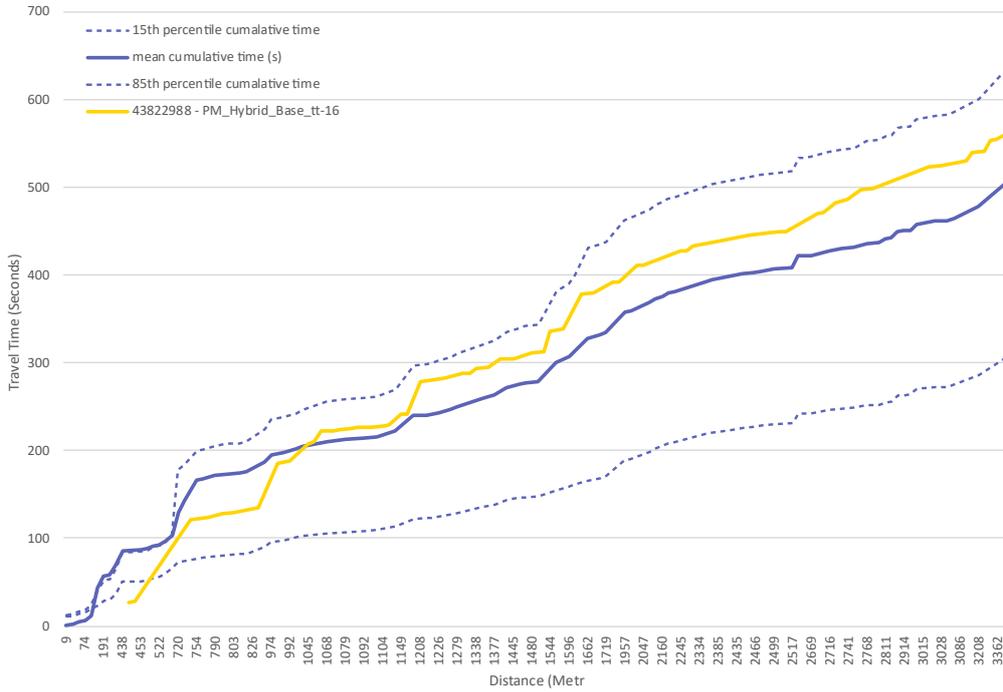
Travel time profile: Harbour View - Waterloo (16-17)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
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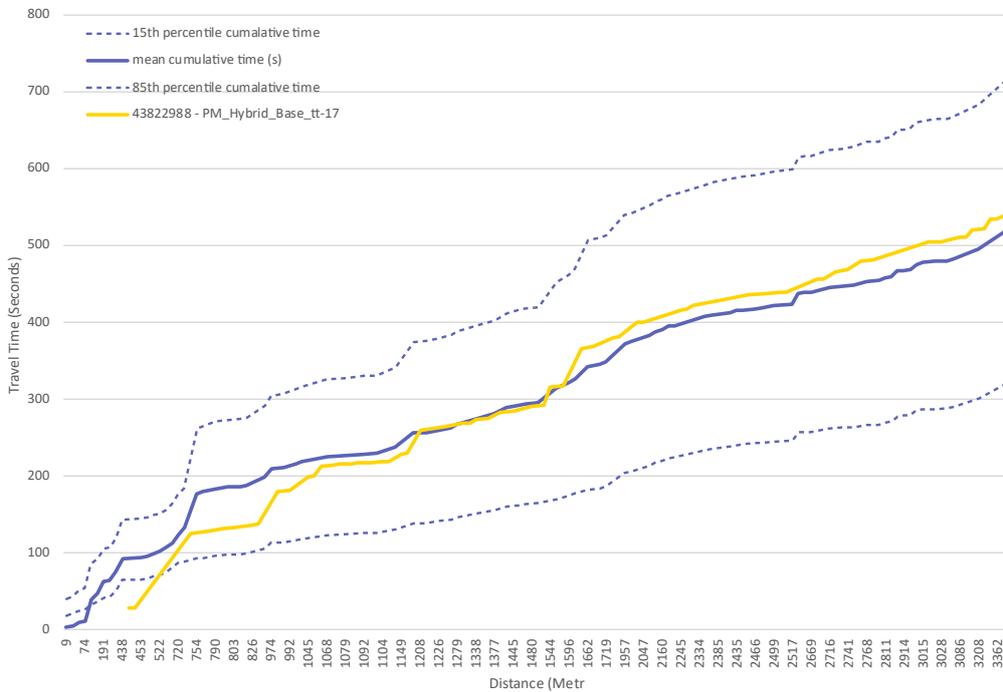
Travel time profile: Harbour View - Waterloo (17-18)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 45101 - AM_Hybrid_Base_tt-07

Travel Time (Seconds) / Distance (Metr)
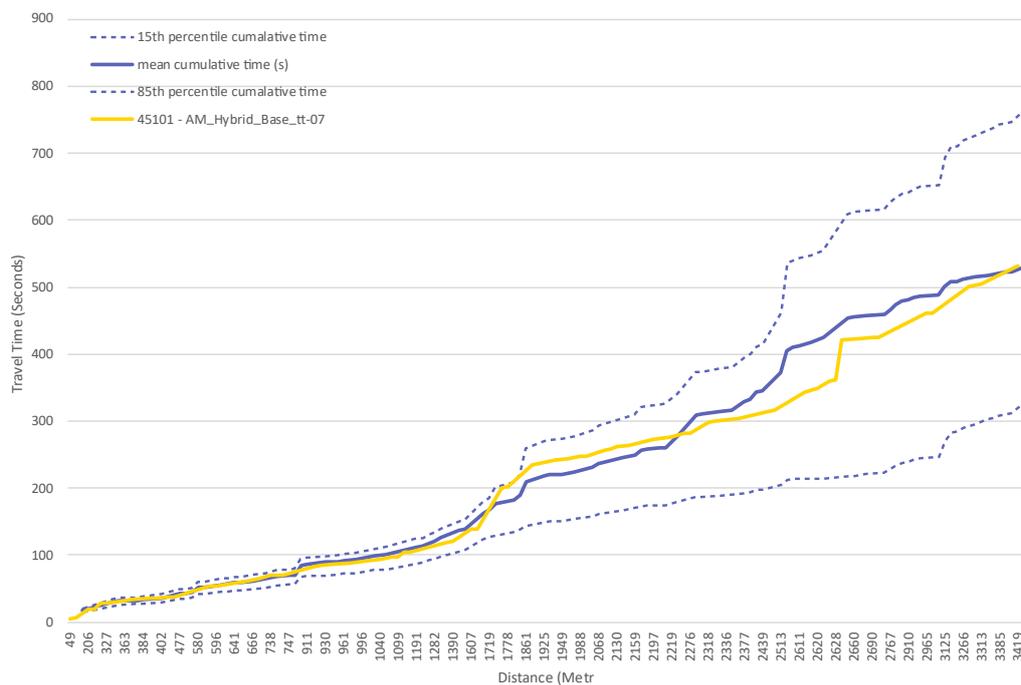
Travel time profile: Waterloo – Harbour View (7-8)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 45101 - AM_Hybrid_Base_tt-08

Travel Time (Seconds) / Distance (Metr)
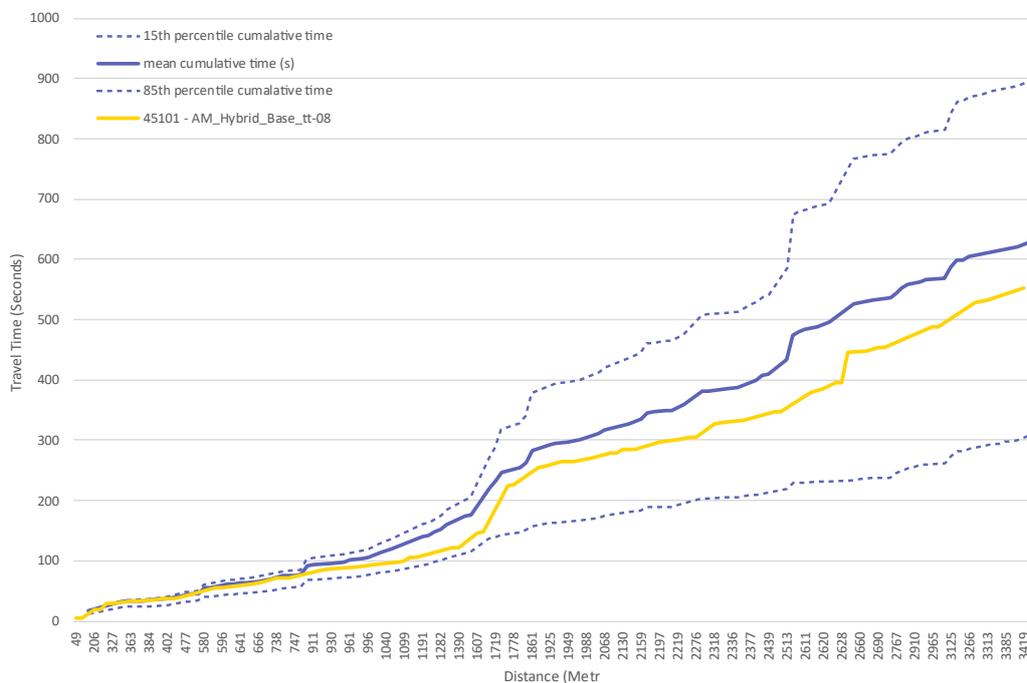
Travel time profile: Waterloo – Harbour View (8-9)

Tomtom vs Modelled Travel Time
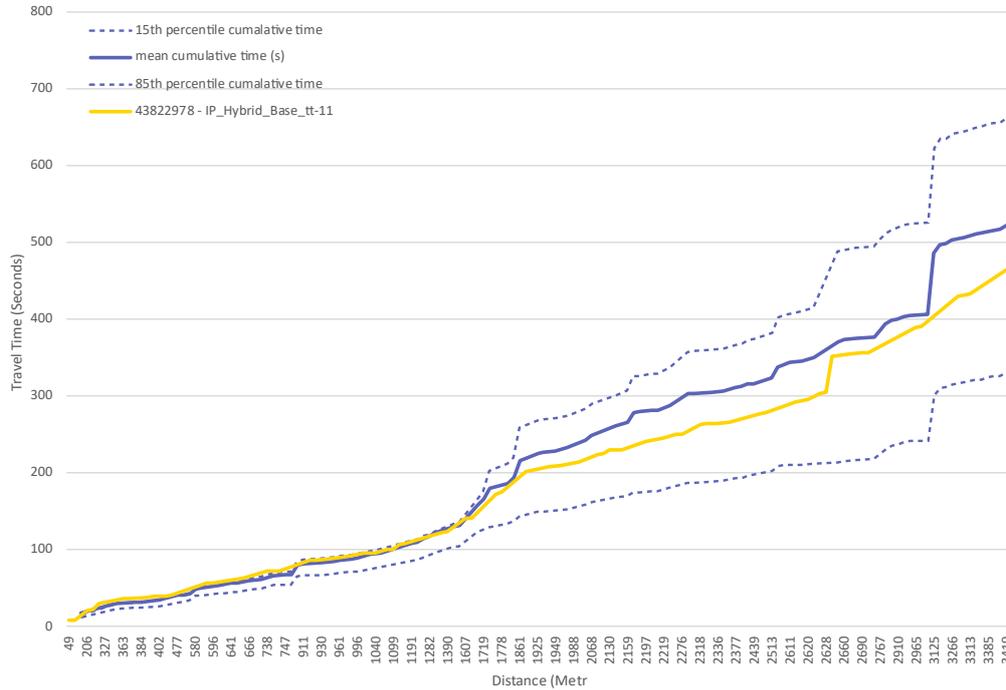
Travel time profile: Waterloo – Harbour View (11-12)

