Central Lancashire Highway Transport Model Present Year Validation

Traffic Data Collection Report

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Lancashire County Council

B2327FTB

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1. Introduction

1.1 Background and Scope

During 2015-2016, Jacobs built a WebTAG compliant RSI based highway traffic model (CLHTM) in SATURN to support Central Lancashire's ambitious programme of economic growth and associated infrastructure improvements. Since then, that version of the CLHTM has been used to support:

- planning applications for three City Deal schemes (PWD, Penwortham Bypass and A582 dualling),
- the PWD Business Case,
- Wyre Local Planning,
- the A582 South Ribble Wester Distributor SOBC;
- Preston TCF SOBC;
- multiple local schemes and bus gate schemes in Preston.

The CLHTM was originally calibrated and validated to Autumn 2013 data using 2015 WebTAG parameters (values of time and vehicle operating costs). In 2018, the model was re-calibrated to 2018 WebTAG for the purpose of the PWD FBC; nonetheless, the Base Year remained 2013 in the absence of more recent traffic data.

In line with WebTAG requirements and recent feedback form DfT on the TCF Appraisal Specification Report; the CLHTM is due for present year validation, since the age of the data used to build the model is reaching six years. For this purpose, a data collection exercise has been undertaken to update and re-calibrate the model to Autumn 2019 traffic counts and journey times. The detailed specification and methodology steps were agreed with DfT by means of producing and obtaining approval on the Model Base Year Revalidation Methodology Technical Note in advance of actual calibration work.

Future applications of the model will be confirmed by LCC; however, it is anticipated that the model, as a minimum, will be used to support the following schemes:

- A582 Dualling OBC and FBC
- TCF schemes and particularly Ringway Improvements;
- Cottam Parkway Station Planning Application;
- New Ribble Crossing

It was critical that the traffic surveys were undertaken prior to the starting of the PWD construction works in November 2019 given that temporary traffic management arrangement are expected to have a significant impact on routing of the traffic which would be difficult to model in the first place and would create issues during the forecasting.

1.2 Purpose of the Report

This report aims to describe the existing and newly collected data to be used in the model revalidation, alongside with the processing methodology and results, as was agreed in the submitted Model Base Year Revalidation Methodology for the Central Lancashire Highway Transport Model Present Year Validation.

1.3 Report Structure

Chapter 2 – provides an overview of the data required for the present year validation of CLTHM.

Chapter 3 – describes the existing data sources and their application.

Chapter 4 – presents the details of the additional traffic surveys that were undertaken in the study area

Chapter 5 – summarises the results of the analysis of the traffic data in the study area, including the traffic profile and the overall statistics.

Chapter 6 – presents the details of the journey time data, including analysis and logic checks undertaken to demonstrate validity of data

Chapter 7 – summarises other sources of data that were used to update the network and demand

Chapter 8 – provides summary of data collection and conclusion on the suitability of data for the purpose of the model revalidation

2. Overview of required data

The primary objective of collecting data is to enable producing a robust base year model calibrated and validated for the purpose of forecasting and conducting the subsequent appraisal process. The model will be updated and re-calibrated to Autumn 2019 traffic counts and journey times in accordance with current best practice contained within DfT WebTAG. For that purpose, the existing data from various sources was reviewed and the need for additional data collection was determined. Table 2.1 summarises the types of data and their use for the model revalidation. Each type of data, source and quality assurance checks are described in the forthcoming sections.

Table 2.1: Overview of required data

Type of data	Sources	Key application
Volumetric data (link counts)	2019 ATC and Radar surveys HE WebTRIS	- Determine the actual link traffic flows for calibration and validation - Confirmation of peak hours
Vehicle classification data	2019 MCC surveys DfT Road Traffic Statistics	- Establish the flows of the modelled vehicle classes for calibration and validation
Road Side Interviews (RSI)	2014 RSI	- Identify origins, destinations and purpose of individual journeys in the study area
Journey time data	2019 TrafficMaster data	- Journey time validation along selected routes
Volumetric data (junction turning counts)	MCTC counts conducted by LCC between 2016 and 2019	- Evaluate the performance of the model around M65(J1) and M6(J29) and support model calibration at key junctions
Geometric and operational data	OS MasterMap®	- Identify network changes since 2013
	Google Maps/Streetview	
	STATS19 Accident data	- Verification of speed limits across the network in the study area
	LCC – Signal timings	- Validation of coded signalised junctions
	NaPTAN TNDS	- Establish route and frequencies of bus services in the study area
	LCC Mapping website	- Identify HGV restrictions in the study area
Planning data	Local plans	- Identify additional major trip generators between 2013 and 2019.

3. Summary and Review of Existing Data

3.1 Existing Roadside Interview Data

Since there were no major network changes or other residential and employment developments, that could have had an impact on the trip distribution patterns between 2014 and 2019, roadside interviews (RSI) data obtained in 2014 was used as a primary source of origin and destination data for the Preston area.

The 2014 roadside interviews were conducted between 1st April 2014 and 1st May 2014; a total 26 RSI were undertaken in 19 locations in the study area. In order to adjust the 2014 data to 2019, manual and automatic traffic counts were conducted at every 2014 RSI location (see Section 4.1.3). This exercise ensured to recreate any increase in trips that might have taken place within the study area. The 2014 survey locations are shown in Figure 3.1. The adjusted data collection rate ranged from 7% to 23%, a detailed overview is provided in Appendix A.

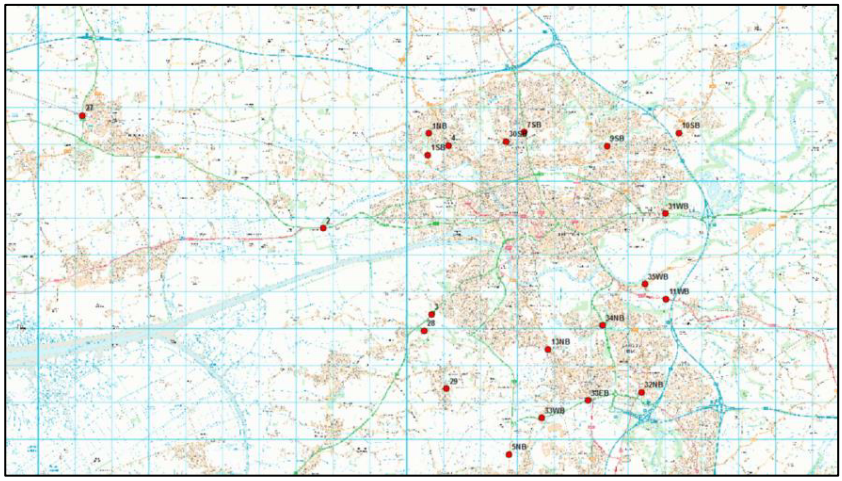


Figure 3.1: 2014 Roadside Interview Survey Locations

3.2 Existing Traffic Data

3.2.1 WebTRIS data

Strategic Road Network (SRN) traffic flows were extracted from Highway's England WebTRIS information. Hourly count reports were obtained and processed for each of the sites using the WebTRIS Traffic Flow API. The map below shows the sites selected classified by type for this project. As required by TAG unit M1-2, only neutral months data was used; abnormal traffic periods such as bank holidays and weekends were excluded. School term dates and holidays were obtained from the Lancashire County Council website for the 2018/19 term.

In order to avoid double-counting and increasing the reliability of the extracted counts, TRIS sites were grouped into 25 virtual sites. The sites were grouped based on their location by direction such that they represent the same sections of the motorway with no major junctions in-between. A detailed list of the TRIS sites and their corresponding virtual sites is provided in Appendix B.1.

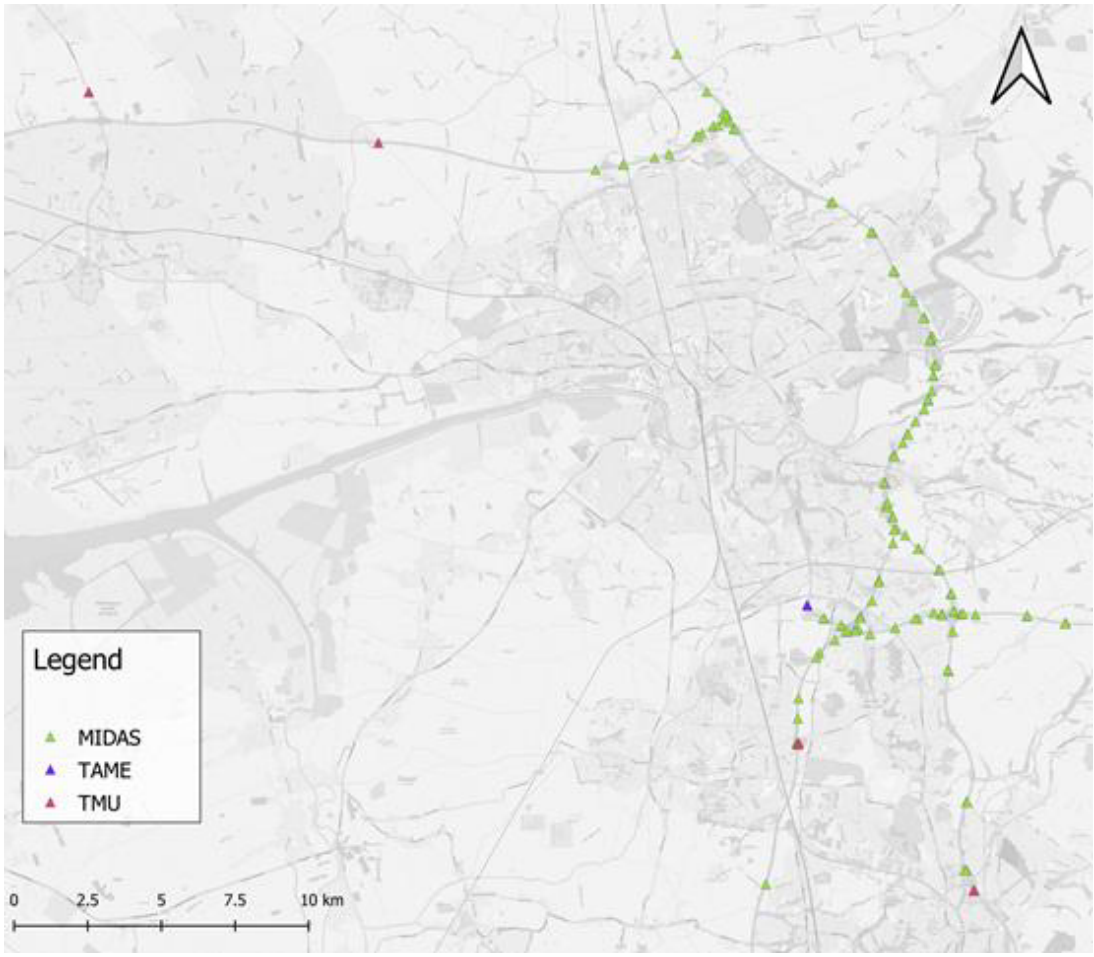


Figure 3.2: Selected webTRIS Sites by Type

Considering that webTRIS count data is classed using length-based categories, this classification might not represent precisely the actual vehicle type classification used for the CLHTM; for this reason, hourly flows for light and heavy good vehicles (LGV and HGV) were calculated using DfT data (described in the next section). Table 3.1 summarises the mean hourly flows for AM, IP and PM for all virtual sites. A table with the complete vehicle-class disaggregated flows is provided in Appendix B.2.

Table 3.1: webTRIS total flows [veh/hour] by grouped site

Virtual Site	Description	Direction	AM	IP	PM
A	A585 M55-B5269	NB	871	912	1248
		SB	1256	865	922
B	M65 J2-M6	EB	1558	1208	1815
		WB	2836	1789	2780
C	M61 J8-J9	NB	3348	2628	3371
		SB	3294	2795	3883
D	M6 J28-J27	NB	3990	3123	3724
		SB	3524	3416	4387
E	M6 J32-J33	NB	2653	2347	2468
		SB	2516	2587	2867
F	M55 J1-J3	EB	2958	2150	2877
		WB	2828	2110	3081
G	M6 J31-J31A	NB	6682	4766	6063
		SB	5582	5200	6770
H	M65 J2-J3	EB	2935	2224	3435
		WB	3413	2213	3295
S1	M6 J32-J32	NB	2147	1913	1831
		SB	1772	2144	2280
S2	M6 J28-Leyland Way	SB	717	507	1000
S3	M6 J28-J29	NB	4499	3271	3901
		SB	3755	3630	4898
S4	M61 J8-J6	NB	3030	2537	3461
		SB	3256	2684	3576
S5	A6 M65-A582	NB	2218	1329	2026
		SB	1655	1318	1922
S6	M6 J29-J30	NB	3721	2704	3168
		SB	2976	2932	3930
S7	M61 J9-M6	NB	2890	2284	2886
		SB	2722	2481	3335
S8	M6 J30-J31	NB	6763	4935	6038
		SB	5699	5462	7231
S9	M6 A59-A6	SB	1057	859	1246
S10	M6 A59-M6	NB	1194	800	1106
S11	M6 A59-M6	NB	1027	633	1093
S12	M6 A59-M6	SB	978	600	954
S13	M6 J31A-J32	NB	4993	4043	5055
		SB	4424	4294	5150
S14	M55 M6-M55	WB	2852	2128	3239
S15	M6 M6-M55	EB	2663	2200	2862
S16	M55 M6-M55	WB	759	449	613
S17	M6 M55-M6	EB	511	443	640

3.2.2 DfT Road Traffic Statistics

A dataset including manual classified counts (MCC) and estimated AADT by vehicle class is available on DfT's road traffic statistics website[1]. This data was used for verifying traffic flows obtained from the surveys and was also used for estimating the vehicle classification for motorways. Since 2019 data was not yet available, 2018 data from this source was used for this project. Table 3.2 summarises the LGV and HGV percentages extracted from DfT count data, which were used to adjust the vehicle classification for motorways. The splits were found to be logical and in line with the local knowledge.