Tomtom vs Modelled Travel Time
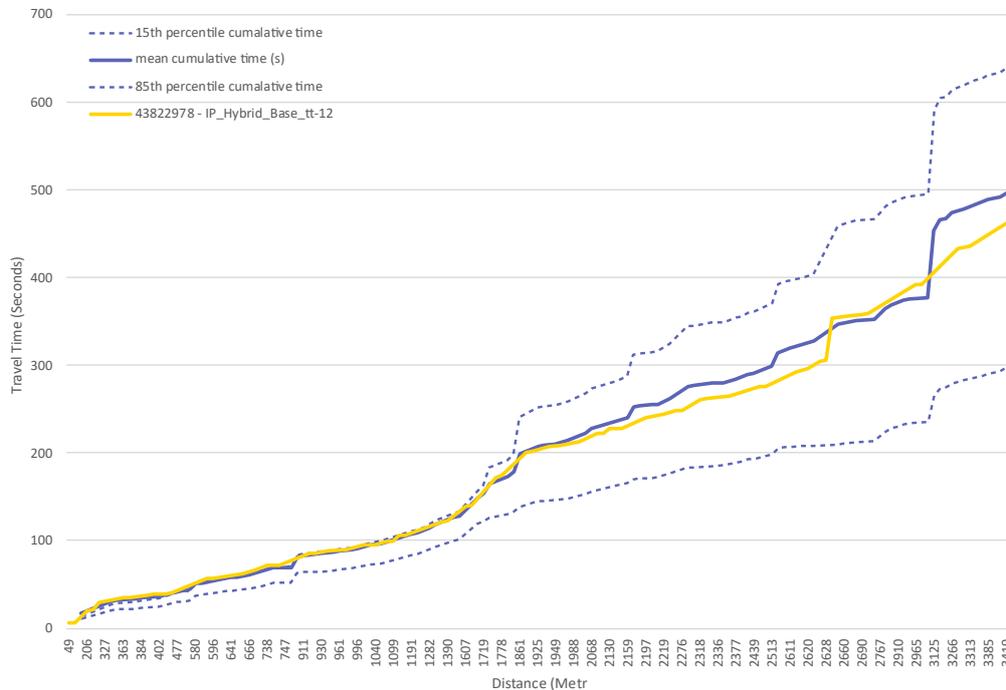
Travel time profile: Waterloo – Harbour View (12-13)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 43822988 - PM_Hybrid_Base_tt-16
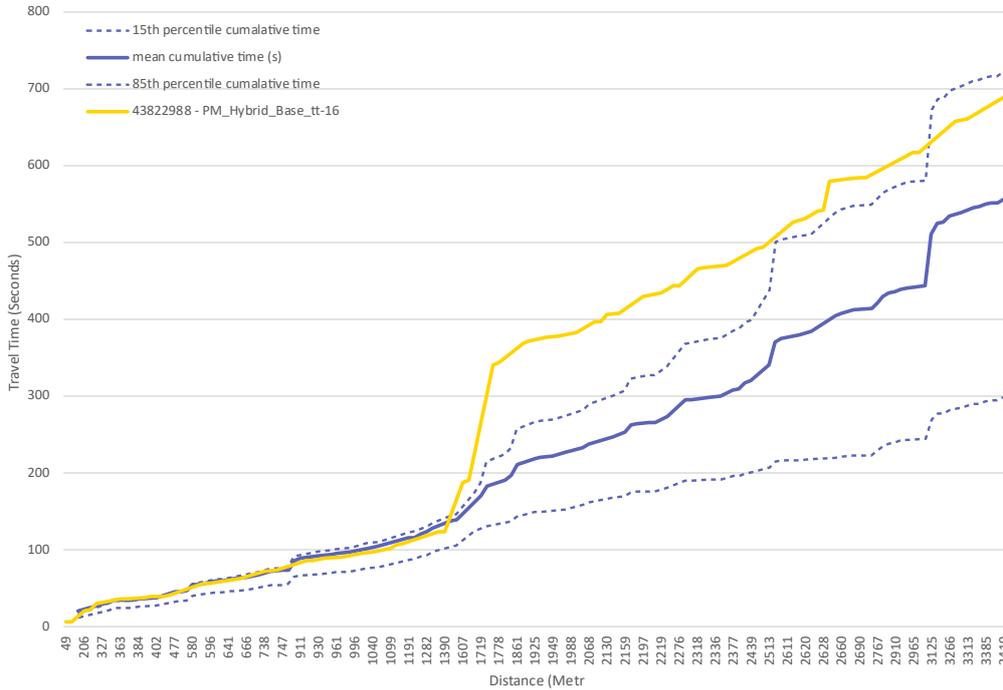
Travel time profile: Waterloo – Harbour View (16-17)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 43822988 - PM_Hybrid_Base_tt-17
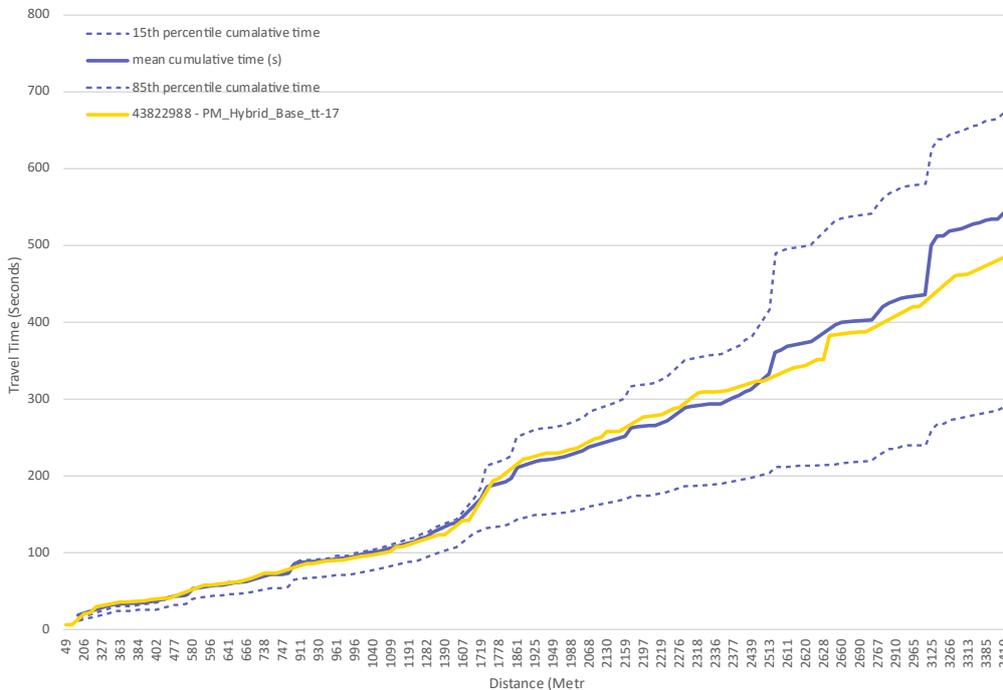
Travel time profile: Waterloo – Harbour View (17-18)

Tomtom vs Modelled Travel Time
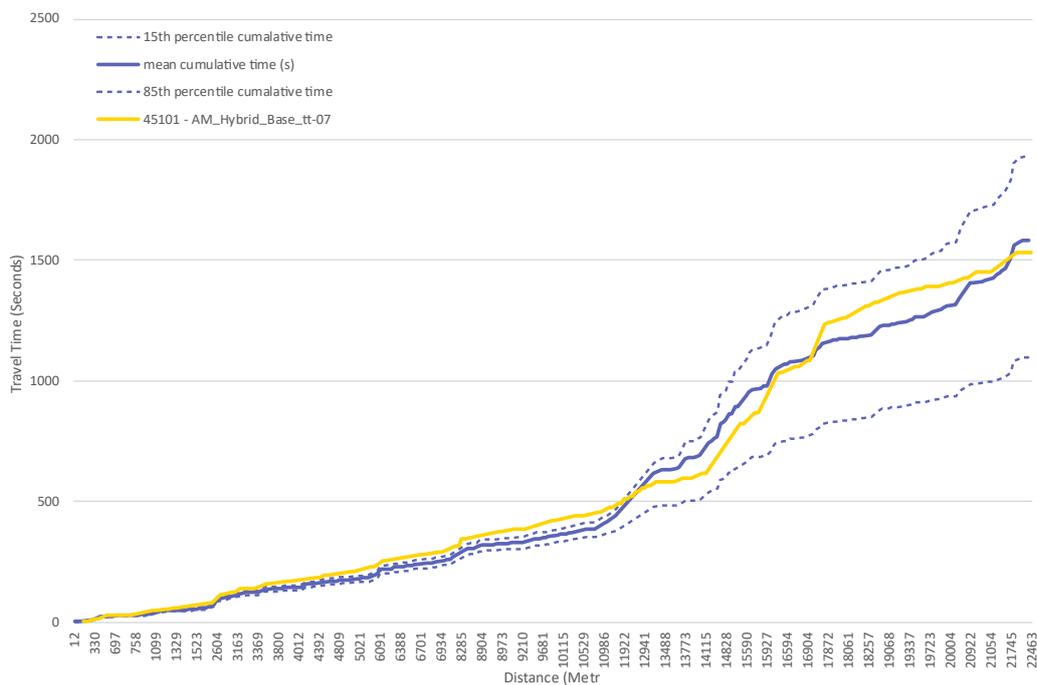
Travel time profile: SH1: TG – Ngauranga (7-8)

Tomtom vs Modelled Travel Time
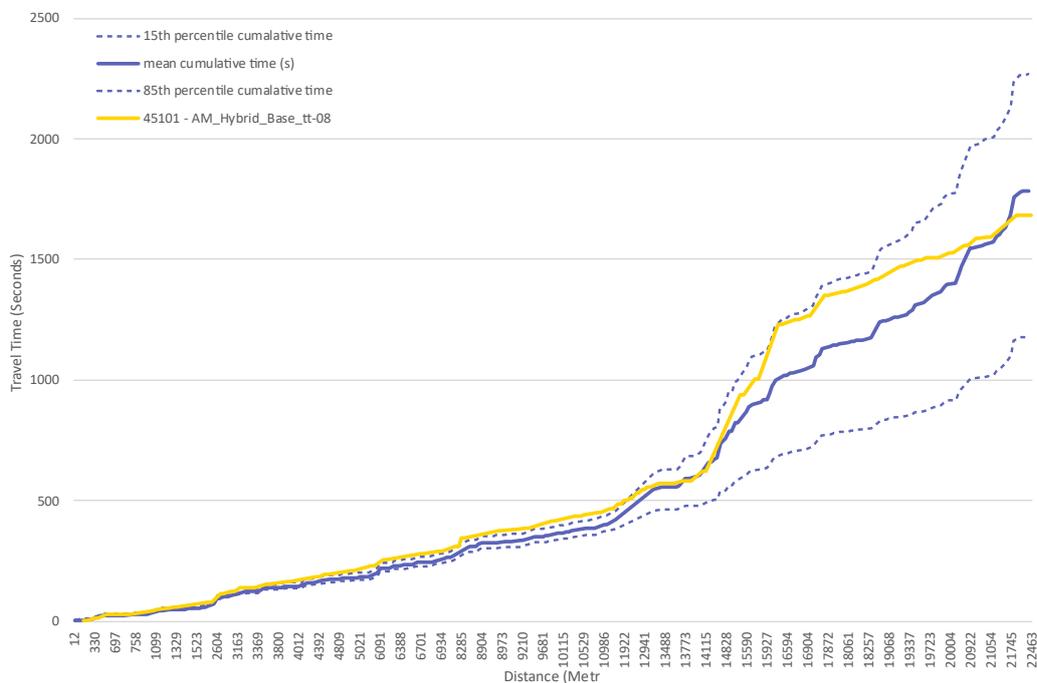
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Tomtom vs Modelled Travel Time
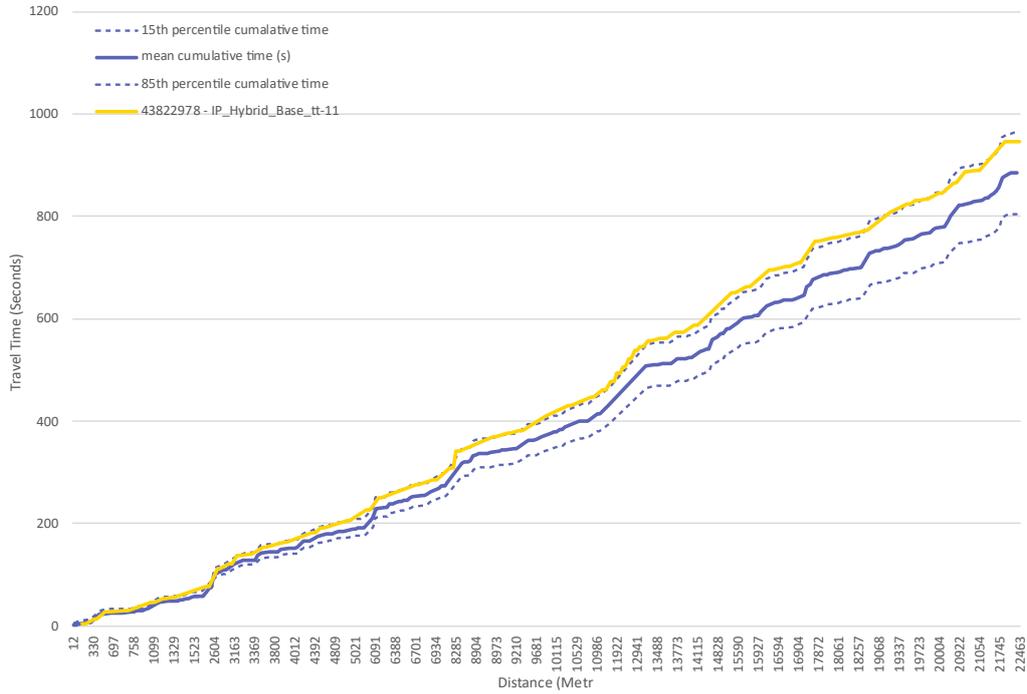
- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 43822978 - IP_Hybrid_Base_tt-11

Travel time profile: SH1: TG – Ngauranga (11-12)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 43822978 - IP_Hybrid_Base_tt-12

Travel time profile: SH1: TG – Ngauranga (12-13)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
— mean cumulative time (s)
- - - 85th percentile cumalative time
— 43822988 - PM_Hybrid_Base_tt-16

Travel time profile: SH1: TG – Ngauranga (16-17)

Tomtom vs Modelled Travel Time

- - - 15th percentile cumalative time
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- - - 85th percentile cumalative time
— 43822988 - PM_Hybrid_Base_tt-17
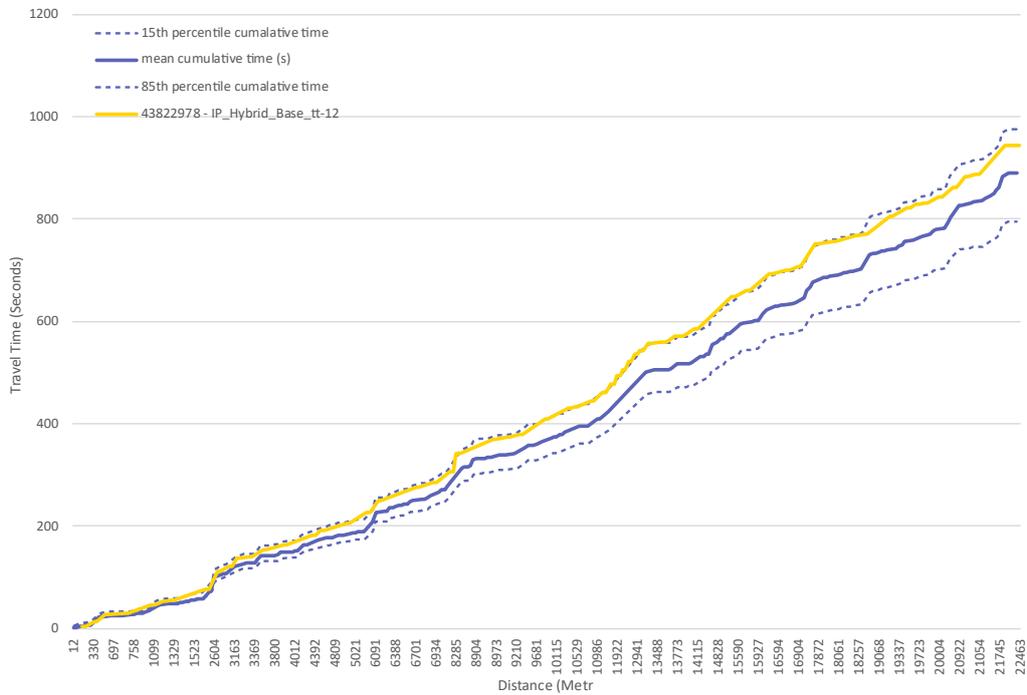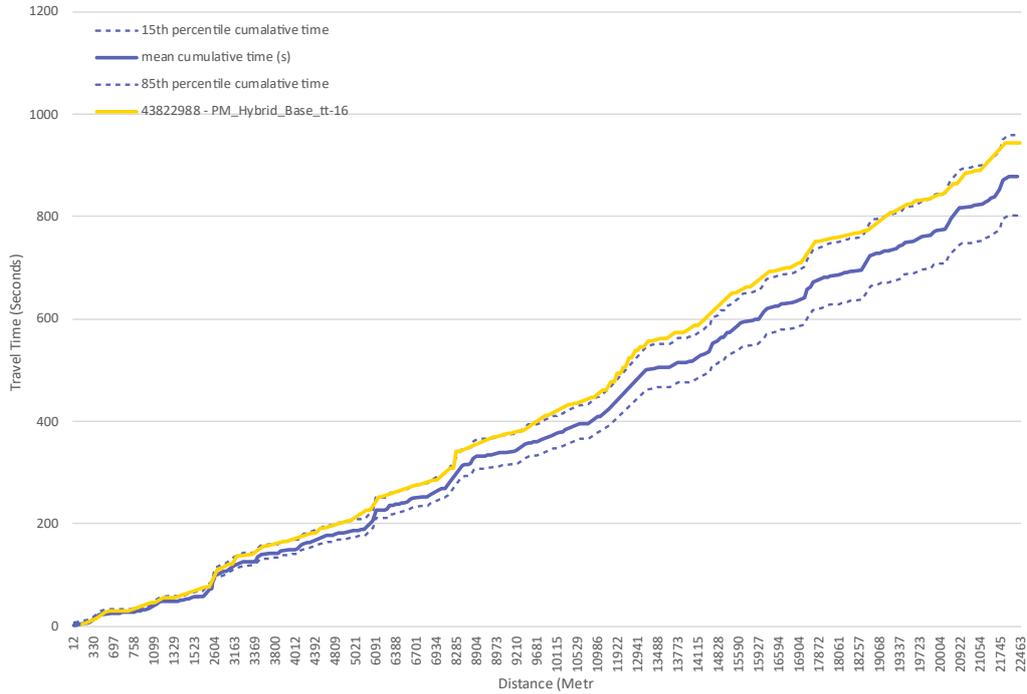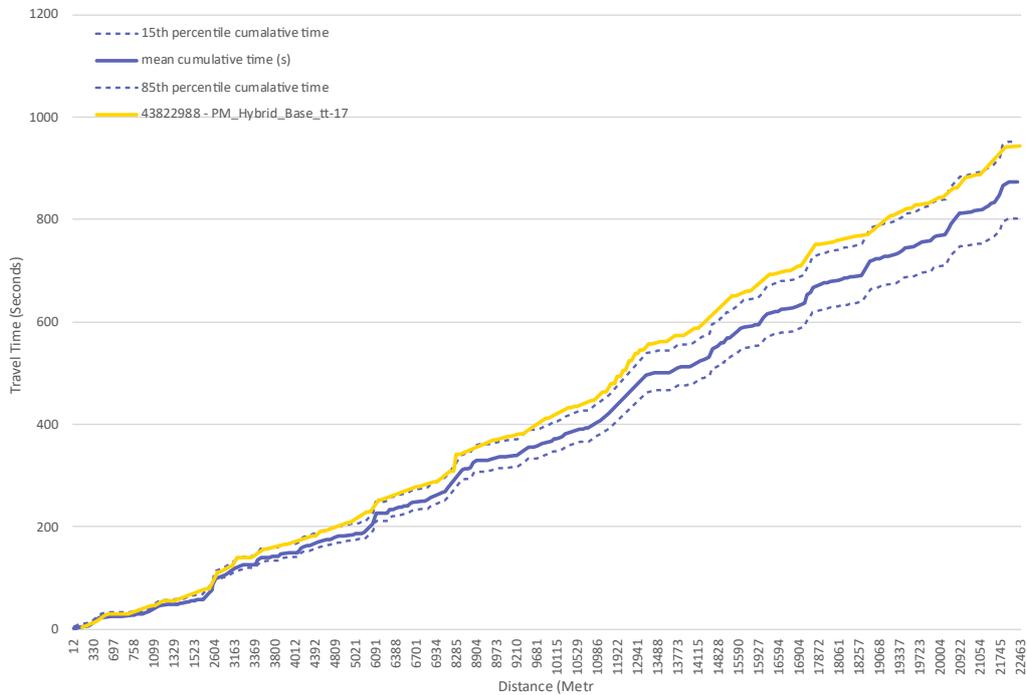
Travel time profile: SH1: TG – Ngauranga (17-18)

Tomtom vs Modelled Travel Time
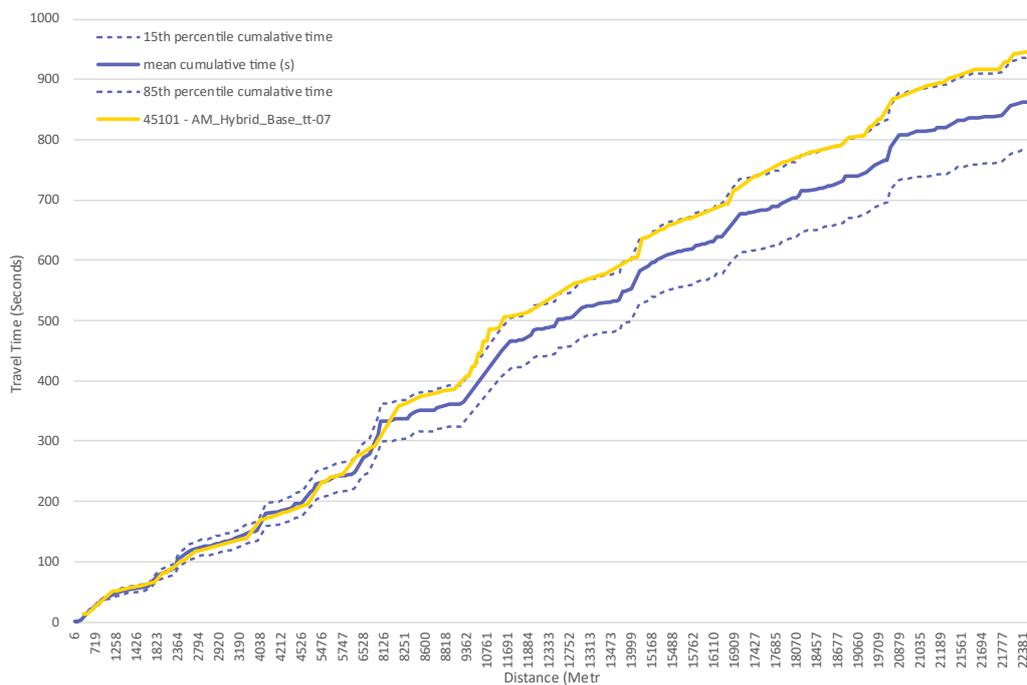
Travel time profile: SH1: Ngauranga – TG (7-8)

Tomtom vs Modelled Travel Time
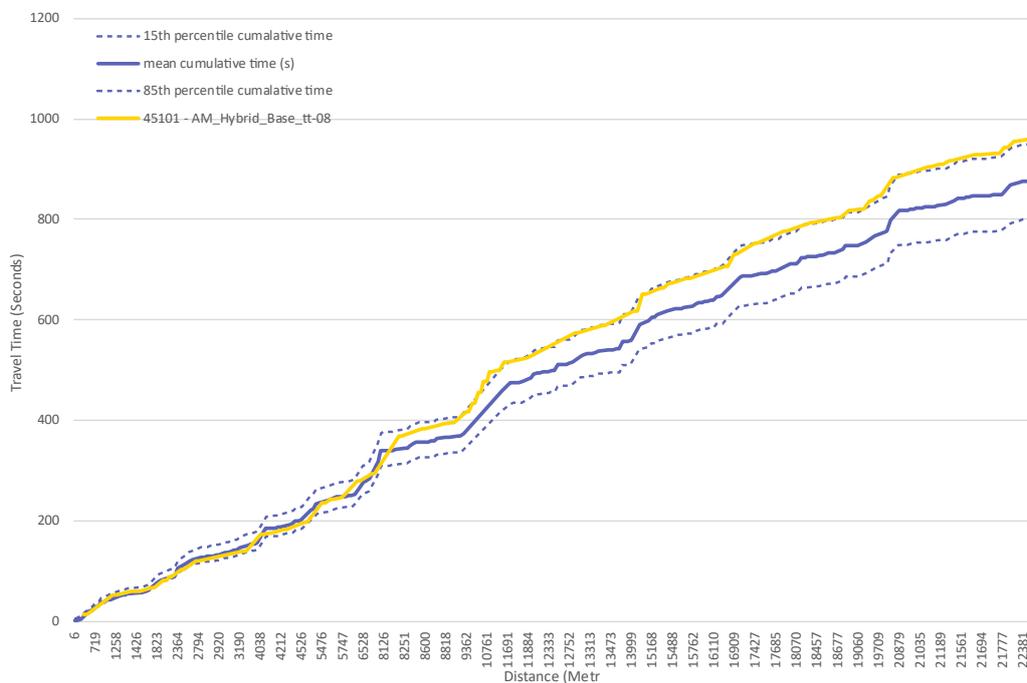
Travel time profile: SH1: Ngauranga – TG (8-9)