[1] https://roadtraffic.dft.gov.uk/

Table 3.2: LGV and HGV percentages in selected DfT sites (2018 data)

Count ID	Description	LGV	HGV
030	M6: 29A - 30	16.2%	10.0%
7306	A585: A586 - M55	17.1%	5.4%
8759	M6: M6 (32) North - M6 (32) South	16.7%	15.9%
16031	M6: 31A - 32	16.0%	8.8%
16048	M61: LA Boundary - 8	15.6%	7.8%
26030	M6: 28 - 29	16.5%	11.5%
28556	M61: 9 - M6	16.2%	7.3%
36029	M6: 30 - 31	16.2%	8.5%
46027	M6: 32 - 33	15.1%	11.7%
46048	M61: 8 - 9	15.7%	7.9%
56176	M55: 3 - 1	16.9%	4.8%
99534	M6: 31 - 31A	15.2%	9.1%
99535	M65: M61 (9) - 3	17.3%	7.9%
99552	M65: M6 (29) - M61 (9)	20.4%	7.5%
99554	A6: A582 - M65	15.6%	4.5%

3.3 Other Existing Data

2016 turning movement and link counts were provided by LCC to be used as a benchmark with the aim of assuring the right performance of the model in the area around M65(J1) and M6(J29). This additional verification of the model performance at SRN junctions was requested by Highways England as part of the A582 Business Case assurance. A summary of the turning count data for M65(J1) is included in Appendix F. Turning counts data for M6(J29) is going to be included in the next revisions of this document.

In addition, recent MCTC data collected by LCC for various projects between 2016 and 2019 has been obtained. Although the model is not required to be validated against turning counts the MCTC data is being used as a supplementary source of data for the route choice calibration.

3.4 Quality Assurance Checks

3.4.1 WebTRIS data

WebTRIS Traffic Flow API provides an automated data quality report for each site, which was considered when selecting the sites. All sites in the area with reported collection rate lower than 50% were discarded. Sense checks and variation analysis were performed to detect any possible abnormalities in the data set. Further quality checks included verification of the flow patterns during the AM, IP and PM, and consistency among nearby sites' flows. Figure 3.3 shows a snapshot of the variation check undertaken for the one of the sites for all three peaks, the boxplots compare the overall variation of the different sites in one group while the scatter plot illustrate the variation over time.

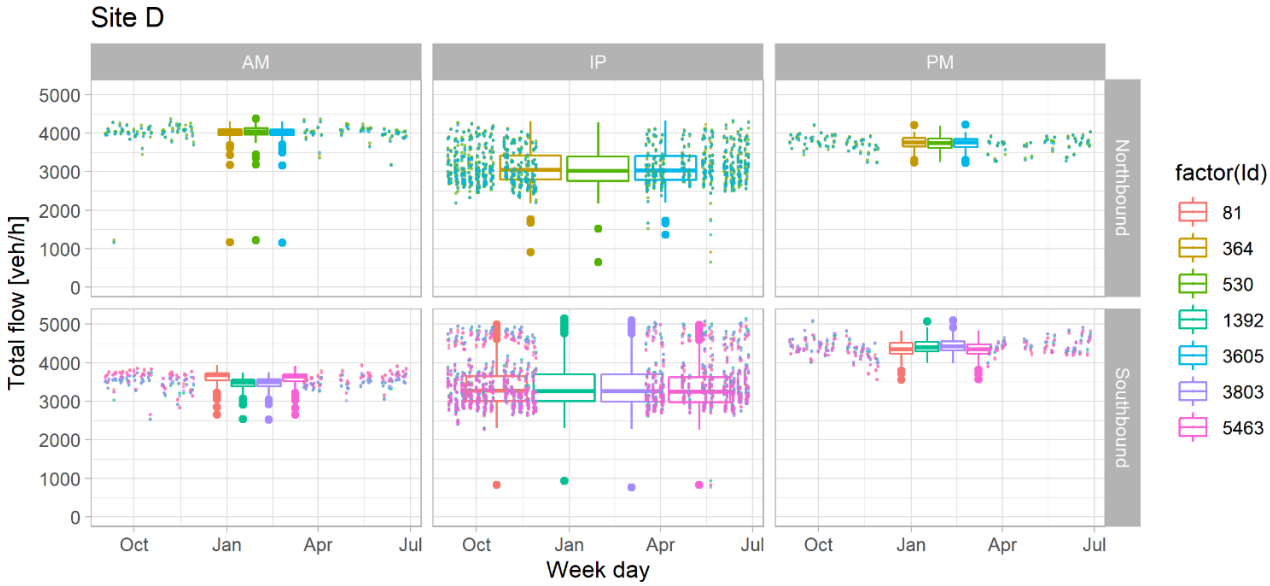


Figure 3.3: Site D boxplot. Variation and consistency check

4. 2019 Traffic Surveys

4.1 Surveys Specification

The main input of the present year revalidation of the CLHTM is the traffic counts data. Figure 4.1 shows the map of count sites locations and screenlines deployed across the study area, which were previously agreed with LCC and DfT (see Table 4.1). The locations of the sites were assigned to assure a comprehensive sample of the network flows. Three types of surveys were undertaken, Automatic Traffic Counts (ATC), Manual Classified Counts (MCC) and Radar (ATR). The data collection was commissioned to TRACSIS, which met the licensing, quality and experience requirements for this kind of projects.

Table 4.1: Number of survey sites by screen line type

Screenline	ATC	Radar	MCC
Calibration	44	4	0
Outer Cordon	34	3	0
RSI	17	2	19
Validation	19	7	0
Individual Counts	35	5	0

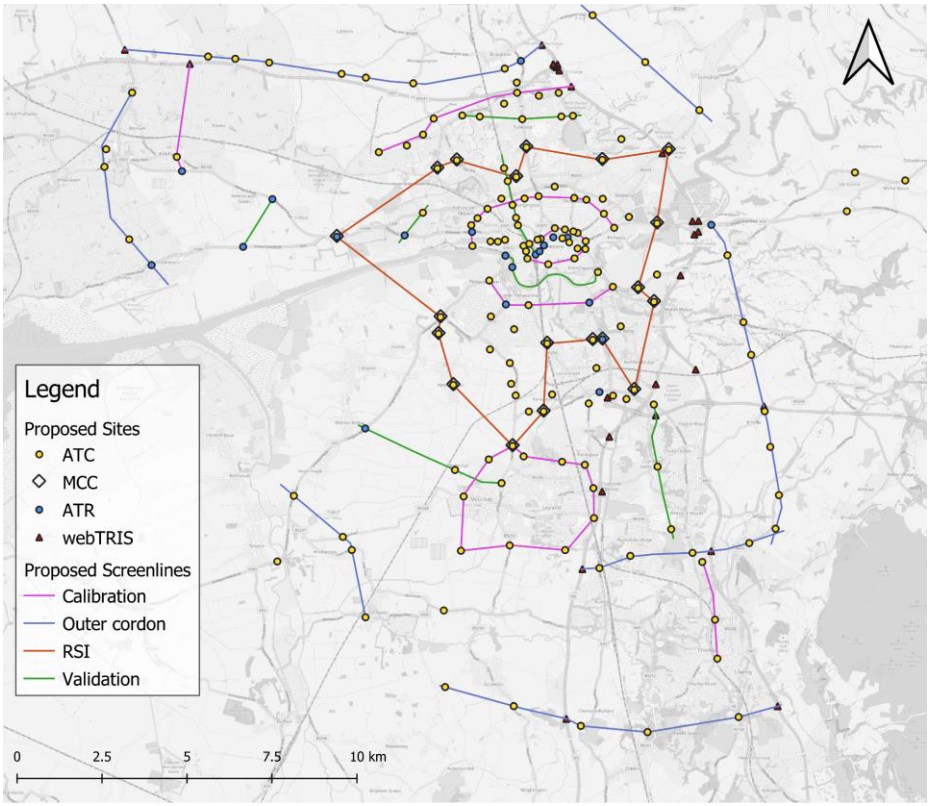


Figure 4.1: Count location sites by type and Screenlines

4.1.1 ATC

Automatic Traffic Counting (ATC) surveys' data was collected using 'Metro Count' 5600-series equipment and pneumatic tubes. This system is a reliable, state-of-the-art event logger which ensure accurate collection of directional volumes. Figure 4.2 below shows a typical ATC installation.

Figure 4.2: Standard ATC installation on a single-carriageway road

Tubes were attached to the carriageway surface and, subsequently calibrated using specialist software provided by the ATC equipment maker. Adequate traffic management and safety procedures were undertaken during the installation of the units.

ATC surveys were conducted at 147 locations and data was collected over a period of two weeks and units were monitored over the course of the installation period to mitigate data loss. In instances where data loss occurred, units were left for additional time in order to collect extra data. The vehicle classification data from ATC was used for reference and only total counts were considered. The data was reported using the DfT Classification Scheme by vehicle type.

Of the 147 ATC sites surveyed, 114 encountered no significant data loss or issues during survey. 33 sites were resurveyed. Data issues at each ATC are noted in Appendix C.1. Any ATC sites with data loss were subjected to a resurvey.

4.1.2 Radar

Radar classifiers were deployed in 23 locations where using ATC units was not suitable due to safety issues. Units were installed on each side of the carriageway at each location. Similarly, to the ATC sites, units collected data for two weeks.

Data collected using radar equipment was reported bi-directional for class and traffic volumes in 15-min intervals. Data was reported using four classification by length; however, only total flows were used.

Of the 23 radar surveys, 18 encountered no significant data loss or issues during survey. 5 sites were resurveyed, 3 due to battery issues and 2 due to vandalism. Site numbers, location and data issues at each radar site are noted in in Appendix C.2.

4.1.3 MCC

Manual classified counts (MCC) were undertaken at 19 locations and were completed using micro high-definition fixed camera systems, which recorded footage of the traffic flows for 12 hours (from 7:00 to 19:00). An example of a typical view captured by a camera is shown in the figure below. Cameras' clock was synchronised on installation and installed to ensure full coverage of all possible movements at each survey location.

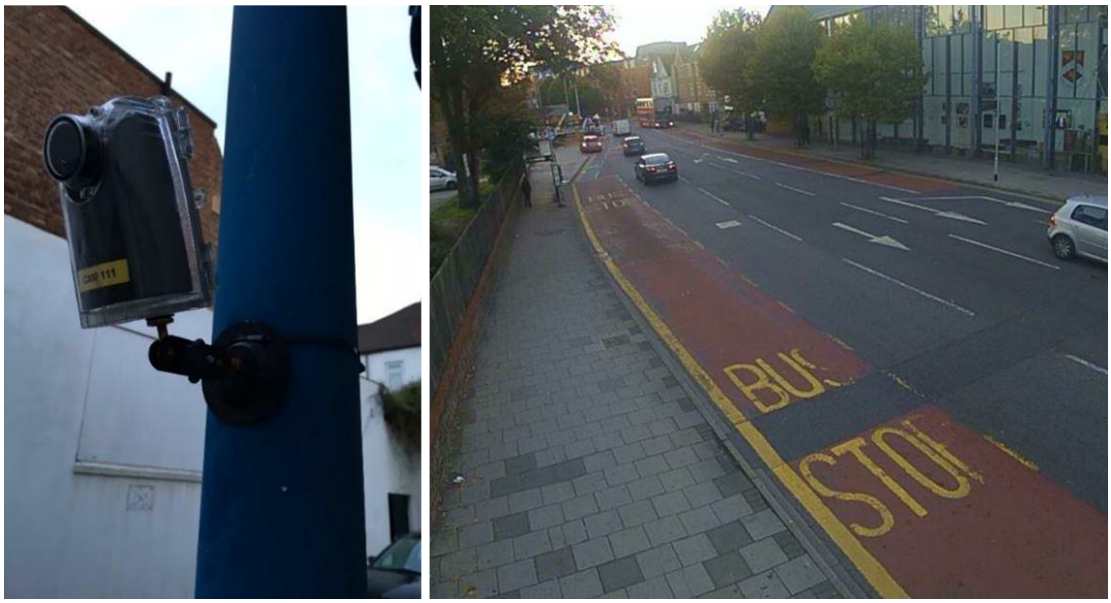


Figure 4.3: (Left) Installed camera. (Right) Typical view from micro-camera

All recorded media was labelled and returned promptly for analysis, accompanied by a report from the surveyor detailing critical information to support the analysis, such as camera locations, weather and driving conditions, incidents and specific site characteristics. All video data was analysed by an experienced team of analysts. Each analyst was trained in identifying vehicle movements and classifications. MCC data was classified into the categories listed in Table 4.2 and summarised in 15-minute intervals.

Table 4.2: Vehicle classification used in ATR

Category	Description
Pedal Cycle	All bicycles
Motorcycle	All motorcycles, motor scooters, mopeds, motor-powered bicycles, and three-wheel motorcycles
Car/Taxi	All passenger-carrying vehicles, including sedans, coupes, station wagons, SUVs, vans, limos, campers, motor homes, small ambulances, etc.
Light Goods Vehicle (LGV)	All light goods-carrying vehicles, including those that pull light trailers, pickups, panel vans, tow trucks, etc.
Single unit truck (OGV 1)	All rigid vehicles over 3.5 tonnes gross vehicle weight. Including all large vehicles on a single frame: trucks, tow trucks, campers, motor homes, large ambulances, etc.
Articulated truck (OGV 2)	All articulated vehicles. Including multi-unit goods-carrying vehicles with a tractor or straight truck power unit, including goods-carrying rigid trucks pulling trailers.
Bus	All passenger-carrying buses, including school buses and articulated buses.
Coach	All passenger-carrying coaches.

All MCC counts were carried out without any issues. Site 1 was surveyed on the 5th November, all other sites were surveyed on 10th October. Site numbers and location are noted in Appendix C – MCC Summary.

4.2 Survey Programme

The data collection process comprised four main stages for ATC, Radar and MCC surveys. Figure 4.4 summarises the actual duration for each survey type. Data was collected from September 23rd to November 11th. No data was collected during the half-term holidays in accordance to the requirements in WebTAG.

It was critical to guarantee that the traffic surveys were undertaken prior to the starting of the PWD construction works in November 2019, given that temporary traffic management arrangements may have a significant impact on routing of the traffic which will be difficult to model in the first place and may also create issues during the forecasting.

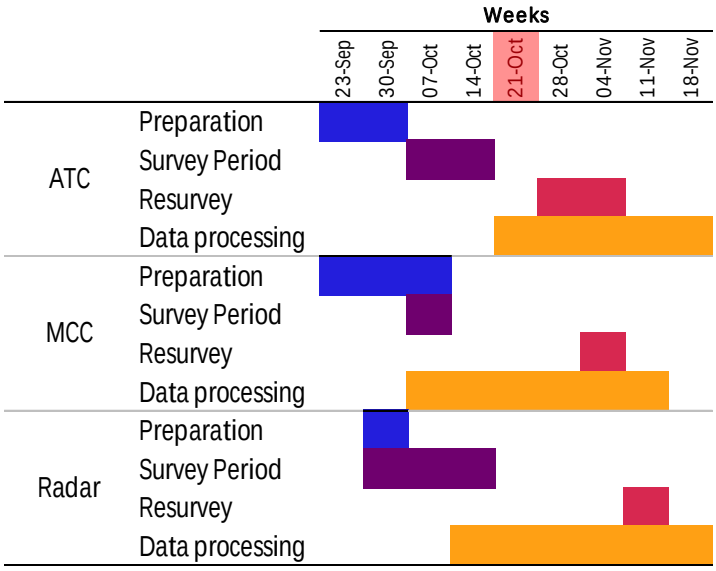


Figure 4.4: Survey programme summary

4.3 Data Quality Assurance

Data obtained from the surveys was subjected to detailed checks to ensure the robustness of the dataset. Data anomalies identified by the survey company as a result of faulty equipment were reported and the data was excluded and subjected for re-surveys. All data sets including the re-surveyed data went through a series of data quality checks including but not limited to:

- Sensitivity checks for consistency against other counts and data sources (e.g. ATCs) where available
- Checks to ensure key survey details such as dates, labelling and survey location plans are correct in the data sheets
- Reviewing keying errors and confirmation accumulation is logical and check for negative accumulation.
- Traffic profile checks to check consistencies in flow patterns and tidality
- Comparison of ATC and MCC counts where available
- Check to ensure if there are any major traffic flow variation for the surveyed 2 weeks
- Vehicle classification comparison from the counts and other sources

The collection rate for every individual site was estimated for each site and direction by time period, i.e. a 100% collection rate in the AM in any site implies that neutral days counts (Monday to Thursday) from 8:00-9:00 were available in both weeks, ATC and ATR sites with less than 100% for all three peaks periods is summarised in Table 4.3. Rates of 50% were considered representative, since the traffic flow of a complete week was captured.

Table 4.3: Collection rate summary by site and direction (below 100%)

Type	Site ID	Direction	Period		
			AM	IP	PM
ATC	52	Northbound		98%	
		Southbound		98%	
	60	Southbound	88%	98%	88%
	76	Southbound	88%	88%	
	78	Eastbound		96%	
		Westbound		96%	
	82	Northbound	75%	79%	88%
		Southbound	75%	79%	88%
	91	Northbound	63%	63%	75%
		Southbound	63%	63%	75%
	94	Southbound			63%
	99	Eastbound	88%	88%	88%
		Westbound	88%	88%	88%
	133	Eastbound	50%	41%	50%
		Westbound	50%	41%	50%
	135	Northbound	88%		
		Southbound	88%		
	136	Northbound	88%	98%	
		Southbound	88%	98%	
	150	Northbound	75%		
		Southbound	75%		
	154	Southbound	75%	68%	63%
	162	Eastbound	88%	98%	
		Westbound	88%	98%	
Radar	7	Northbound	50%	50%	50%
	42	Southbound	50%	50%	50%
	56	Eastbound	50%	50%	50%
		Westbound	50%	50%	50%
	65*	Eastbound	50%	50%	50%
	67	Northbound	50%	50%	50%
		Southbound	50%	50%	50%
	81	Eastbound	50%	50%	50%
	117	Westbound		95%	88%
	130	Eastbound	50%	50%	50%

Further analysis was undertaken to compare the inbound and outbound flows for all sites along each screenline to verify that the flow patterns were consistent. Abnormal day-to-day or week-to-week variations were checked in detail.

A traffic profile of MCC and ATC/ATR data comparison was undertaken for the RSI screenline sites to observe the vehicle classification splits. Where the comparison showed significant differences, as was the case of sites 123 and 130, it was further investigated to check whether possible data loss problems or issues with data download had occurred. However, no-issues were found in this regard.

Surveyed counts for site 65 were discarded as the accumulation checks revealed that counts underestimated the actual flows. In this specific case, DfT manual counts for a site in the same link were used as a replacement. Variation checks for all sites, as the one presented in Figure 4.5, were produced and is included in the appendices.

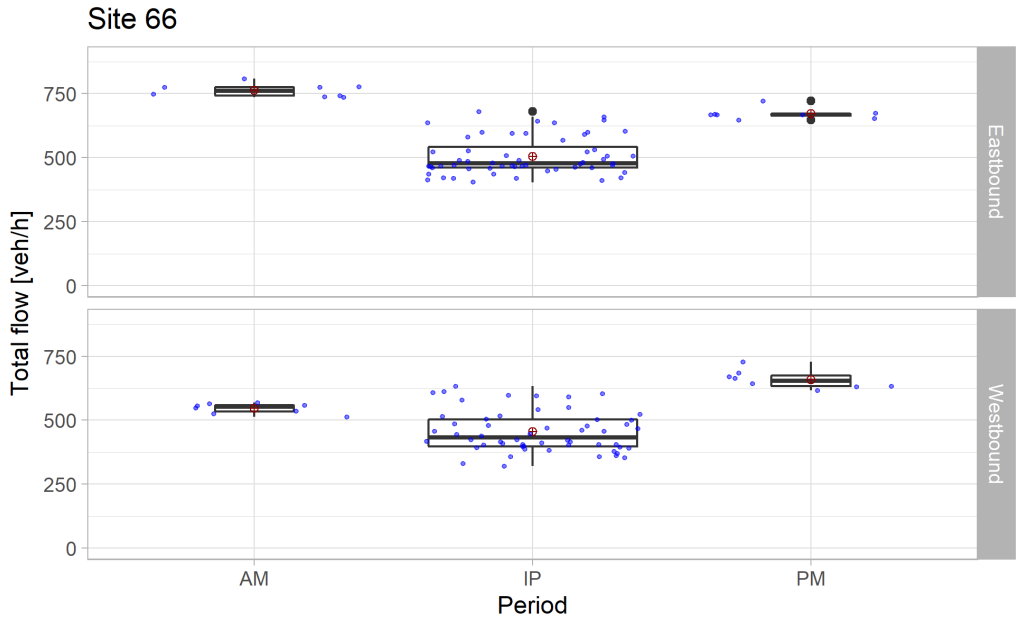


Figure 4.5: Site 66 - Traffic Flow Plots by time

Manual traffic count data were compared against corresponding ATR/ ATC site to check if any major variations were observed. There were few instances where the direction of the ATC/ATR were provided in the wrong direction, these locations were re-confirmed with TRACSIS and corrected files were provided. A snapshot of traffic profile check done is shown below in Figure 4.6. Plots for other MCC locations is provided in Appendix D.3.

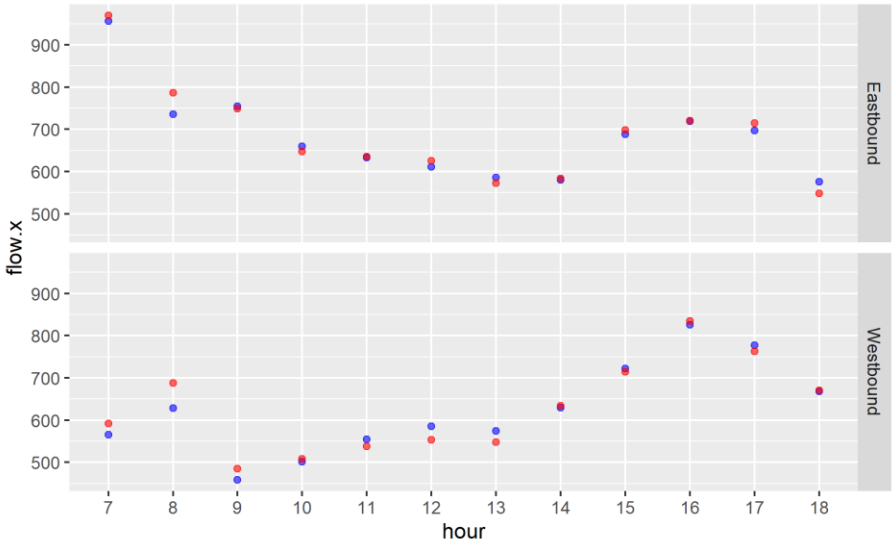


Figure 4.6: Site 1 - Manual and ATC Traffic Profile

The figures below illustrate the observed fleet composition by vehicle class for the three defined periods. In order to estimate the vehicle composition at the other locations, a correspondence between ATC/Radar and MCC sites was defined based on the type of corridor and location. A detailed correspondence and final estimated classified counts by site are provided in Appendices D.4 and D.5.

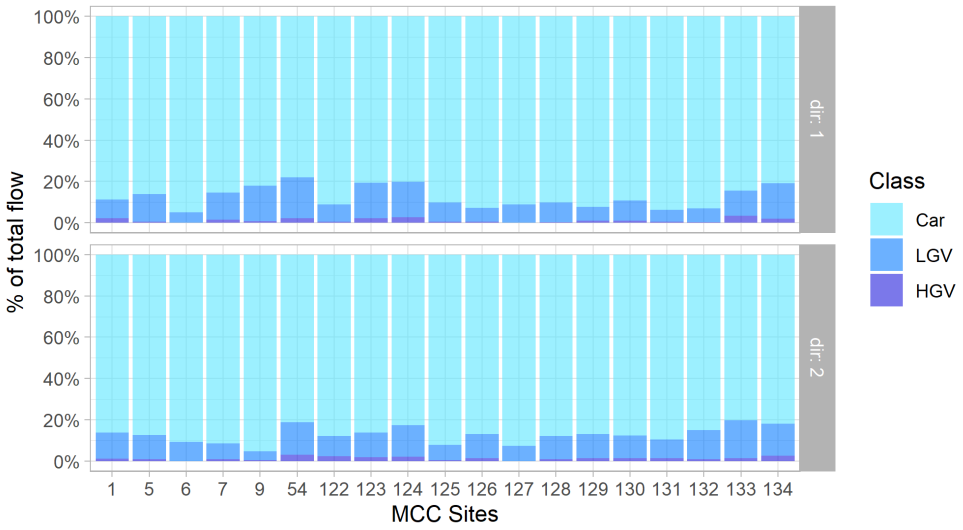


Figure 4.7: MCC observed vehicle classification percentages - AM

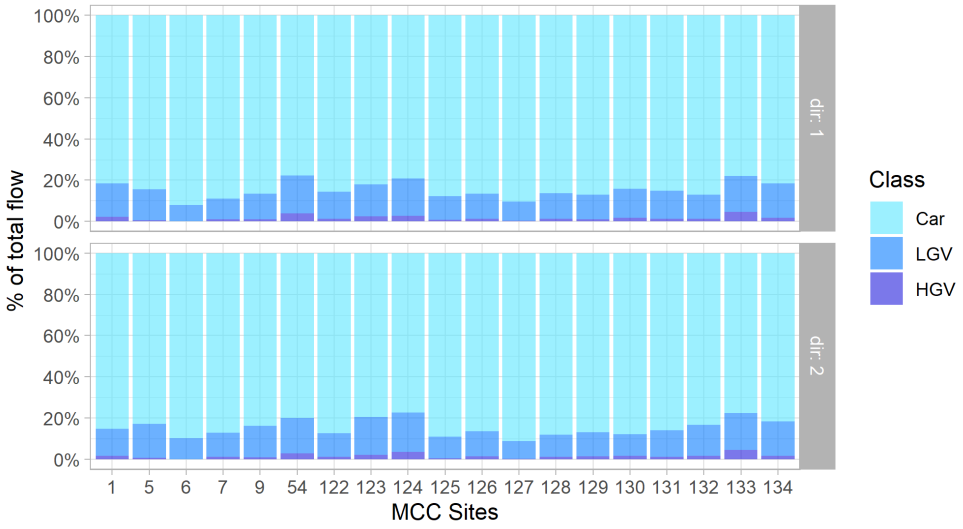


Figure 4.8: MCC observed vehicle classification percentages - IP

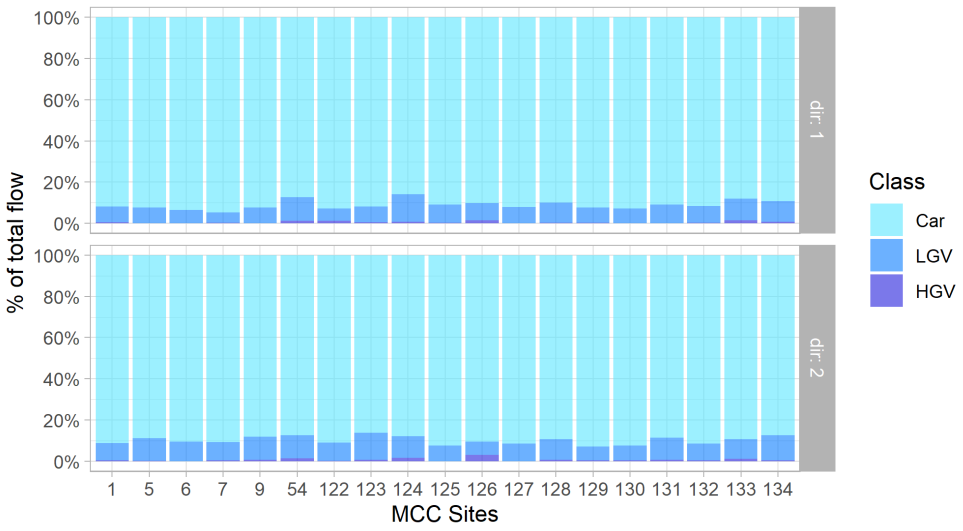


Figure 4.9: MCC observed vehicle classification percentages - PM

5. 2019 Traffic Data Analysis

5.1 Traffic Profile and Peak-Hour

A total of 16 Automatic Traffic Counts (ATC/Radar) and 16 video-based Manual Classified (MCC) link counts around the RSI cordon have been used to confirm the peak hour. The RSI sites were selected as they represent a spread of locations and road types for the model area. Counts on Monday, Tuesday, Wednesday and Thursday were averaged to calculate the peak hour traffic flows. Friday was excluded from the analysis as traffic flows on Friday deviate from a typical weekday average. Counts on Saturdays and Sundays were also excluded as the model represents average weekday.