Tomtom vs Modelled Travel Time
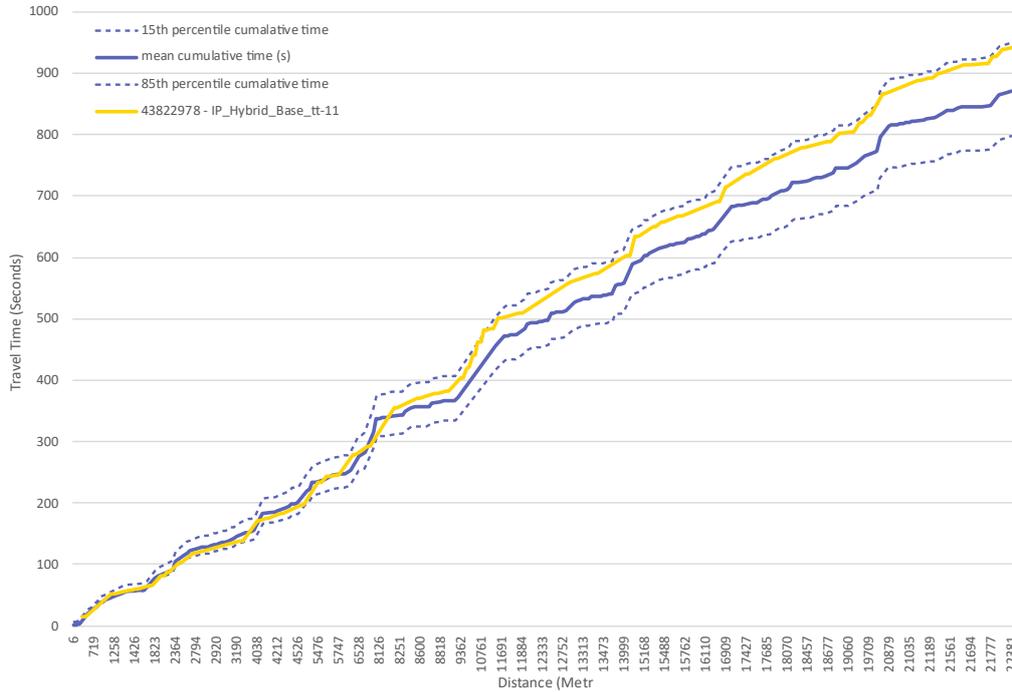
Travel time profile: SH1: Ngauranga – TG (11-12)

Tomtom vs Modelled Travel Time
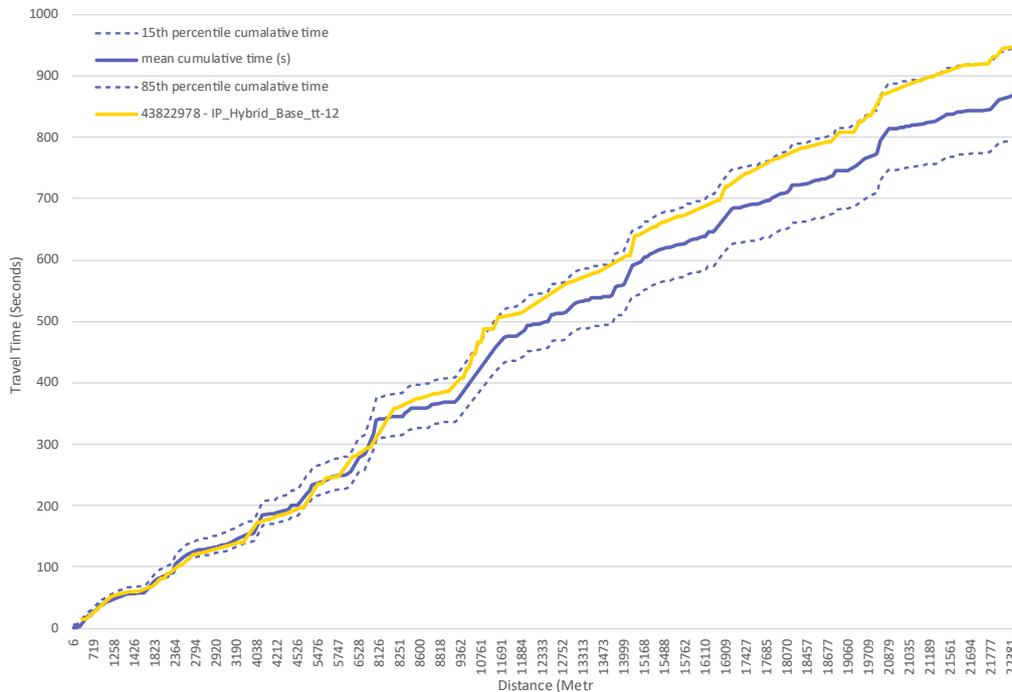
Travel time profile: SH1: Ngauranga – TG (12-13)

Tomtom vs Modelled Travel Time
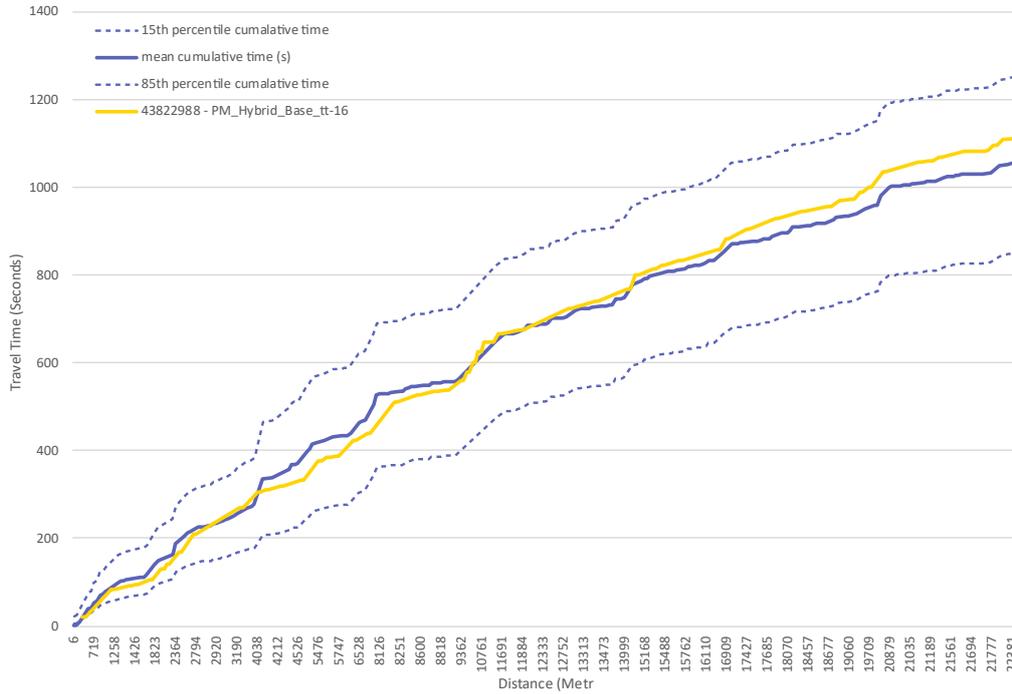
Travel time profile: SH1: Ngauranga – TG (16-17)

Tomtom vs Modelled Travel Time
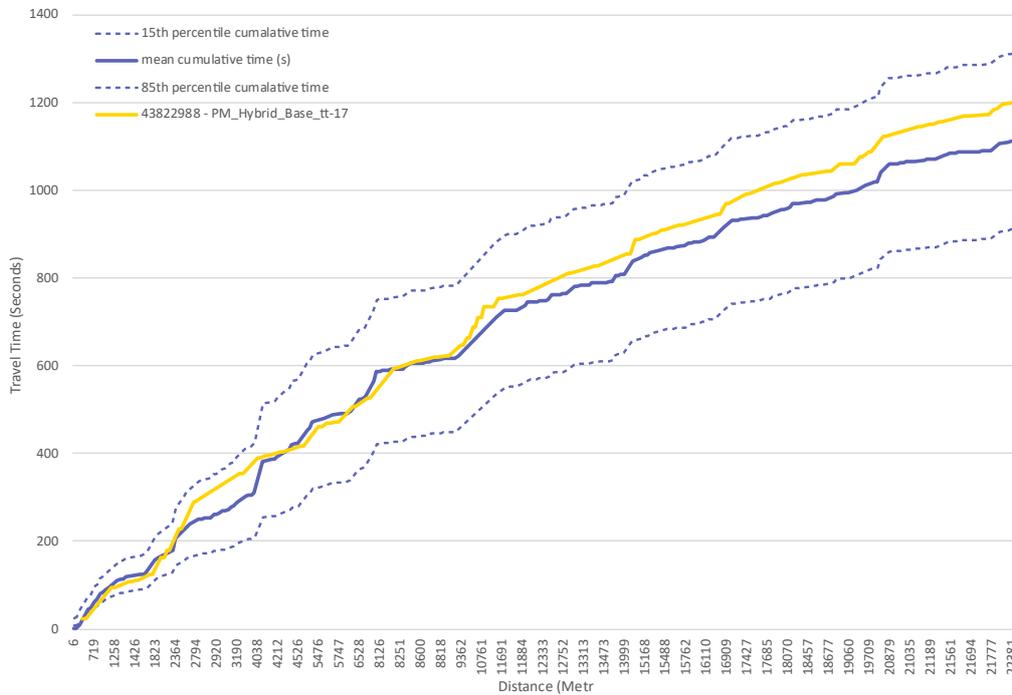
Travel time profile: SH1: Ngauranga – TG (17-18)

Tomtom vs Modelled Travel Time
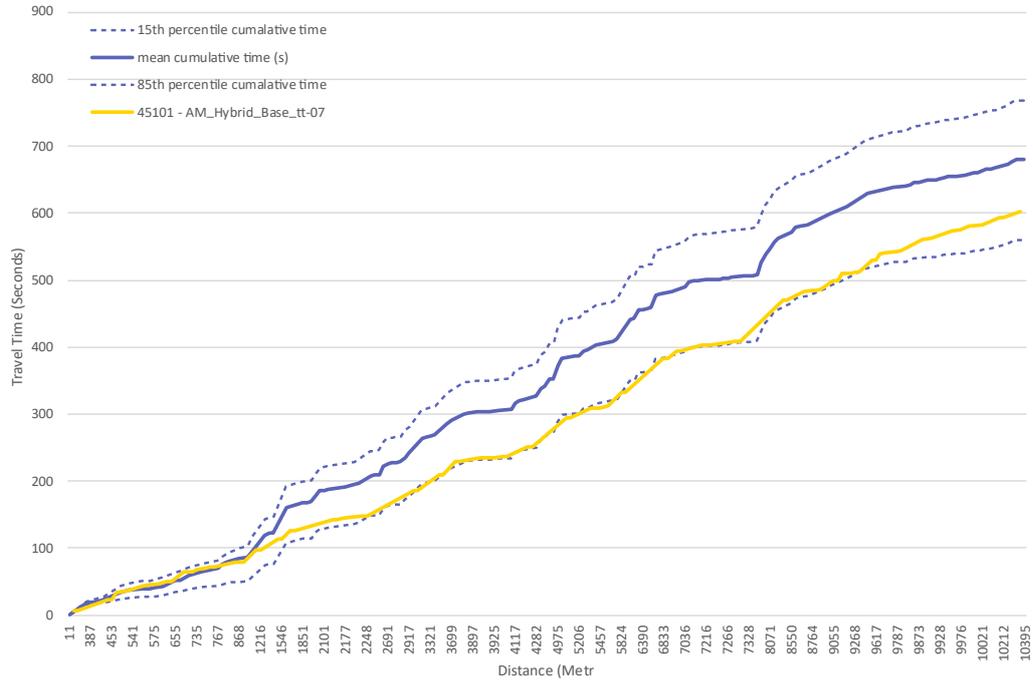
Travel time profile: SH58 EB (7-8)