The count data was averaged in 15 minutes across the 16 count sites and rolling hourly traffic flows were estimated. Average two-way traffic flows for the link counts during the AM and PM peak periods is summarised in Table 5.1. The results confirm the previous model peak hours for both AM and PM peak period and based on this analysis the AM peak hour for the model was identified as 08:00 - 09:00 and for the PM peak the peak hour of 17:00 – 18:00.

Table 5.1: Average hourly two-way flow by site

Hour	Site																			Total
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 7	Site 9	Site 10	Site 11	Site 13	Site 27	Site 28	Site 29	Site 30	Site 31	Site 32	Site 33	Site 34	Site 35	
07:00	868	2533	1521	712	1950	1188	1274	1257	674	1461	1577	453	862	754	1988	1004	2071	2037	561	24741
08:00	1118	3040	1364	1099	1949	1571	1631	1407	986	1441	1833	706	962	1146	1621	1112	2051	1765	666	27469
09:00	831	2026	1213	788	1539	1319	1230	962	551	1176	1220	296	661	843	1396	973	1920	1753	389	21084
10:00	702	1559	1161	731	1272	1121	1073	811	467	958	1022	255	562	770	1295	909	1634	1595	262	18158
16:00	1150	2733	1545	1087	2055	1180	1671	1341	761	1479	1670	518	957	1219	1988	1320	2055	2370	629	27714
17:00	1210	2759	1474	1143	2017	1264	1684	1151	824	1484	1619	573	953	1130	1926	1246	2204	2382	670	27726
18:00	937	2105	1245	966	1375	1141	1341	790	562	1264	1201	375	697	1022	1505	847	1785	1958	404	21517

Traffic flows for count locations which were not used for estimating the peak hour were reviewed for the identified peak hour. The count data showed that in morning and evening peak hours there is a range in peak hours across the network which is anticipated due to the differing proximities of count sites to urban centres. It is important to note that at sites where there is peak congestion the periods of highest flow aren't necessarily the peak periods, as the congestion can limit the amount of traffic able to pass through the count site.

It is, therefore, proposed that the identified peak hours for morning and evening periods will be used as the model peak hours as this fits most closely with the peak ranges for majority of the count sites and fits with the hour of lowest speed recorded for the count sites.

The inter peak model typically covers an average of several inter peak hours. A review of the count and speed data doesn't provide any strong reasons for applying anything other than the standard approach of taking the inter peak to be an average of 10:00-16:00.

5.2 Traffic Flow Analysis

In addition to the traffic flows for the modelled hours, detailed analysis such as traffic profile, heavy vehicle classification and speed profiles were provided for all count sites by TRACSIS. These were reviewed and analysed for the determining any major anomalies. Figure 5.1 shows the analysis sheet prepared for one of the count locations. Due to the large number of count sites, these have not been included in the report and will be provided if required.

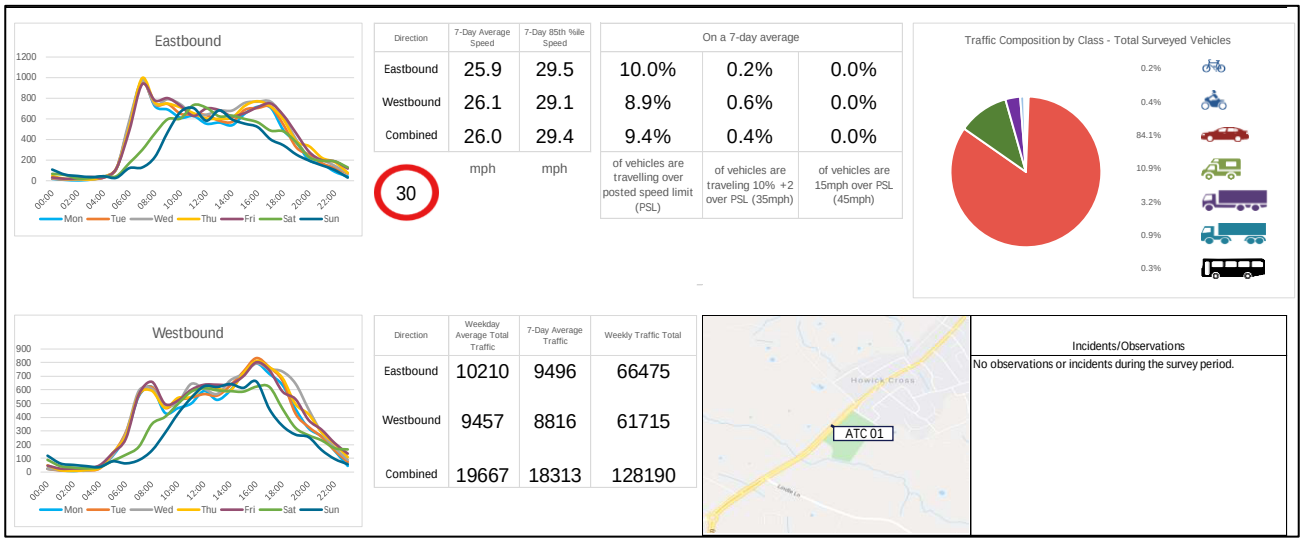


Figure 5.1: Example of summary sheet for Site 1

6. Travel Time Surveys

6.1 Journey Time Routes

As a basis for this study, it was used a set of fourteen journey time routes that had been previously agreed in conjunction with both LCC, and Highways England for the Preston Western Distributor and A582 projects. Such routes had to be updated to match the current network. For this purpose, LCC provided the latest version of the OS MasterMap® Integrated Transport Network™ (ITN) layer. Figure 6.1 illustrates the routes' final layout. All routes were split into sections that comply with WebTAG Unit M1.2 requirements.

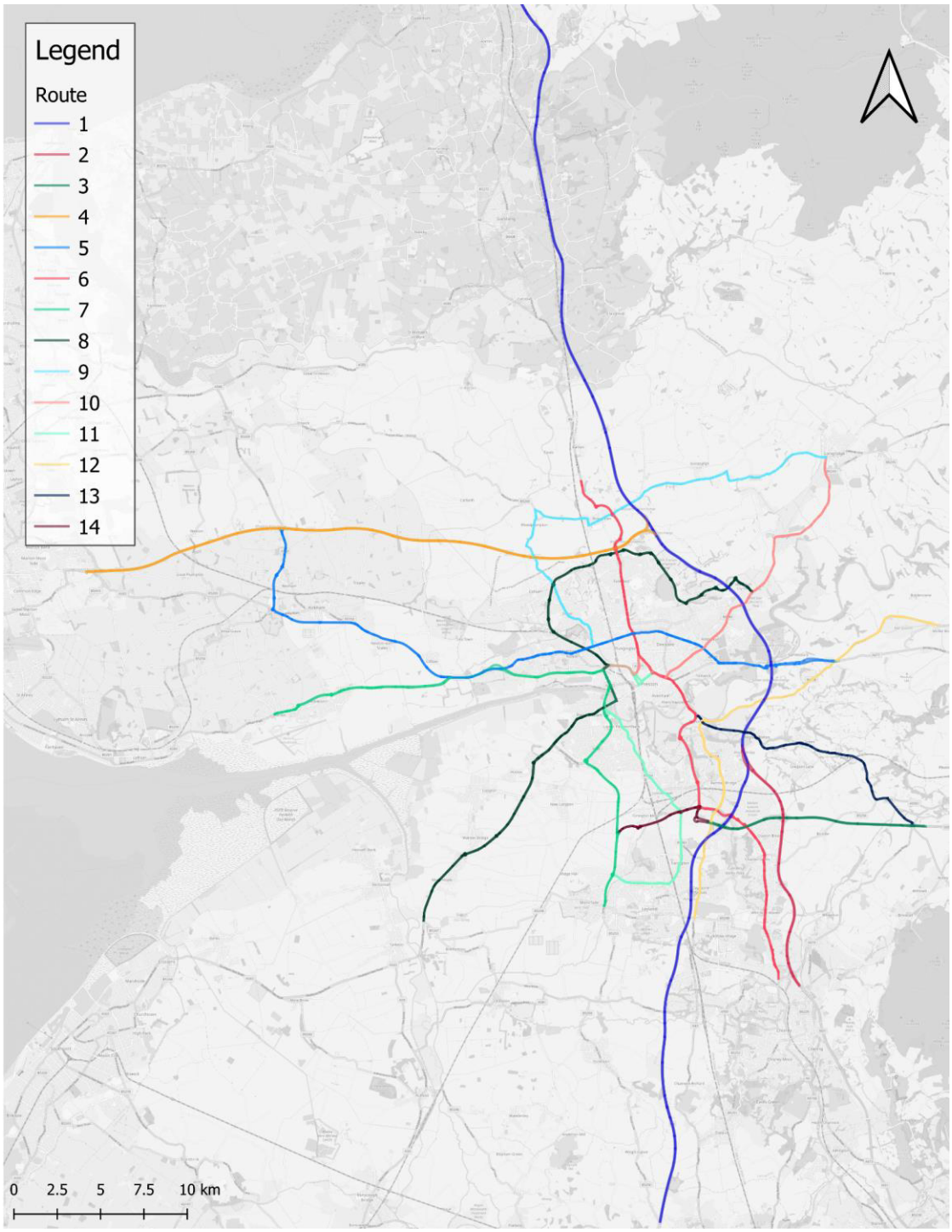


Figure 6.1: Journey time routes

6.2 Journey Time Data

Journey Time Data of the first semester of 2019 was obtained from the TrafficMaster dataset and processed for journey time calibration using the same approach that has been previously applied on the PWD and A582 Business Case projects. Time periods selection were consistent with WebTAG requirements, only neutral months and dates were used. Mean journey times were calculated for all the links in the calibration routes. Only private car and LGV data was used, since these vehicle categories are a more representative sample of the actual flow speeds in the network. Table 6.1 includes the mean travel time and estimated mean travel speed for all the sections. The results showed that for almost all routes, the interpeak period had the lowest travel speed and, therefore, a higher average speed than the peak hours.

Table 6.1: Summary of mean travel time and estimated mean speed along JT routes

Route	Length [m]	Mean Travel time [s]			Estimated mean speed [km/h]		
		AM	IP	PM	AM	IP	PM
1A	23500	2591	2194	2531	33	39	33
1B	23743	2702	2232	2664	32	38	32
2A	20784	2669	2207	2658	28	34	28
2B	20981	2781	2178	2514	27	35	30
3A	21000	1544	1574	2007	49	48	38
3B	20885	1717	1489	1671	44	50	45
4A	24735	2602	2041	2293	34	44	39
4B	24721	2677	2226	3184	33	40	28
5A	17073	1613	1481	1527	38	42	40
5B	17010	1526	1468	1536	40	42	40
6A	13570	1810	1657	1964	27	29	25
6B	13671	1864	1705	2235	26	29	22
7A	12927	2042	1862	2397	23	25	19
7B	13074	1934	1902	2482	24	25	19
8A	16715	1579	1421	1508	38	42	40
8B	16753	1570	1446	1703	38	42	35
9A	9250	661	654	664	50	51	50
9B	9240	837	675	642	40	49	52
10A	3906	357	323	542	39	44	26
10B	3823	417	346	407	33	40	34
M1A	47411	1705	1555	1520	100	110	112
M1B	47659	1558	1585	1634	110	108	105
M2A	8777	293	296	292	108	107	108
M2B	8986	352	298	297	92	109	109
M3A	7503	364	268	298	74	101	91
M3B	7576	301	262	288	91	104	95
M4A	20018	679	641	637	106	112	113
M4B	20110	652	661	664	111	110	109

Figures below show average travel speeds for AM, IP and PM along the different routes, which were estimated using TrafficMaster's journey time data.

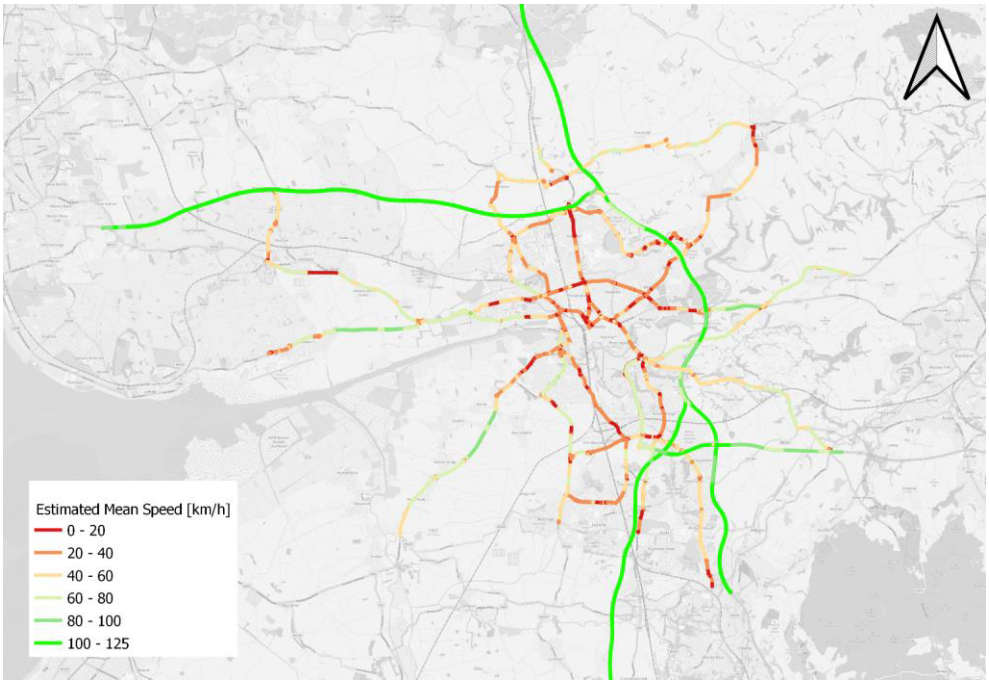


Figure 6.2: AM Peak – Estimated Mean Speed

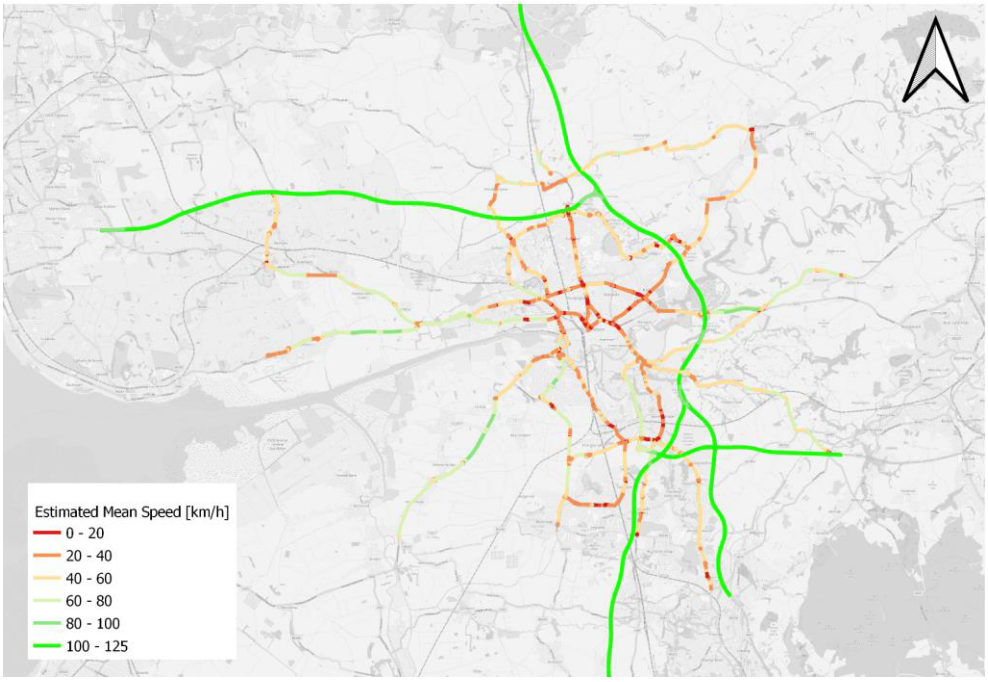


Figure 6.3: IP Peak – Estimated Mean Speed

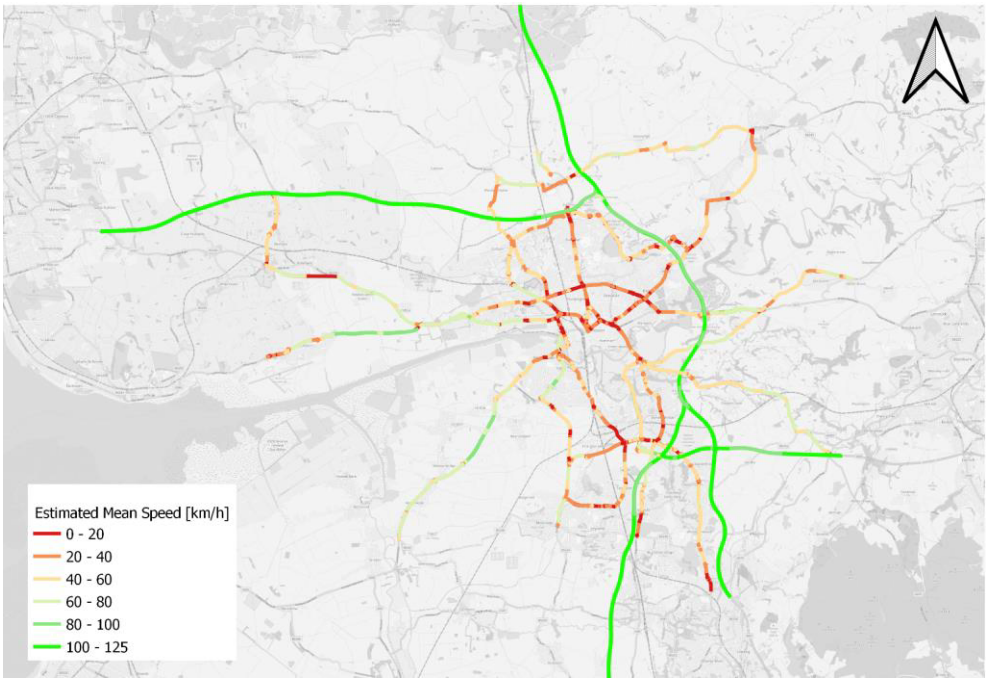


Figure 6.4: PM Peak – Estimated Mean Speed

6.3 Data Quality Assurance

A number of sense checks were undertaken to validate the estimated observed journey times. As an initial check, journey times were compared to the results of Google maps journey planner to ensure whether the observed journey times were within the reasonable range. Comparison of travel time with previous 2013 base year journey time was also undertaken to check for any major differences.

The observed journey times was compared with Saturn free-flow speeds for the relevant section to confirm that observed travel time were less than the free-flow time for all journey time routes. All suspicious results were investigated and rectified to pass the check.

7. Geometric and operational data

7.1 Network Updates

The starting point for the network coding was the PWD FBC update to the CLHTM model. The schemes to include belong to the PWD Traffic Forecasting Uncertainty Log. The list was reviewed and refined in collaboration with LCC and further verified using latest satellite/street view images where relevant.

The most relevant changes which have been implemented since 2013 include:

- M6/M55 - M6 J32 and M55 Jn1 junction improvements
- M55 - J1 improvements, approach and circulatory widening
- A6 Broughton Bypass - Broughton Congestion relief and public realm
- Lightfoot lane – Eastway junction improvements, signalisation
- New Hall Lane Local Centre
- A582 junction improvements
- Bamber Bridge Local Centre - Brownedge Lane/ Collins Road junction improvements - Public Realm
- Penwortham – Liverpool and Leyland Road junction improvements (under construction, expected to be completed by December 2019)
- Penwortham Bypass and Public Realm – from Goldenway roundabout to A59 Liverpool Road (under construction, opening by December 2019)
- Golden Way dualling
- Preston City Centre bus gate schemes

The actual configuration of the network was confirmed using the ITN layer and satellite images from Google Maps. Other relevant network updates such as road closures due to temporary works were confirmed by LCC and updated in the model network accordingly.

7.2 Signalised Junctions

Signal junction plans were provided by LCC, for most of the signalised junctions in the study area. All new signals that were introduced recently in the network were validated and updated in the network model.

7.3 Bus Services Frequency

Bus services are coded in the network as fixed routes with a set frequency for AM, IP and PM. Hourly frequencies and routes of the bus services were extracted from the Traveline National Dataset (TNDS) and the national dataset of public transport access points (NaPTAN). Figure 7.1 illustrates the routes that were included in the coding of the bus network.

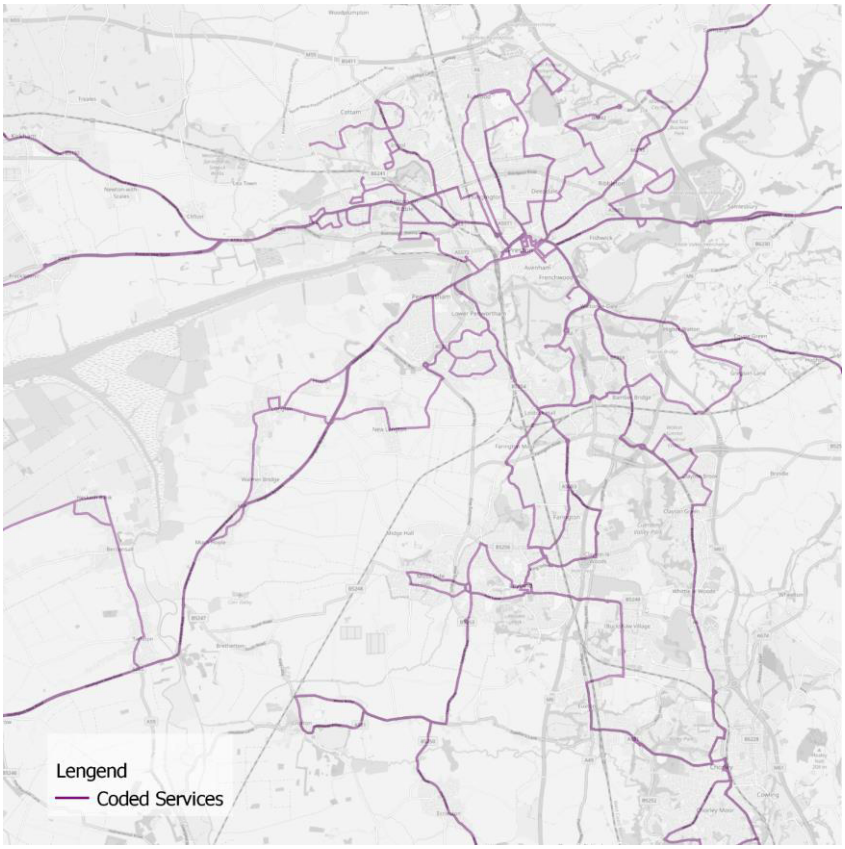


Figure 7.1: Selected bus services

For this project, the bus routes that were included in the model were those which had a minimum an hourly frequency of 2 services. Given that the services are coded as fixed routes without affecting the actual travel demand. Table 7.1 summarises the frequencies extracted from the already mentioned datasets.

Table 7.1: Hourly frequencies of selected bus services in the study area

Service	Direction	AM	IP	PM
19	Circular	6	6	6
23	Circular	8	7	7
1	Outbound	6	6	6
	Inbound	6	6	6
125	Outbound	6	6	6
	Inbound	6	6	6
16	Circular	6	6	6
3	Circular	6	6	6
35	Circular	6	6	6
6	Circular	6	6	5
8	Circular	6	6	6
89	Circular	6	6	6
111	Outbound	5	5	5
	Inbound	5	5	5
1A	Circular	5	6	5
31	Circular	4	4	4
68	Outbound	4	4	4
	Inbound	3	4	4

Service	Direction	AM	IP	PM
9	Circular	3	3	3
14	Circular	2	2	2
109	Outbound	2	2	2
	Inbound	2	2	2
152	Outbound	2	2	2
	Inbound	2	2	2
12	Outbound	1	2	2
	Inbound	2	2	2
2	Outbound	2	2	2
	Inbound	2	2	2
113	Outbound	2	2	2
	Inbound	2	2	2
44	Circular	2	2	2
X2	Outbound	2	2	2
	Inbound	1	2	2
59	Outbound	2	2	1
	Inbound	3	2	2
61	Outbound	1	2	1
	Inbound	3	2	2

7.4 Restrictions for Good Vehicles

Restrictions for vehicles were obtained from the 2013 CLHTM and confirmed using the Lancashire mapping website (MARIO)[2]. Only height and weight restrictions were considered for this purpose; and they were coded in the SATURN model accordingly for the affected vehicle classes.

7.5 Road Safety Data

Official accident data (STATS 19) was used as a reference to compare speed limits across the network to the model free-flow speed for major links. Figure 7.2 shows speed limit for the reports of the study area in 2018. Google Street view images were also used to confirm and define variable speed limits along the same road.

On the other hand; estimated travel speed, calculated from TrafficMaster data, was compared as an additional sense check for the network update.

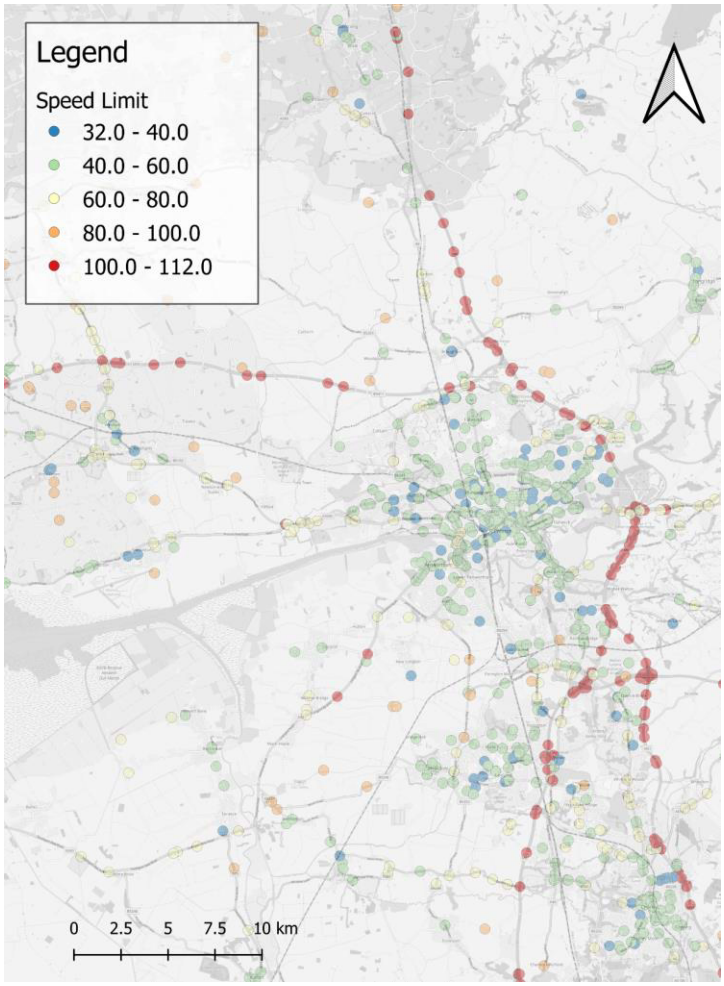


Figure 7.2: STATS19 - Speed Limit data [km/h] (2018) in the study area

7.6 Local Planning data

The information about housing and employment sites that were completed since 2103 was provided by LCC. The planning data was reviewed and developments that were expected to have major impacts on peak hour traffic

[2] http://mario.lancashire.gov.uk/agsmario/default.aspx

were identified. As part of model calibration additional trips associated with new developments are being added into the model to improve count calibration.