Tomtom vs Modelled Travel Time
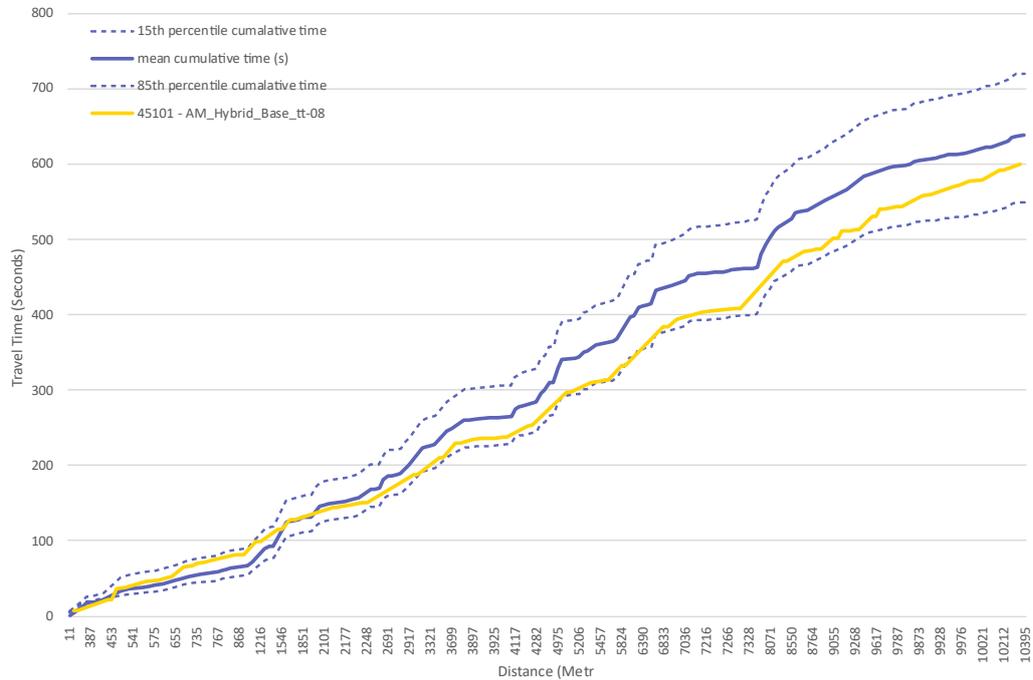
Travel time profile: SH58 EB (8-9)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 43822978 - IP_Hybrid_Base_tt-11
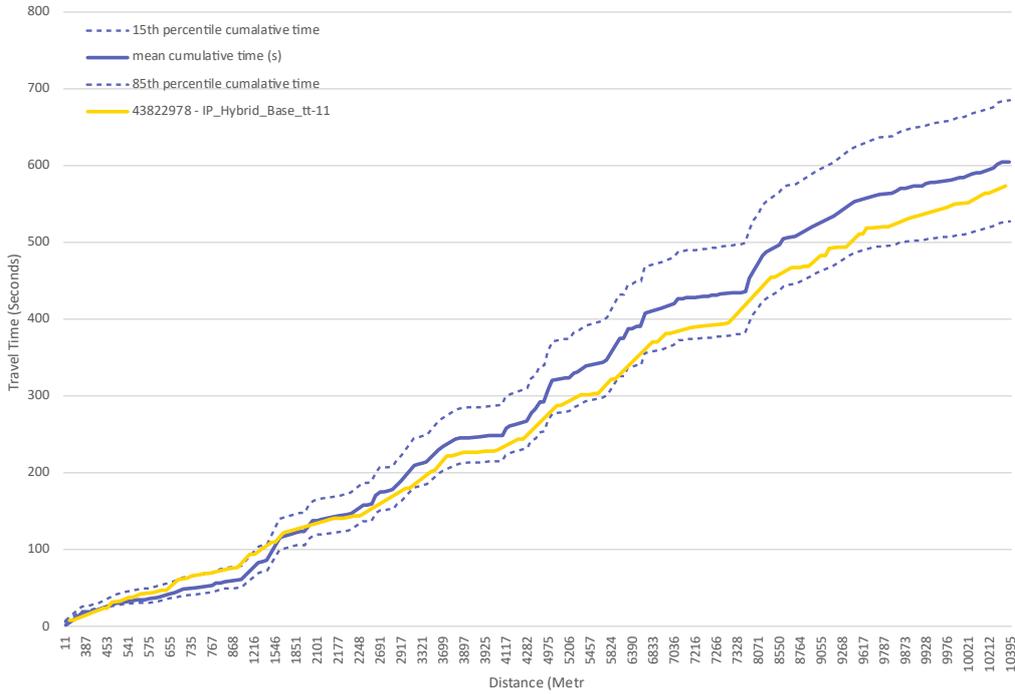
Travel time profile: SH58 EB (11-12)

Tomtom vs Modelled Travel Time

- - - - 15th percentile cumalative time
——— mean cumulative time (s)
- - - - 85th percentile cumalative time
——— 43822978 - IP_Hybrid_Base_tt-12
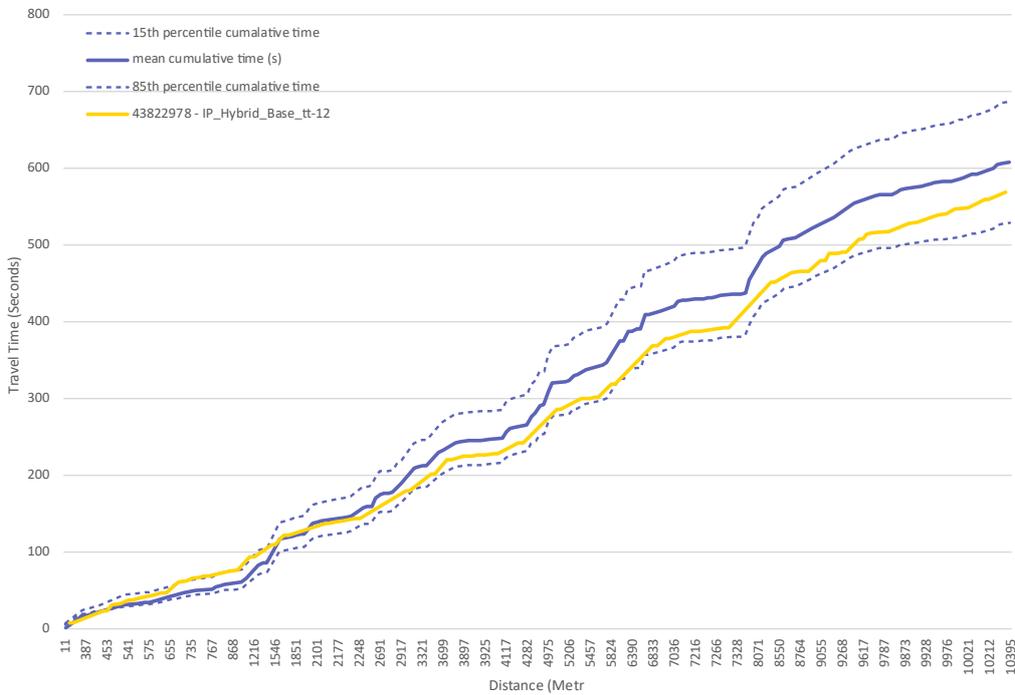
Travel time profile: SH58 EB (12-13)

Tomtom vs Modelled Travel Time
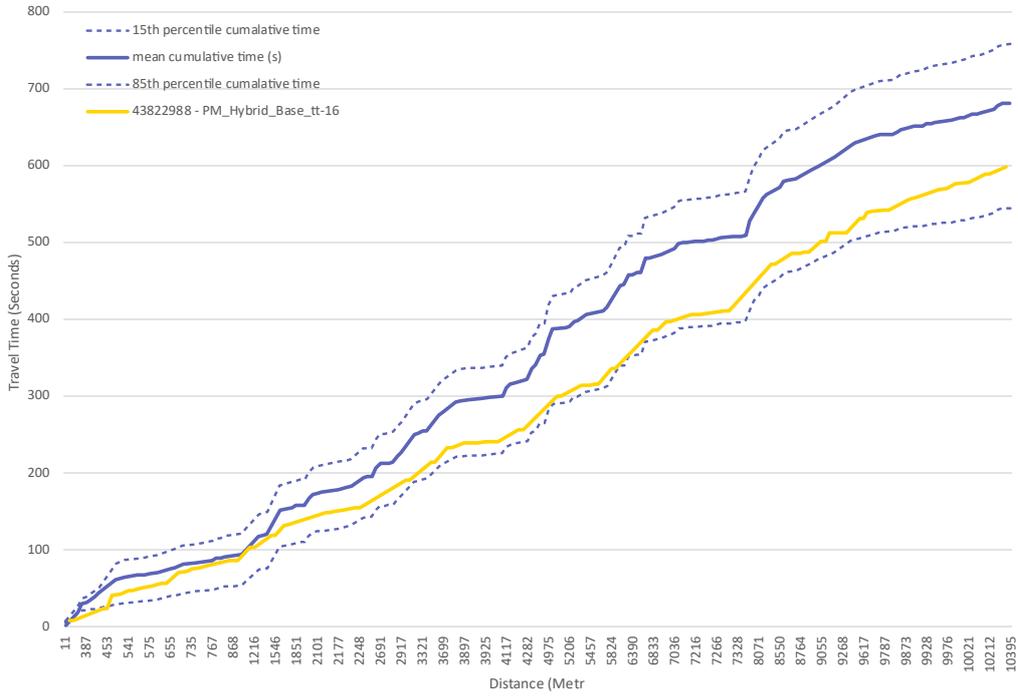
Travel time profile: SH58 EB (16-17)

Tomtom vs Modelled Travel Time
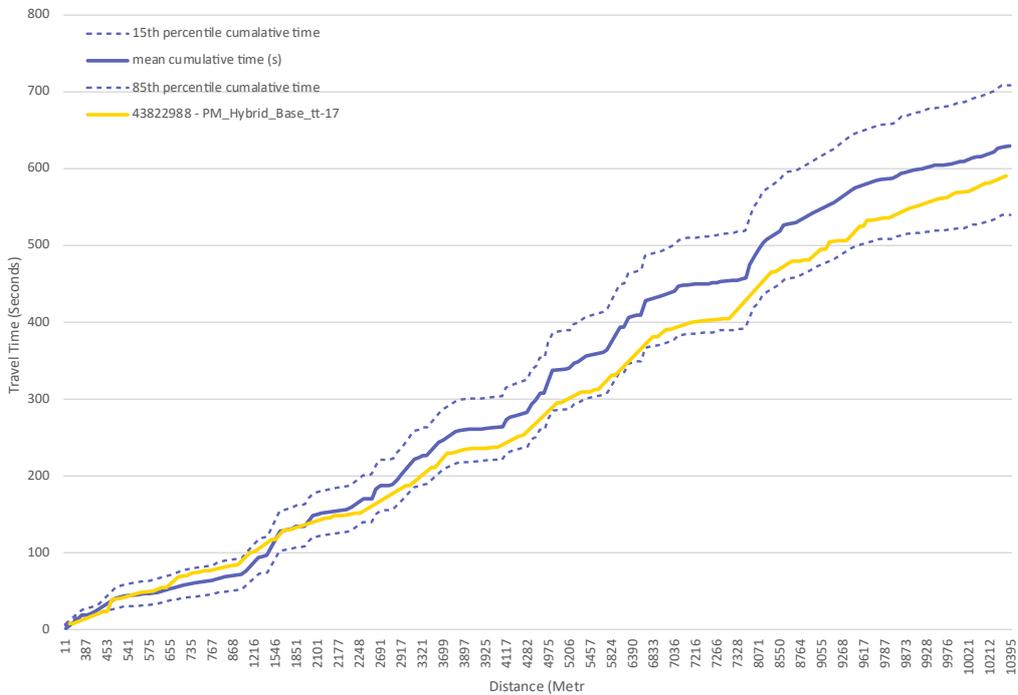
Travel time profile: SH58 EB (17-18)

Tomtom vs Modelled Travel Time
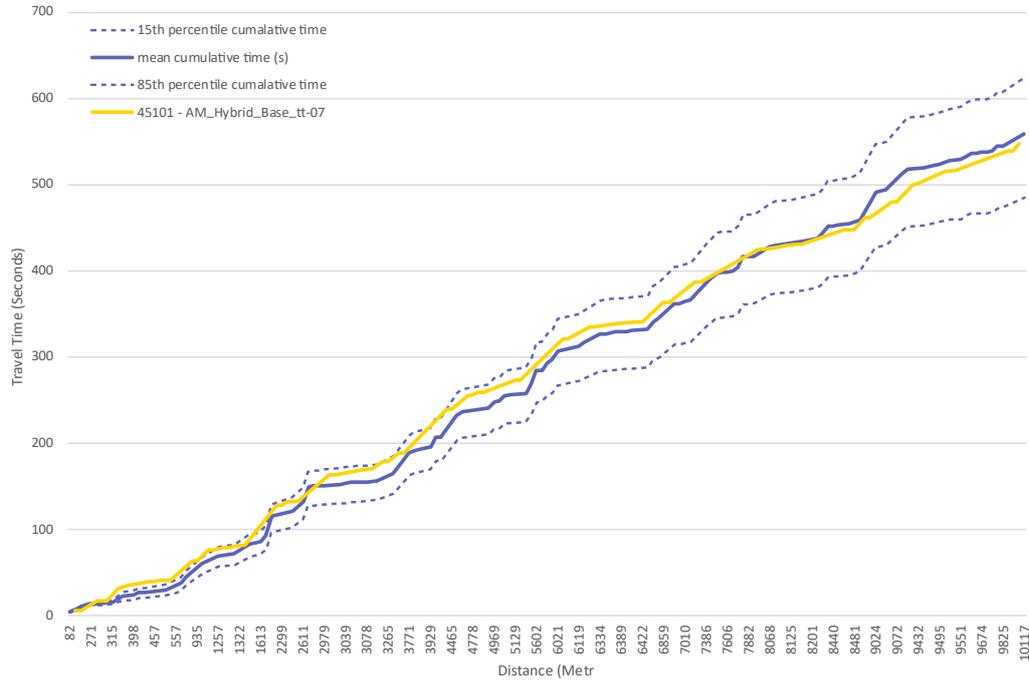
Travel time profile: SH58 WB (7-8)

Tomtom vs Modelled Travel Time
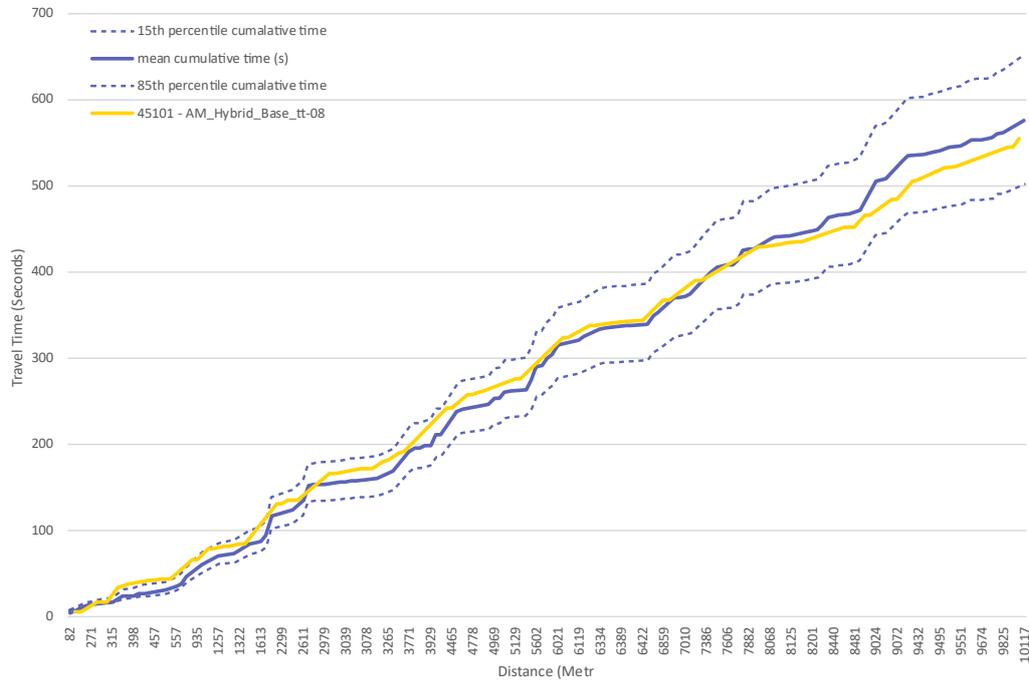
Travel time profile: SH58 WB (8-9)

Tomtom vs Modelled Travel Time
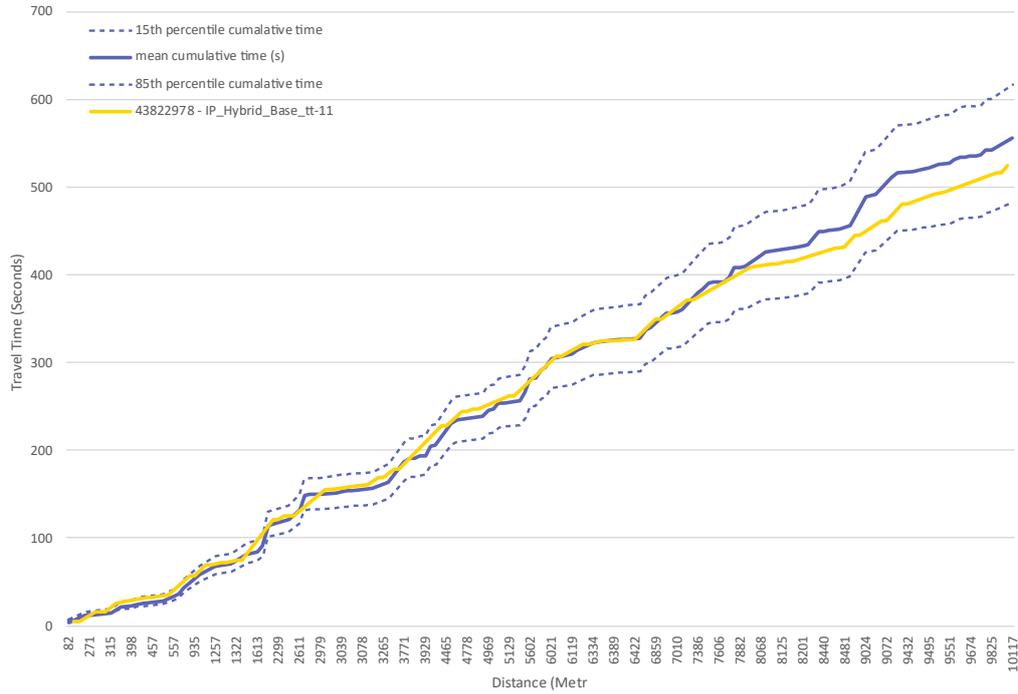
Travel time profile: SH58 WB (11-12)

Tomtom vs Modelled Travel Time
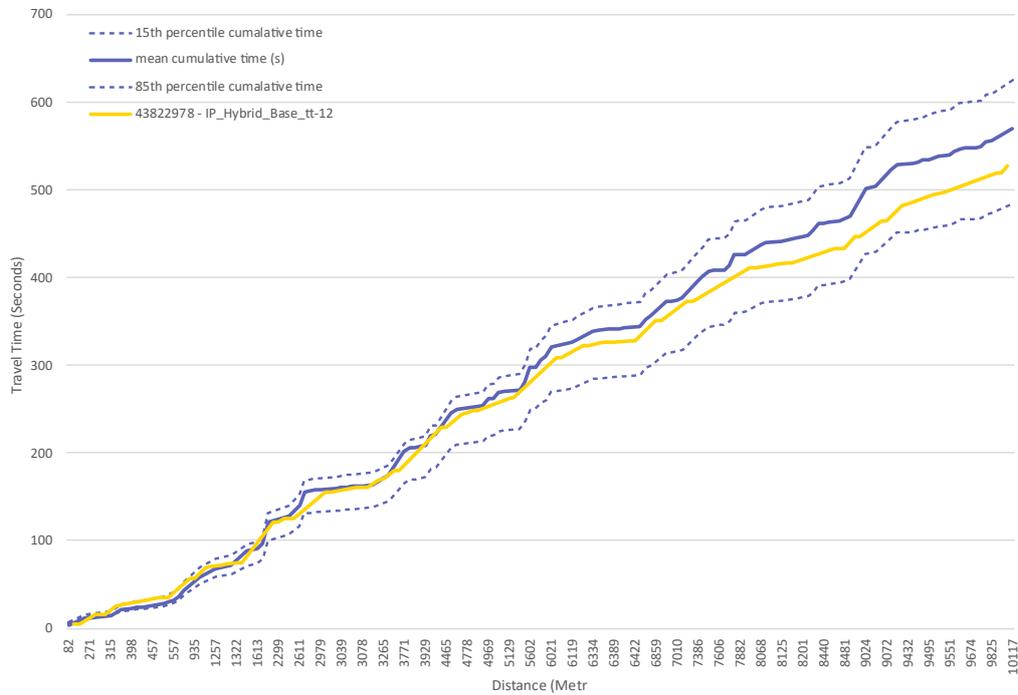
Travel time profile: SH58 WB (12-13)

Tomtom vs Modelled Travel Time
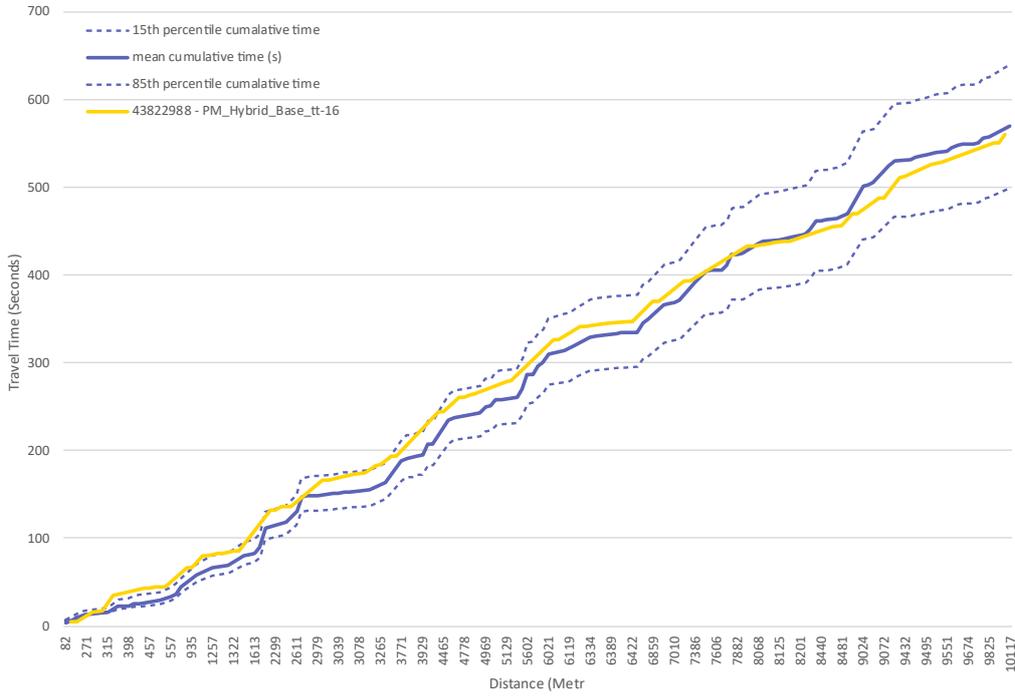
Travel time profile: SH58 WB (16-17)

Tomtom vs Modelled Travel Time
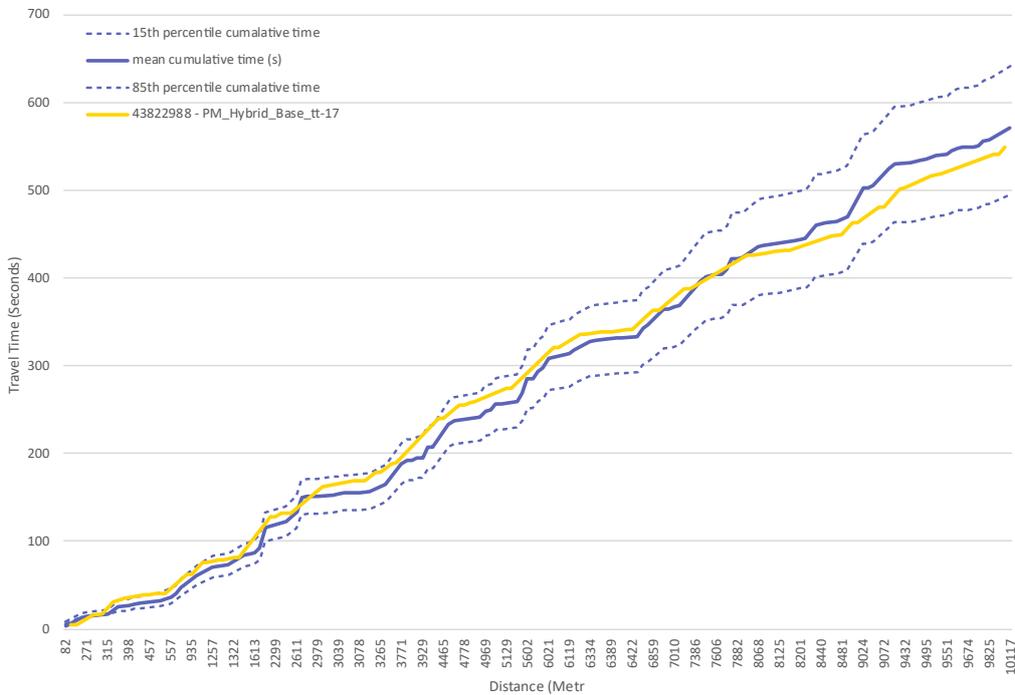
Travel time profile: SH58 WB (17-18)

Tomtom vs Modelled Travel Time
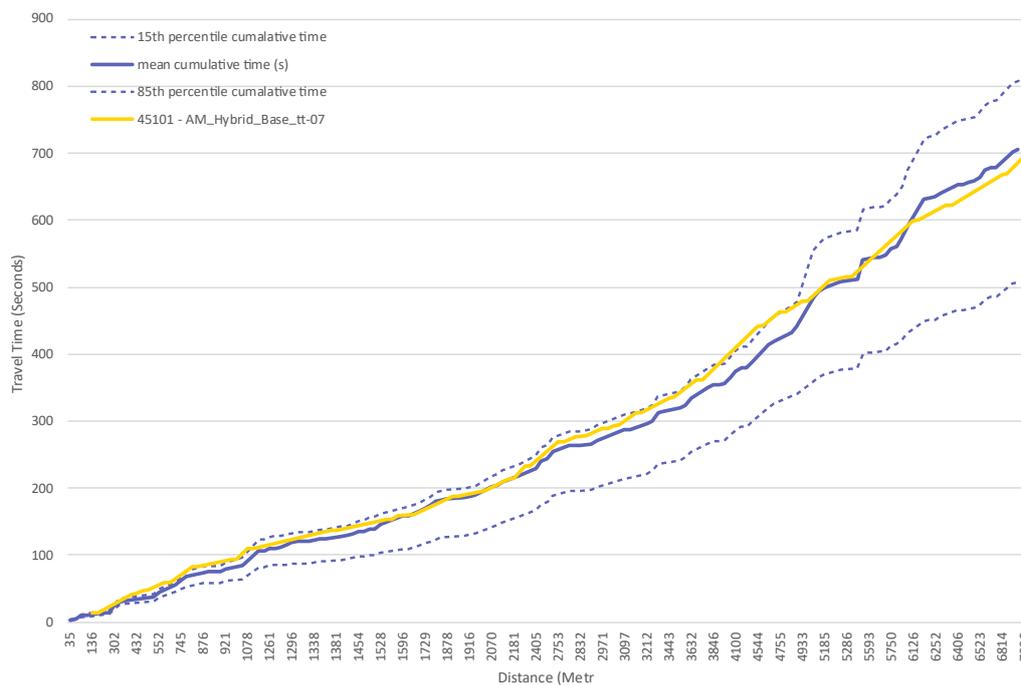
Travel time profile: Eastbourne – Seaview (7-8)