8. Summary and Conclusion

This report has provided an overview of the data and sources used to inform the CLHTM 2019 revalidation process. The sources of data used are highly reliable and widely used for modelling in the UK; therefore, are suitable for this application, and should provide a robust basis for forecasting purposes.

Although recent RSI data was not collected, the 2014 dataset provide a representative representation of the trip patterns in the Preston area, considering that there have not been major changes in the area.

The 2019 surveyed traffic count's locations, methods, equipment and checks were described and evidenced the reliability and suitability of the collected data. Issues in some of the sites did not affect the integrity of the data. Also, traffic count data allowed the confirmation of the peak hours for the study area.

Geometrical, operational and planning data has been collated to inform the update and improvement of the modelled network and matrices in SATURN as part of the revalidation process.

Overall, the dataset provides a comprehensive and adequate basis to establish the relevant traffic patterns in the study area, which is sufficient for the calibration and validation purposes of this project.

Appendix A. RSI summary

Site	Date	2014 No. Surveys	Total flow		Sample rate	
			2014	2019	2014	2019
1NBD	1-Apr-14	1187	5273	5745	22.51%	15.6 %
1SBD	2-Apr-14	1010	5394	4976	18.72%	12.7 %
2EBD	30-Apr-14	1298	11653	12353	11.24%	9.9 %
2WBD	30-Apr-14	1235	11837	14847	10.53%	7.3 %
3NBD	29-Apr-14	1232	8691	8163	14.34%	13.1 %
3SBD	29-Apr-14	1213	8734	7474	14.04%	13.5 %
4NBD	01-Apr-14	847	4532	5727	19.45%	9.0 %
4SBD	02-Apr-14	885	4147	5035	22.37%	11.9 %
5NBD	1-May-14	1054	8741	9530	12.10%	8.7 %
7SBD	22-Apr-14	1185	7349	8153	16.26%	9.4 %
9SBD	3-Apr-14	1077	7286	8714	14.78%	9.4 %
10SBD	03-Apr-14	888	5713	6651	15.87%	7.5 %
11WBD	24-April-14	1224	2728	3771	44.87%	23.5 %
13NBD	2-Apr-14	1131	6852	8509	16.51%	10.7 %
27SBD	1-April-14	1026	5713	5713	17.96%	12.4 %
28EBD	29-Apr-14	597	1843	2428	32.39%	14.9 %
28WBD	29-Apr-14	565	1833	2298	30.86%	16.0 %
29EBD	1-May-14	975	2956	4228	32.98%	14.1 %
29WBD	30-April-14	930	3832	4718	24.27%	8.5 %
30SBD	22-Apr-14	957	4886	6281	19.59%	8.8 %
31WBD	03-Apr-14	1090	10790	10560	18.72%	8.1 %
32NBD	23-Apr-14	975	6273	6510	15.77%	8.2 %
33EBD	22-Apr-14	1398	10788	11166	12.96%	10.0 %
33WBD	24-Apr-14	1143	8742	11833	13.07%	7.3 %
34NBD	23-Apr-14	1228	11109	12971	11.05%	7.2 %
35WBD	24-April-14	1045	2254	2788	46.36%	22.3 %

Appendix B. WebTRIS Count Data

B.1 Detailed list of used webTRIS sites by group

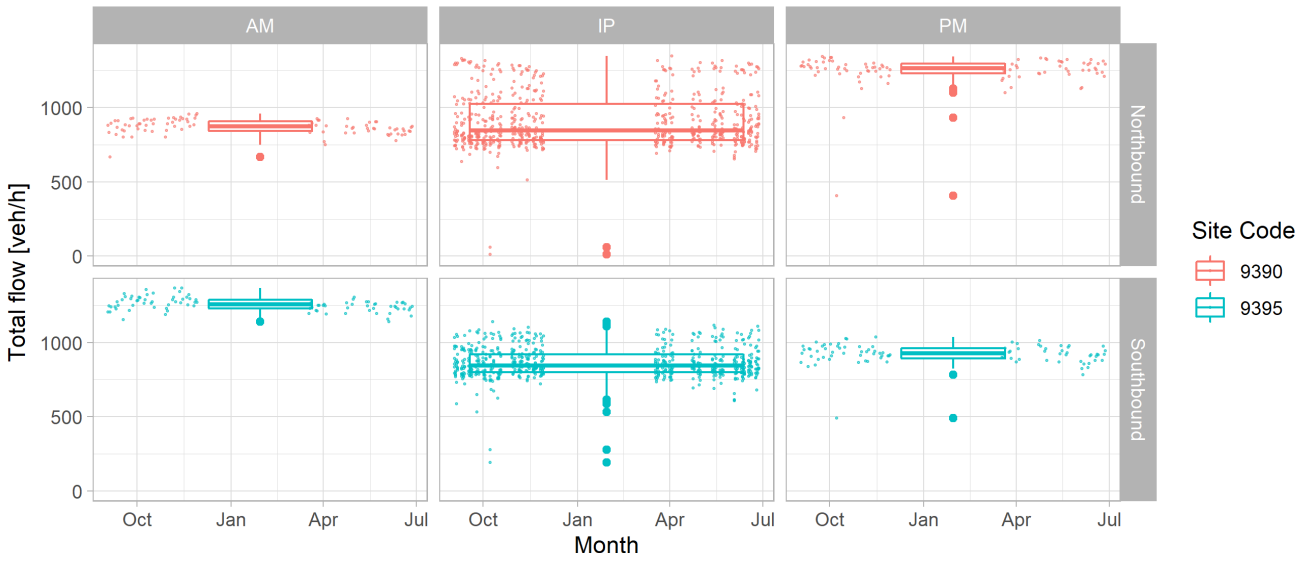
Site Name	Type	Corridor	Direction	Group
7087/1	TMU	A585	Northbound	A
7087/2	TMU	A585	Southbound	
M65/4026A	MIDAS	M65	Eastbound	B
M65/4027B	MIDAS	M65	Westbound	
M61/2320B	MIDAS	M61	Southbound	C
M61/2320J	MIDAS	M61	Northbound	
M61/2292A	MIDAS	M61	Northbound	
M61/2292B	MIDAS	M61	Southbound	
M61/2320A	MIDAS	M61	Northbound	
M6/7313B	MIDAS	M6	Southbound	D
M6/7307A	MIDAS	M6	Northbound	
M6/7358A	MIDAS	M6	Northbound	
M6/7383B	MIDAS	M6	Southbound	
M6/7312A	MIDAS	M6	Northbound	
M6/7358B	MIDAS	M6	Southbound	
M6/7307B	MIDAS	M6	Southbound	
M6/7570A	MIDAS	M6	Northbound	E
M6/7580B	MIDAS	M6	Southbound	
M55/5229A	MIDAS	M55	Eastbound	F
M55/5235A	MIDAS	M55	Eastbound	
M55/5235J	MIDAS	M55	Eastbound	
9010/1	TMU	M55	Westbound	
M6/7510B	MIDAS	M6	Southbound	G
M6/7526B	MIDAS	M6	Southbound	
M6/7517B	MIDAS	M6	Southbound	
M6/7526A	MIDAS	M6	Northbound	
M6/7512A	MIDAS	M6	Northbound	
M6/7517A	MIDAS	M6	Northbound	
M6/7506B	MIDAS	M6	Southbound	
M6/7506A	MIDAS	M6	Northbound	
M65/4049B	MIDAS	M65	Westbound	H
M65/4066B	MIDAS	M65	Westbound	
M65/4049A	MIDAS	M65	Eastbound	
M65/4057A	MIDAS	M65	Eastbound	
M65/4057B	MIDAS	M65	Westbound	
M65/4066A	MIDAS	M65	Eastbound	
M6/7564B	MIDAS	M6	Southbound	S1

Site Name	Type	Corridor	Direction	Group
M6/7564A	MIDAS	M6	Northbound	
9040/1	TMU	M6	Southbound	S2
M6/7417B	MIDAS	M6	Southbound	S3
M6/7431A	MIDAS	M6	Northbound	
M6/7421B	MIDAS	M6	Southbound	
M6/7430B	MIDAS	M6	Southbound	
30361049	TAME	M61	Northbound	S4
30361050	TAME	M61	Southbound	
30361658	TAME	A6	Northbound	S5
30361659	TAME	A6	Southbound	
M6/7450B	MIDAS	M6	Southbound	S6
M6/7450A	MIDAS	M6	Northbound	
M61/2347A	MIDAS	M61	Northbound	S7
M61/2347B	MIDAS	M61	Southbound	
M61/2351B	MIDAS	M61	Southbound	
M61/2341B	MIDAS	M61	Southbound	
M61/2353A	MIDAS	M61	Northbound	
M61/2341A	MIDAS	M61	Northbound	
M6/7484A	MIDAS	M6	Northbound	S8
M6/7481A	MIDAS	M6	Northbound	
M6/7481B	MIDAS	M6	Southbound	
M6/7479B	MIDAS	M6	Southbound	
M6/7489A	MIDAS	M6	Northbound	
M6/7476A	MIDAS	M6	Northbound	
M6/7491B	MIDAS	M6	Southbound	
M6/7487B	MIDAS	M6	Southbound	
M6/7476B	MIDAS	M6	Southbound	
M6/7489B	MIDAS	M6	Southbound	
M6/7496M	MIDAS	M6	Southbound	S9
M6/7494J	MIDAS	M6	Northbound	S10
M6/7501K	MIDAS	M6	Northbound	S11
M6/7502L	MIDAS	M6	Southbound	S12
M6/7536A	MIDAS	M6	Northbound	S13
M6/7536B	MIDAS	M6	Southbound	
M6/7561L	MIDAS	M6	Westbound	S14
M55/5258K	MIDAS	M55	Eastbound	S15
M55/5259M	MIDAS	M55	Westbound	S16
M55/5258J	MIDAS	M55	Eastbound	S17

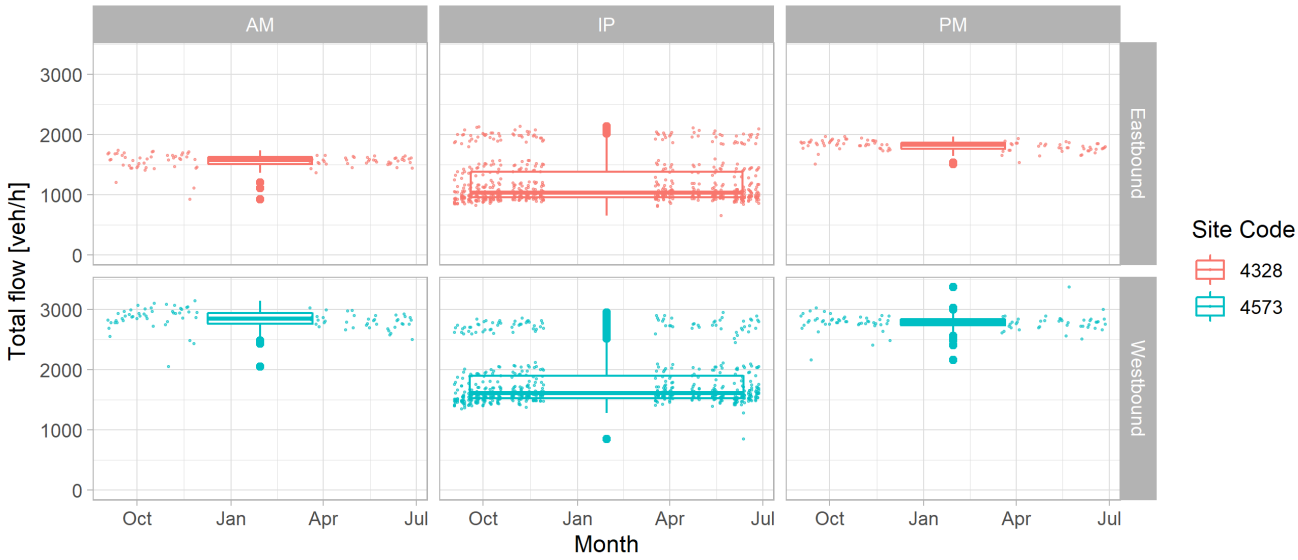
B.2 WebTRIS Grouped sites classified counts

Virtual Site	Direction	AM				IP				PM			
		Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV
A	Northbound	871	588	219	65	912	692	173	47	1248	1087	106	57
	Southbound	1256	1039	168	50	865	634	182	49	922	747	115	61
B	Eastbound	1558	1194	225	140	1208	928	192	89	1815	1553	128	135
	Westbound	2836	2337	309	192	1789	1359	294	137	2780	2367	202	212
C	Northbound	3348	2534	535	281	2628	1919	487	223	3371	2701	369	303
	Southbound	3294	2586	465	244	2795	2144	446	205	3883	3284	330	270
D	Northbound	3990	2801	752	438	3123	1983	770	371	3724	2653	622	450
	Southbound	3524	2367	732	426	3416	2245	791	381	4387	3241	666	482
E	Northbound	2653	1556	764	334	2347	1346	712	290	2468	1519	649	301
	Southbound	2516	1627	619	271	2587	1591	709	288	2867	1845	699	324
F	Eastbound	2958	2527	299	133	2150	1696	334	120	2877	2493	213	172
	Westbound	2828	2346	334	148	2110	1782	242	87	3081	2817	147	118
G	Northbound	6682	4979	1128	575	4766	3460	903	403	6063	4863	710	491
	Southbound	5582	3985	1058	540	5200	3572	1126	503	6770	5118	977	676
H	Eastbound	2935	2284	412	240	2224	1740	330	155	3435	2976	239	222
	Westbound	3413	2699	453	263	2213	1600	418	196	3295	2650	335	311
S1	Northbound	2147	1339	468	341	1913	1160	454	300	1831	1193	350	289
	Southbound	1772	1100	390	283	2144	1277	522	346	2280	1471	444	366
S2	Southbound	717	498	137	83	507	349	100	59	1000	674	212	115
S3	Northbound	4499	3232	806	462	3271	2197	711	364	3901	2895	561	446
	Southbound	3755	2419	851	487	3630	2365	838	429	4898	3621	713	565
S4	Northbound	3030	1902	891	238	2537	1592	752	194	3461	2444	756	263
	Southbound	3256	2045	957	256	2684	1631	838	216	3576	2453	834	290
S5	Northbound	2218	1782	348	89	1329	982	284	64	2026	1616	308	103
	Southbound	1655	1227	342	87	1318	1015	248	56	1922	1615	231	77
S6	Northbound	3721	2450	901	371	2704	1671	767	268	3168	2168	691	309
	Southbound	2976	1947	729	300	2932	1786	851	297	3930	2632	898	402
S7	Northbound	2890	2254	413	225	2284	1767	348	171	2886	2434	236	218
	Southbound	2722	2196	342	186	2481	1941	363	178	3335	2843	256	237
S8	Northbound	6763	4913	1308	543	4935	3502	1045	389	6038	4713	863	463
	Southbound	5699	3949	1237	514	5462	3650	1321	492	7231	5338	1233	662
S9	Southbound	1057	756	212	90	859	573	214	73	1246	834	307	106
S10	Northbound	1194	916	178	102	800	590	143	68	1106	907	106	94
S11	Northbound	1027	744	190	94	633	427	149	58	1093	852	142	100
S12	Southbound	978	701	188	89	600	420	125	55	954	752	116	87
S13	Northbound	4993	3746	852	396	4043	3069	690	285	5055	4233	526	297
	Southbound	4424	3054	936	435	4294	2754	1090	451	5150	3474	1072	604
S14	Westbound	2852	2136	465	252	2128	1541	400	188	3239	2682	271	286
S15	Eastbound	2663	2124	305	235	2200	1673	334	195	2862	2368	242	253
S16	Westbound	759	552	119	89	449	306	91	53	613	484	59	72
S17	Eastbound	511	418	34	60	443	362	29	52	640	547	19	75