Tomtom vs Modelled Travel Time
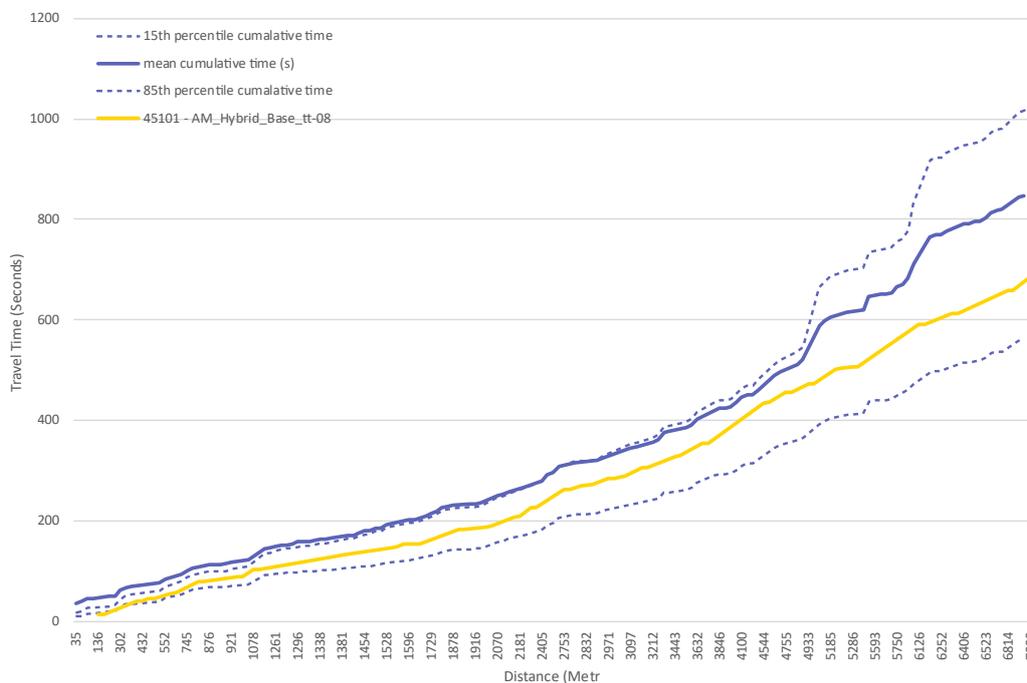
Travel time profile: Eastbourne – Seaview (8-9)

Tomtom vs Modelled Travel Time
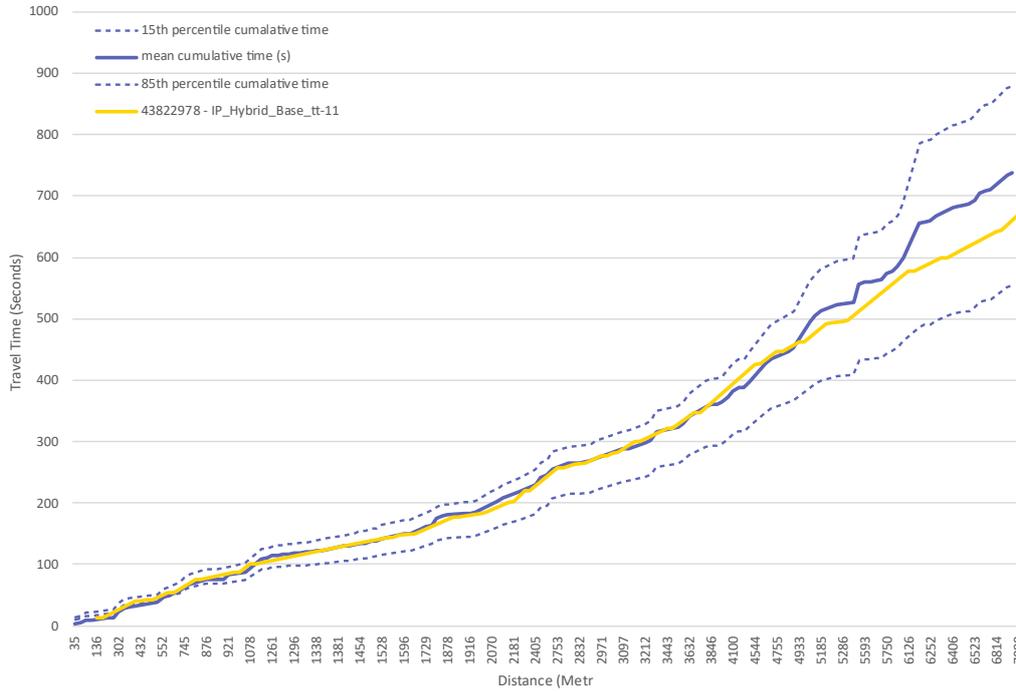
Travel time profile: Eastbourne – Seaview (11-12)
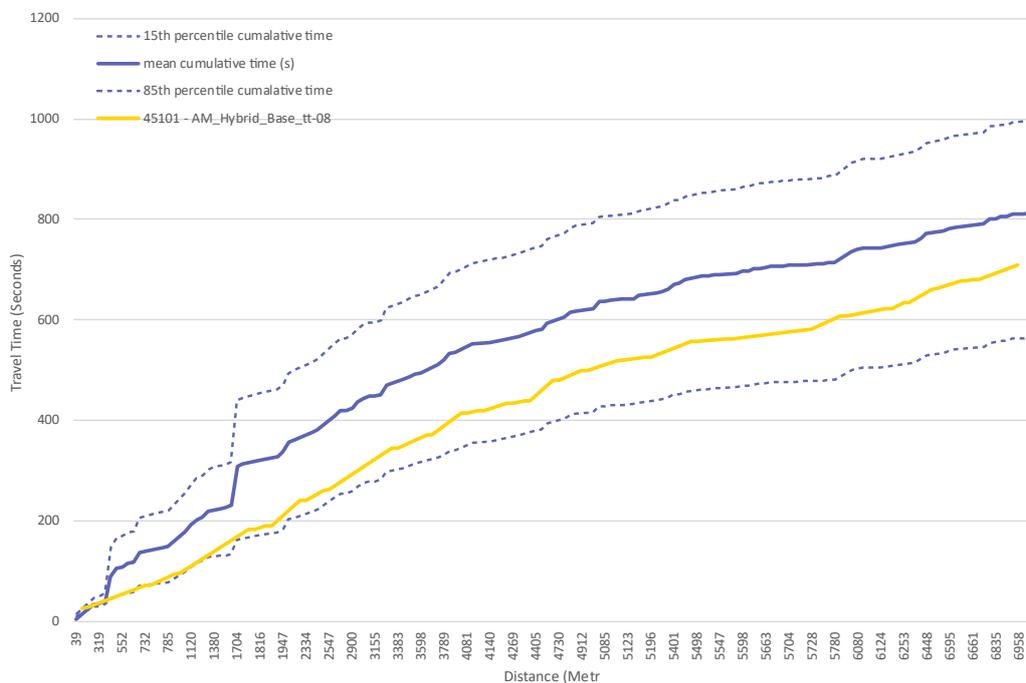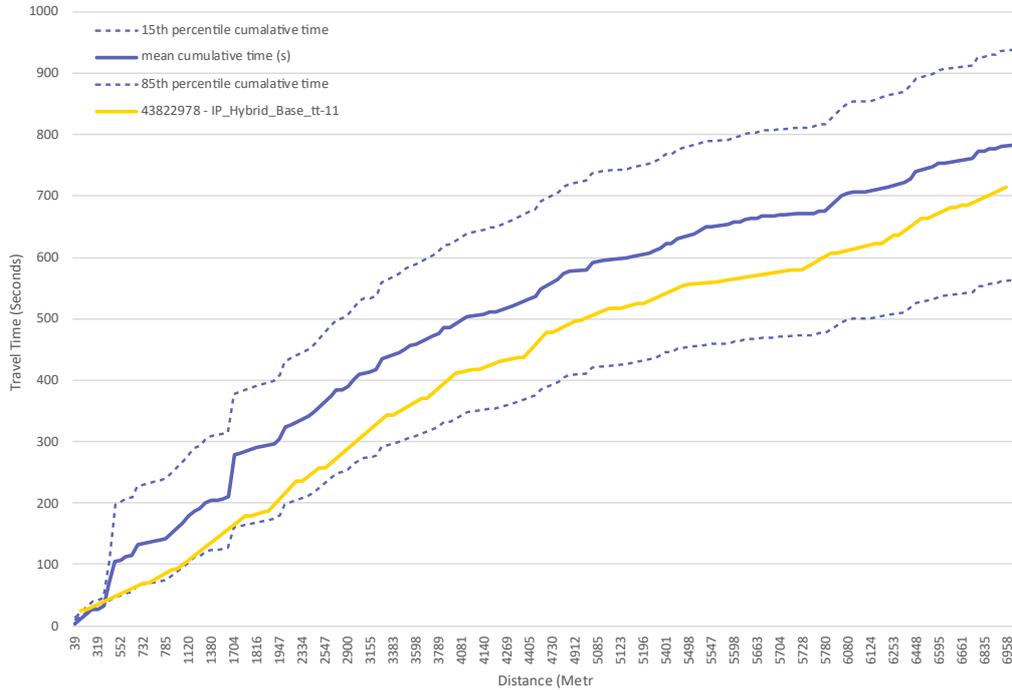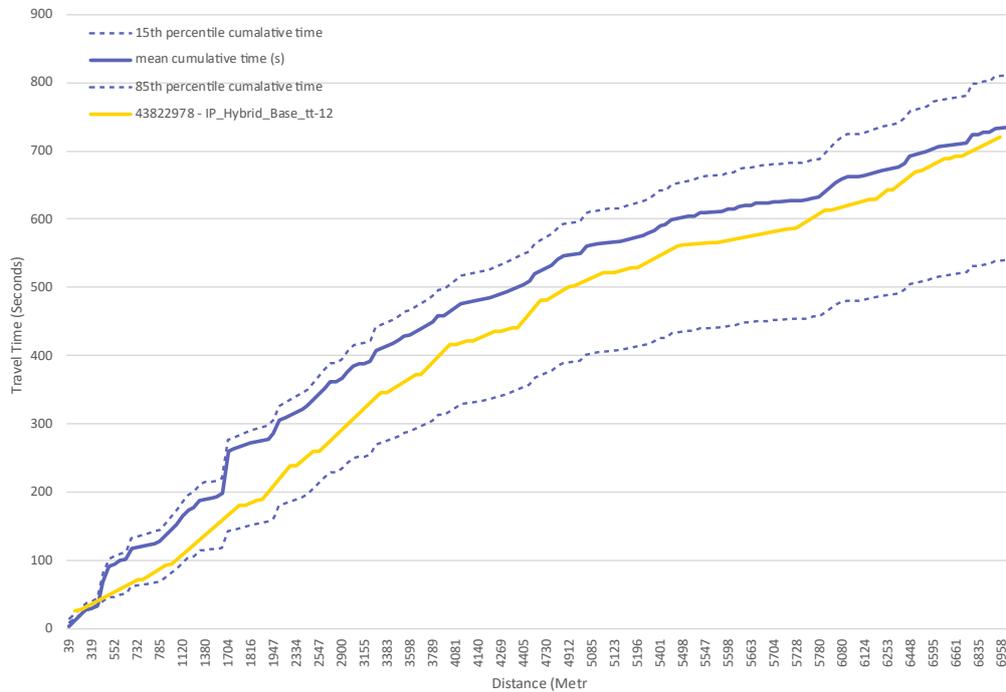
Tomtom vs Modelled Travel Time
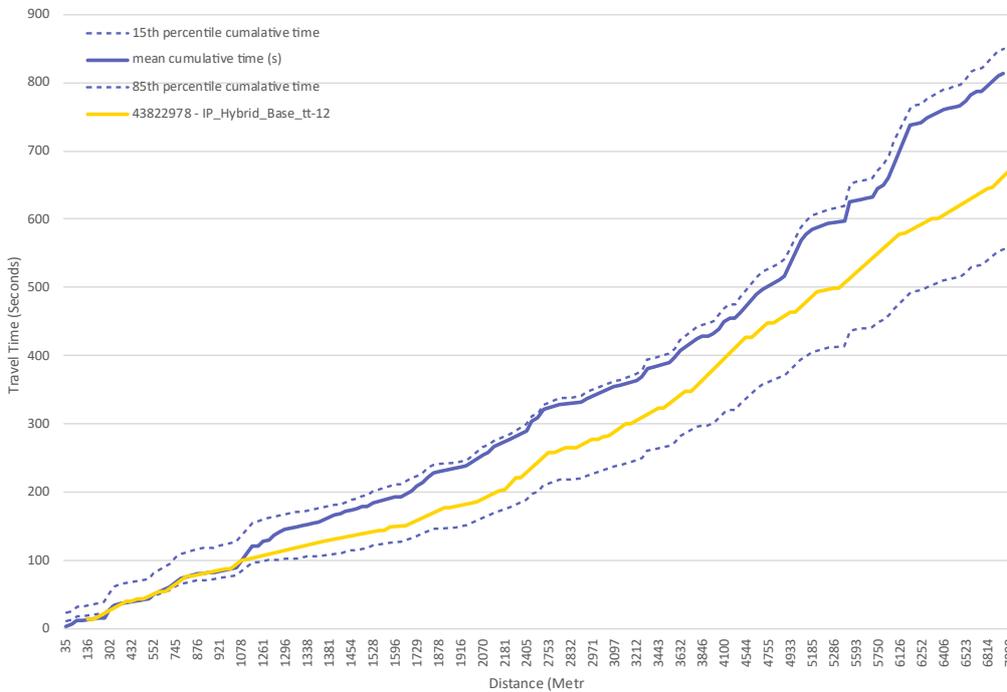
Travel time profile: Eastbourne – Seaview (12-13)

Travel time profile: Eastbourne – Seaview (16-17)
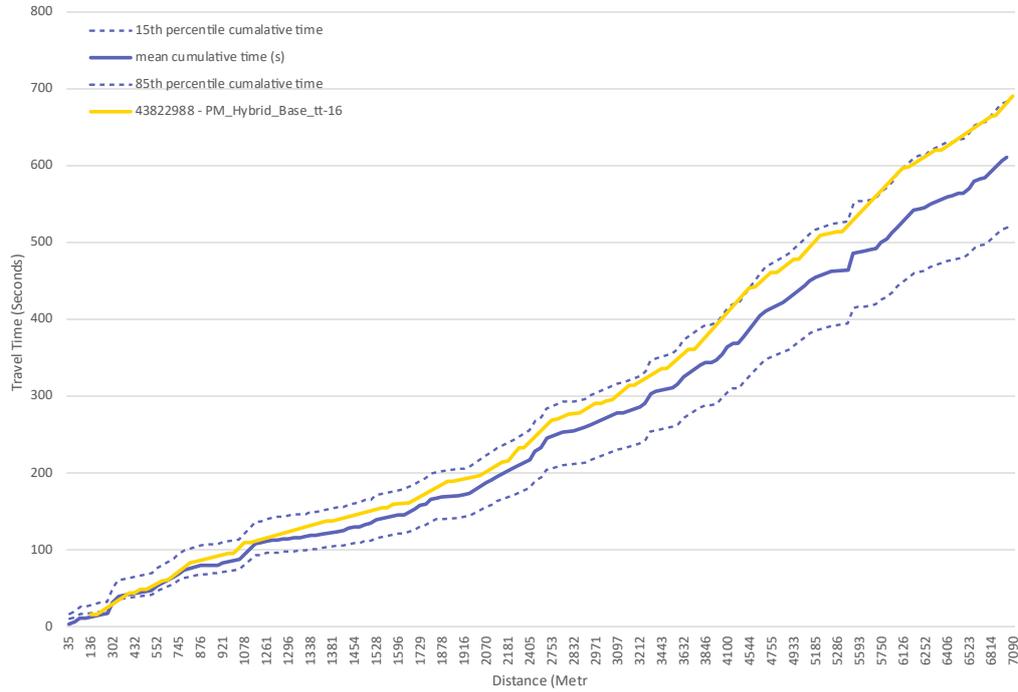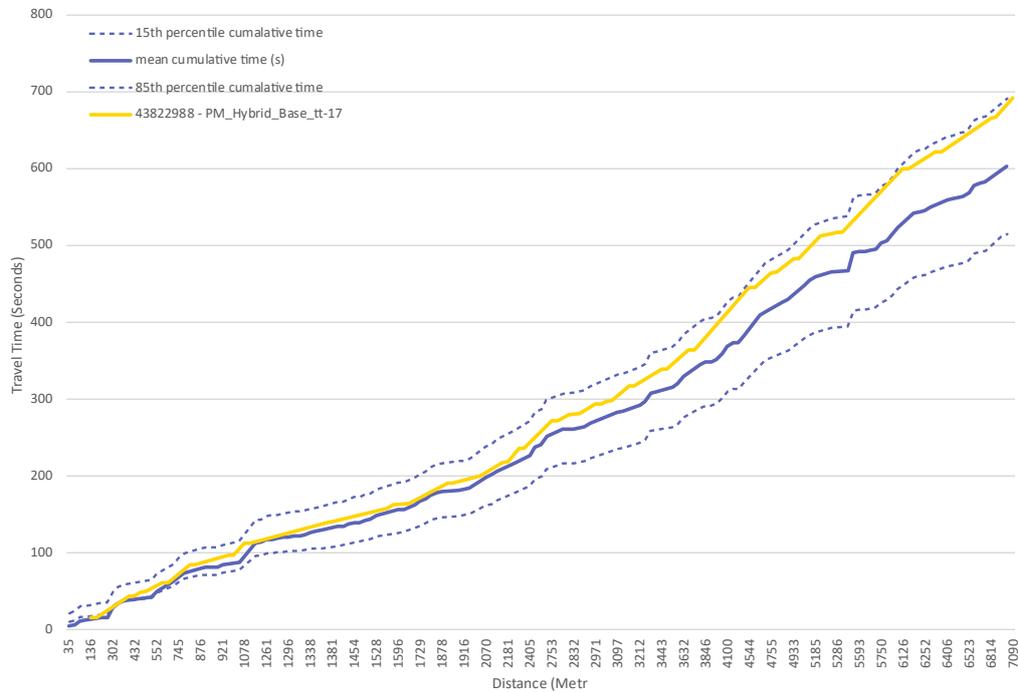
Travel time profile: Eastbourne – Seaview (17-18)

Tomtom vs Modelled Travel Time

Legend:
- 15th percentile cumalative time
- mean cumulative time (s)
- 85th percentile cumalative time
- 45101 - AM_Hybrid_Base_tt-07
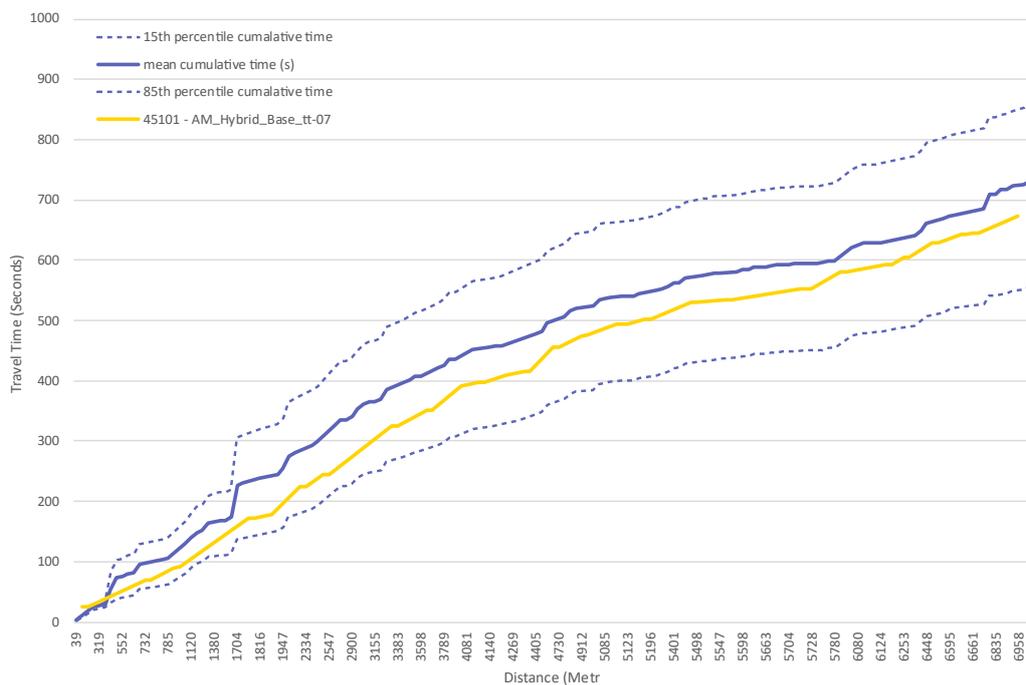
Travel time profile: Seaview – Eastbourne (7-8)

Tomtom vs Modelled Travel Time

Legend:
- 15th percentile cumalative time
- mean cumulative time (s)
- 85th percentile cumalative time
- 45101 - AM_Hybrid_Base_tt-08

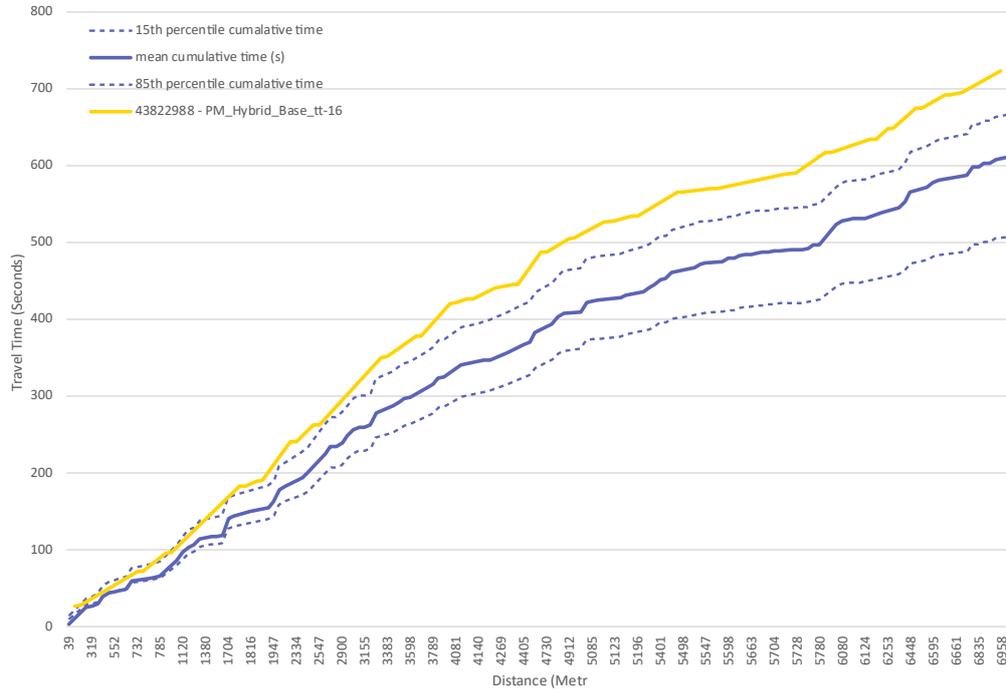**Travel time profile: Seaview – Eastbourne (8-9)**

Tomtom vs Modelled Travel Time

Travel time profile: Seaview – Eastbourne (11-12)
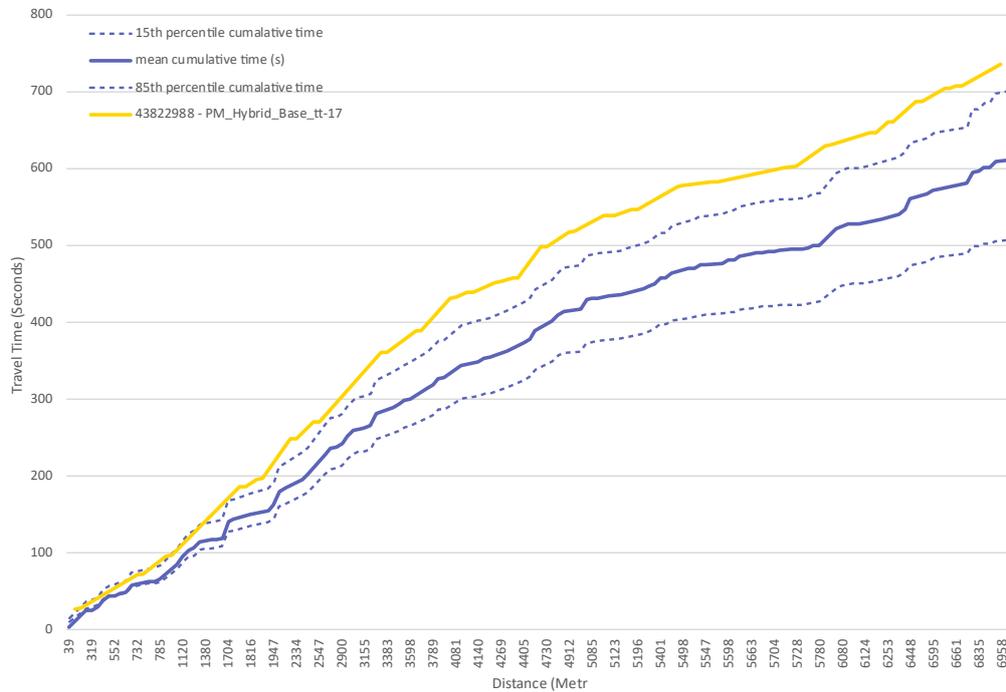

Tomtom vs Modelled Travel Time

Travel time profile: Seaview – Eastbourne (12-13)

Tomtom vs Modelled Travel Time

Travel time profile: Seaview – Eastbourne (16-17)

Tomtom vs Modelled Travel Time

Travel time profile: Seaview – Eastbourne (17-18)