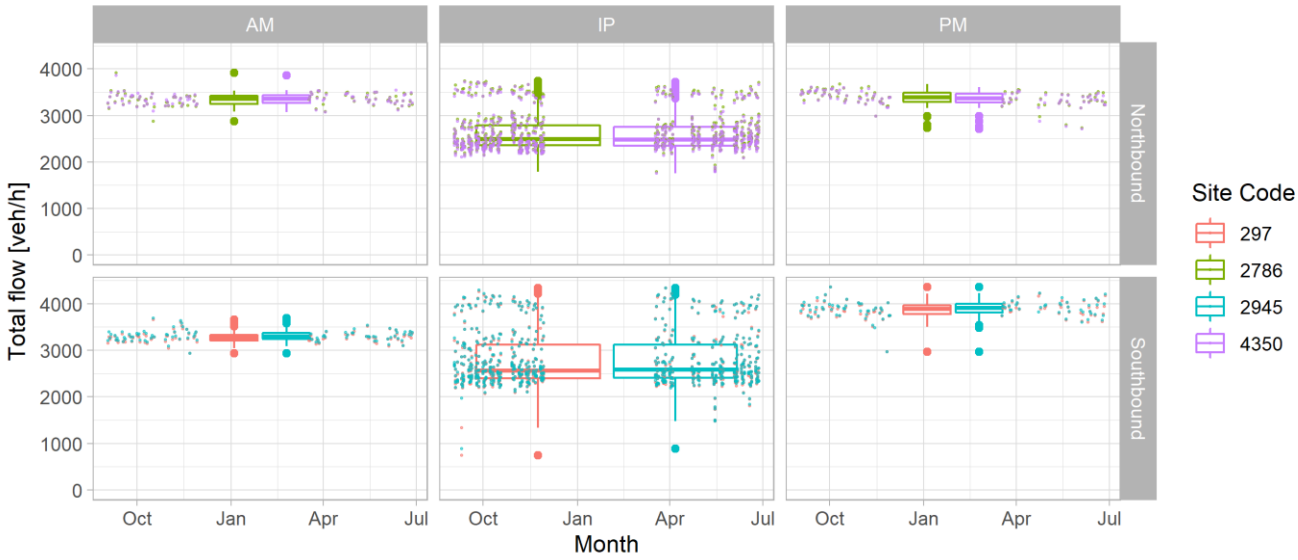
Site A



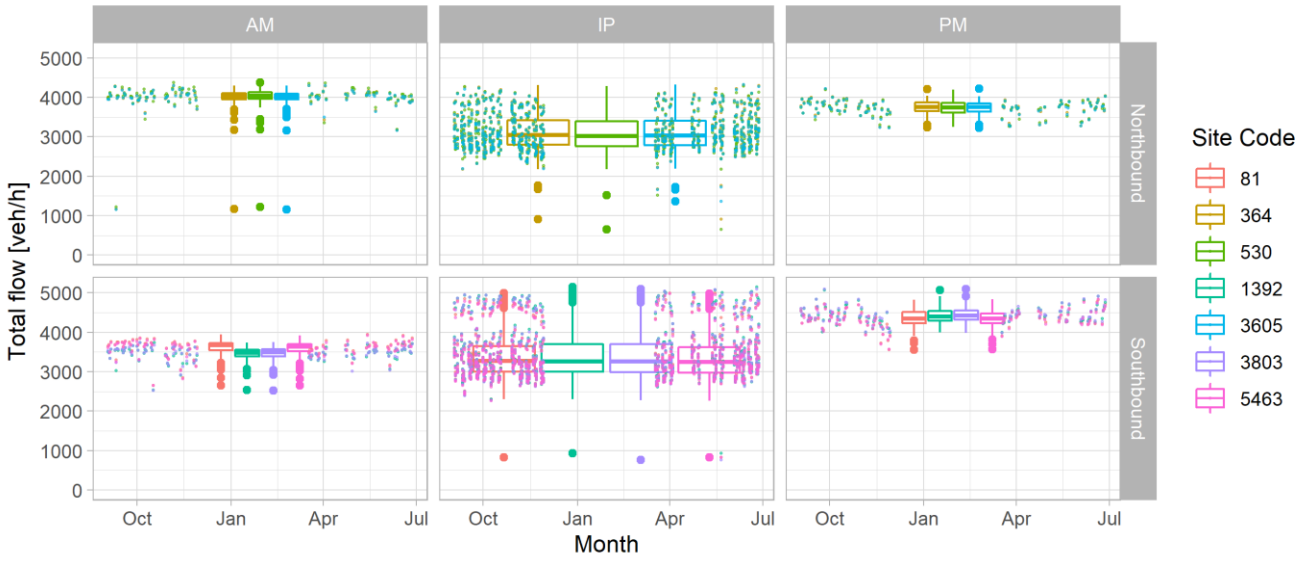
Site B



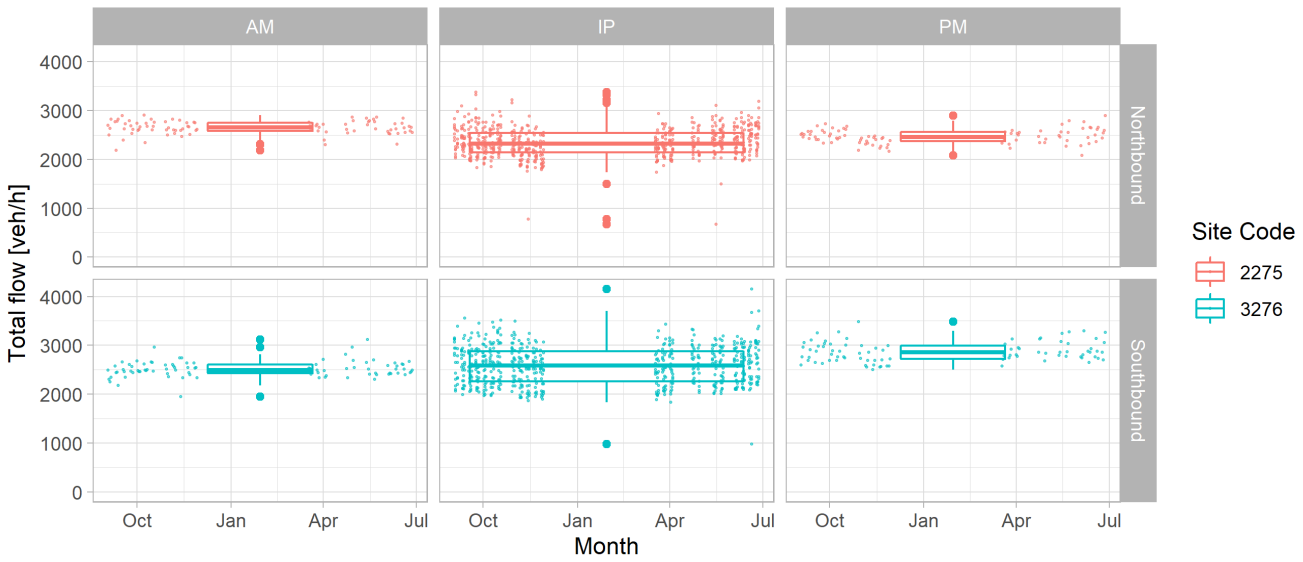
Site C



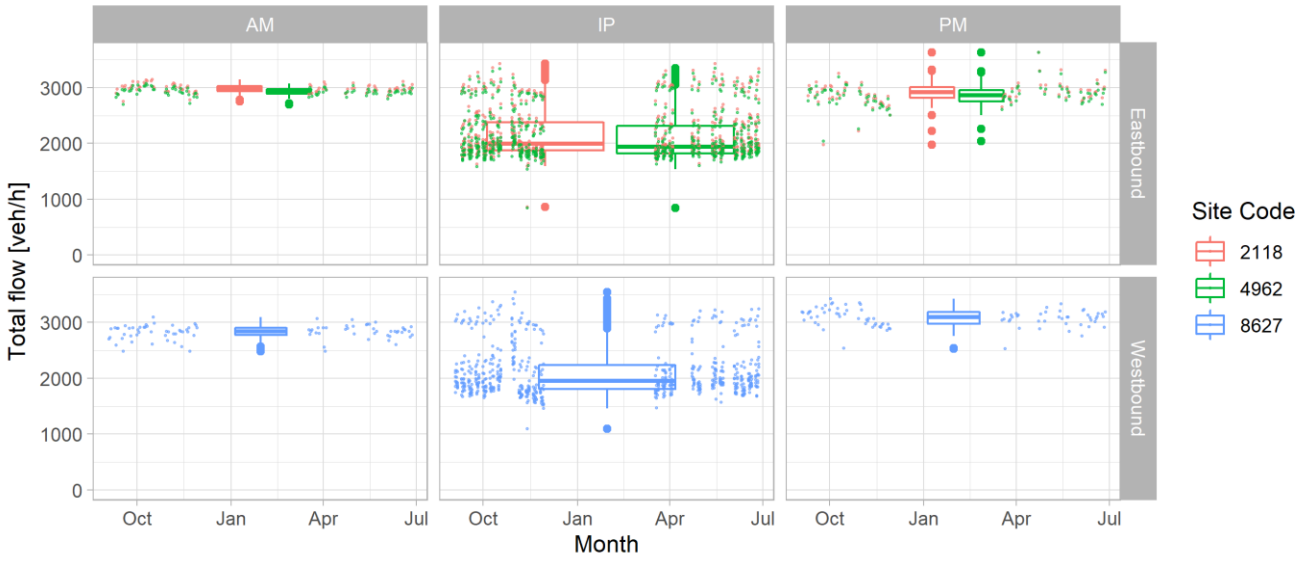
Site D

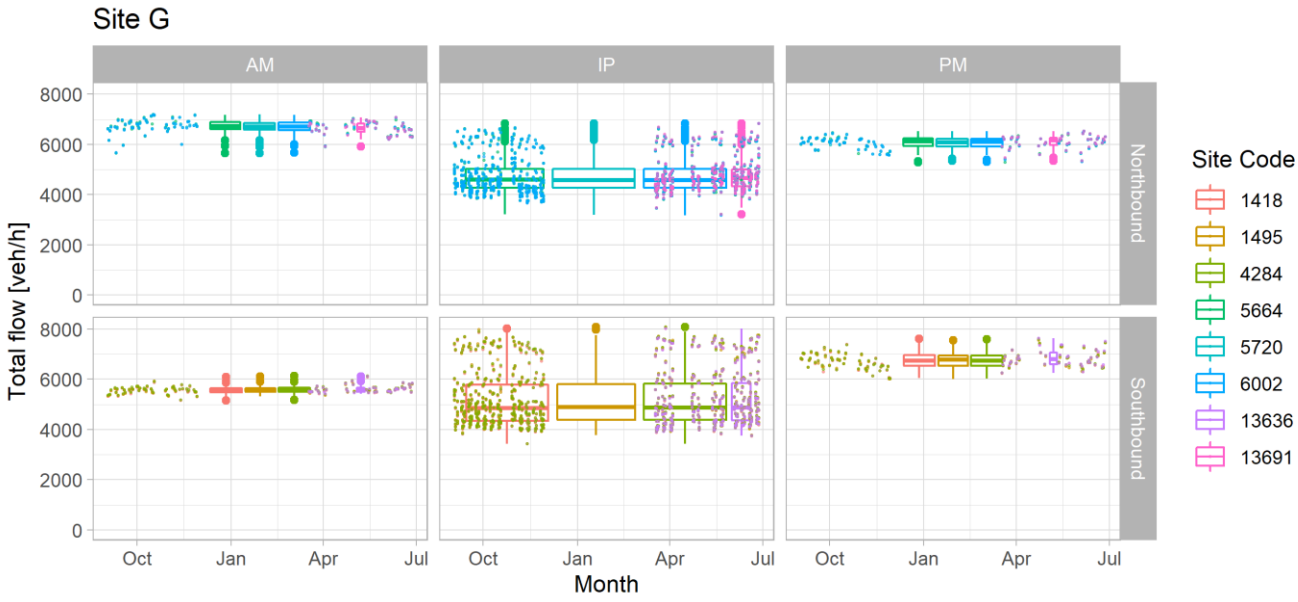


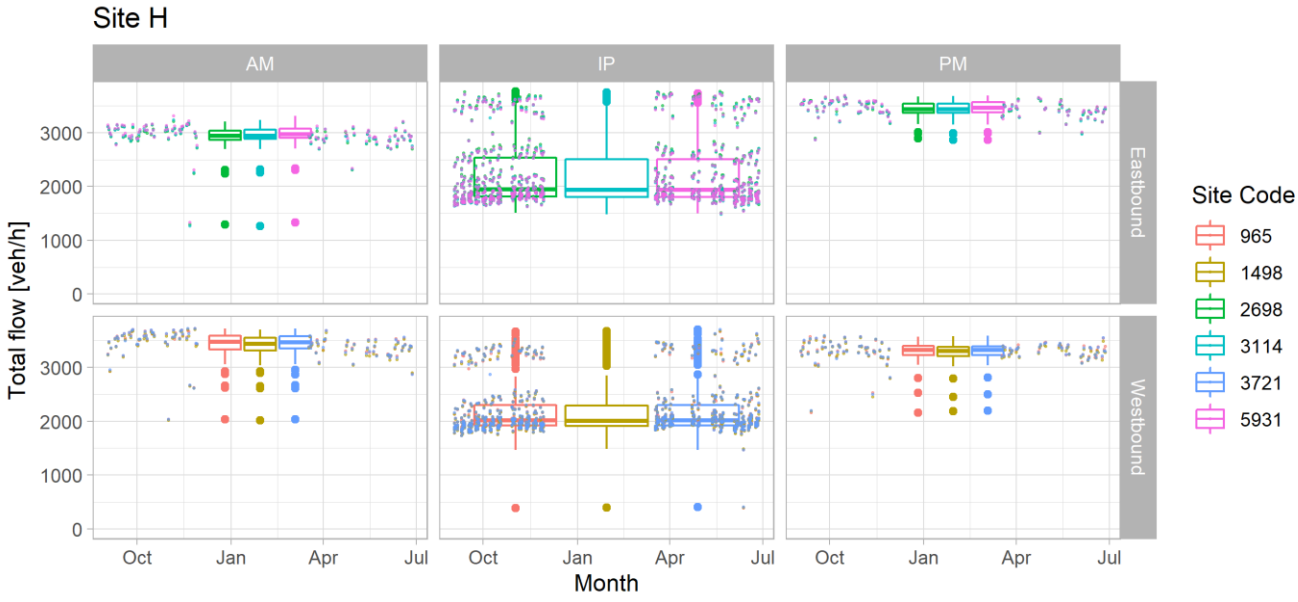
Site E

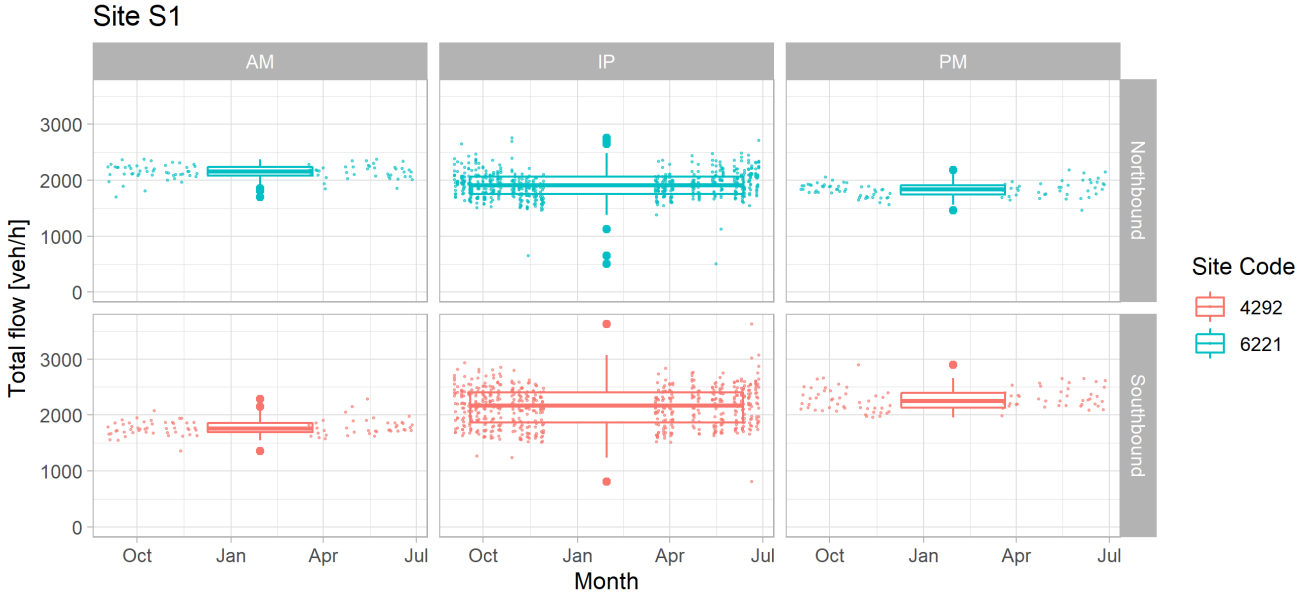


Site F

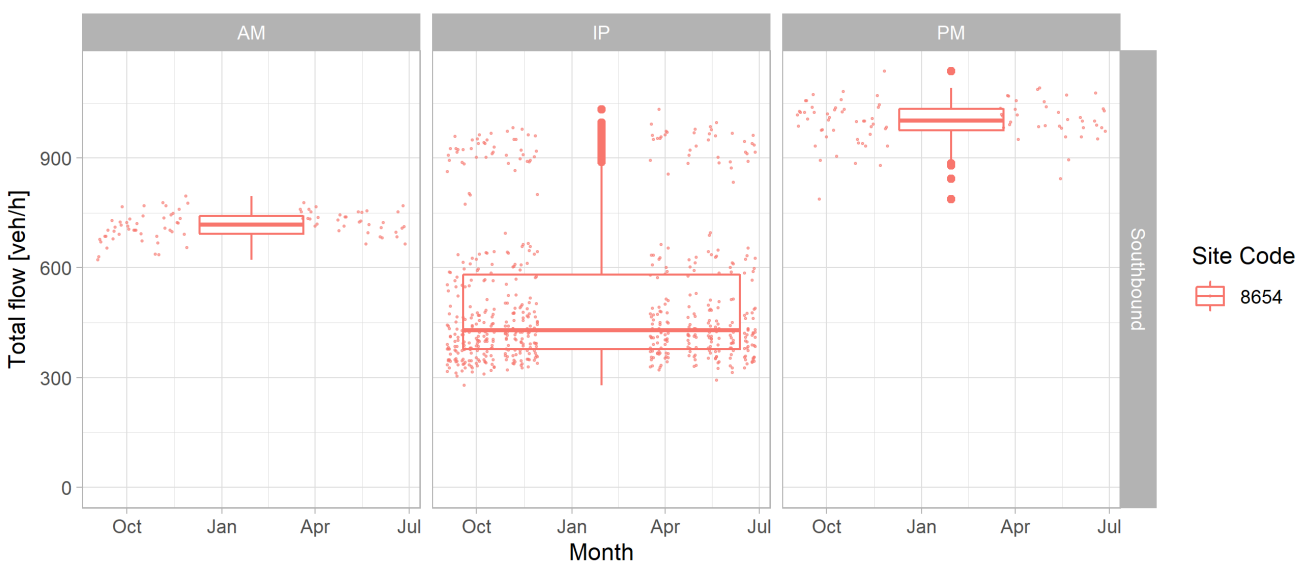



Site G
AM
IP
PM
Northbound
Southbound
Total flow [veh/h]
0
2000
4000
6000
8000
Oct
Jan
Apr
Jul
Month
Site Code
1418
1495
4284
5664
5720
6002
13636
13691

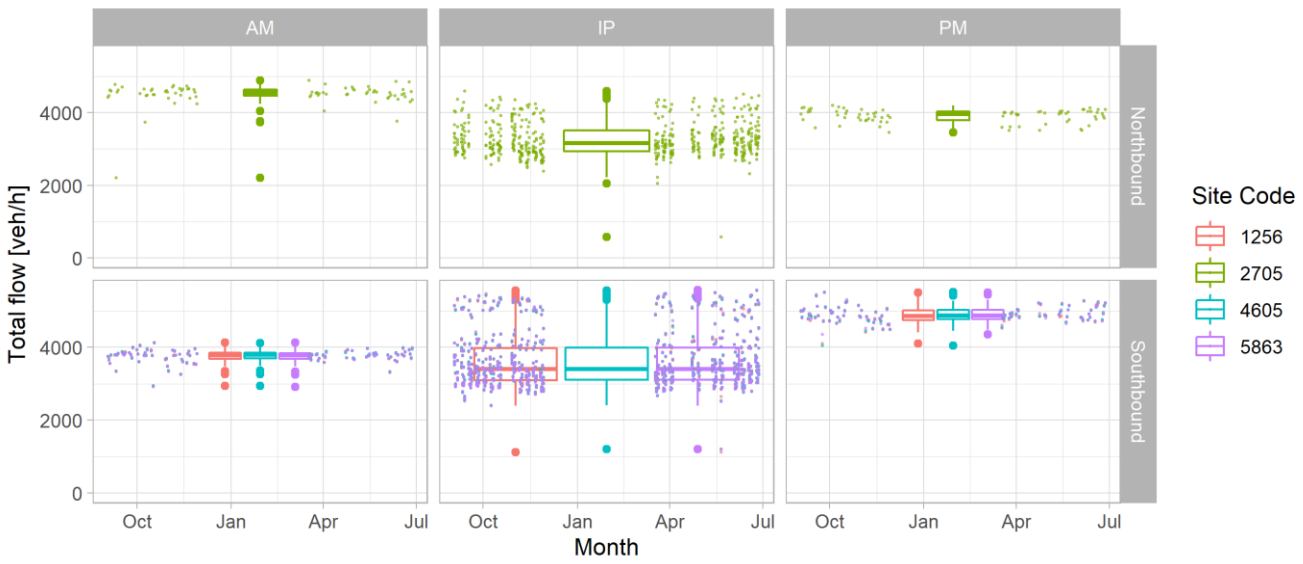

Site H
AM
IP
PM
Eastbound
Westbound
Total flow [veh/h]
0
1000
2000
3000
Oct
Jan
Apr
Jul
Month
Site Code
965
1498
2698
3114
3721
5931


Site S1
AM
IP
PM
Northbound
Southbound
Total flow [veh/h]
0
1000
2000
3000
Oct
Jan
Apr
Jul
Month
Site Code
4292
6221

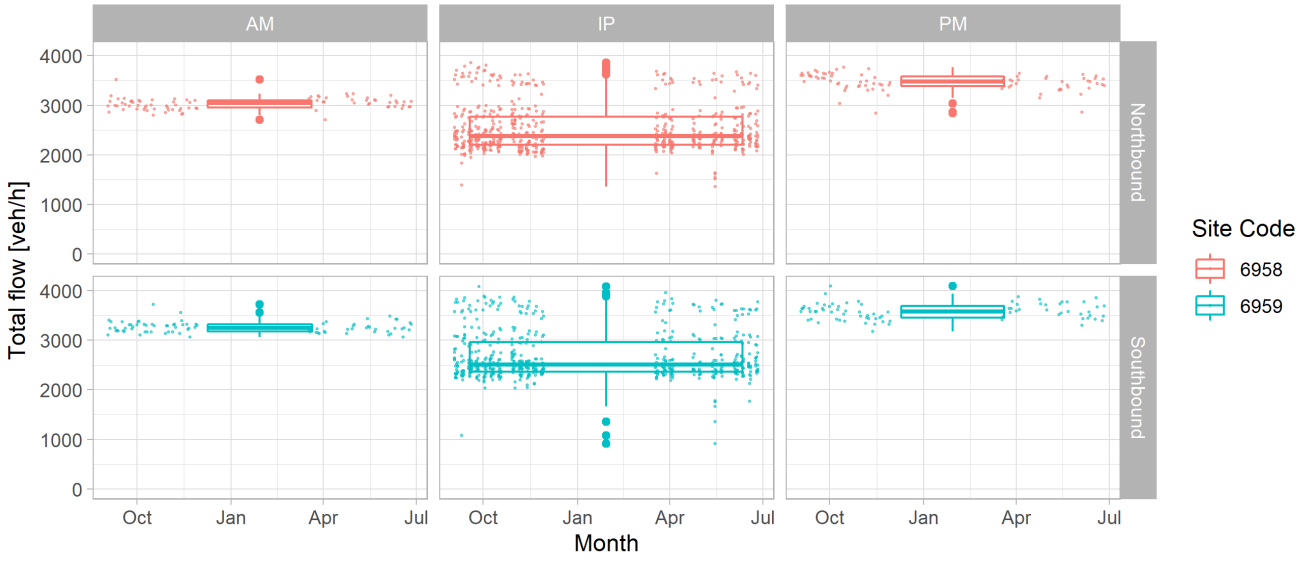
Site S2



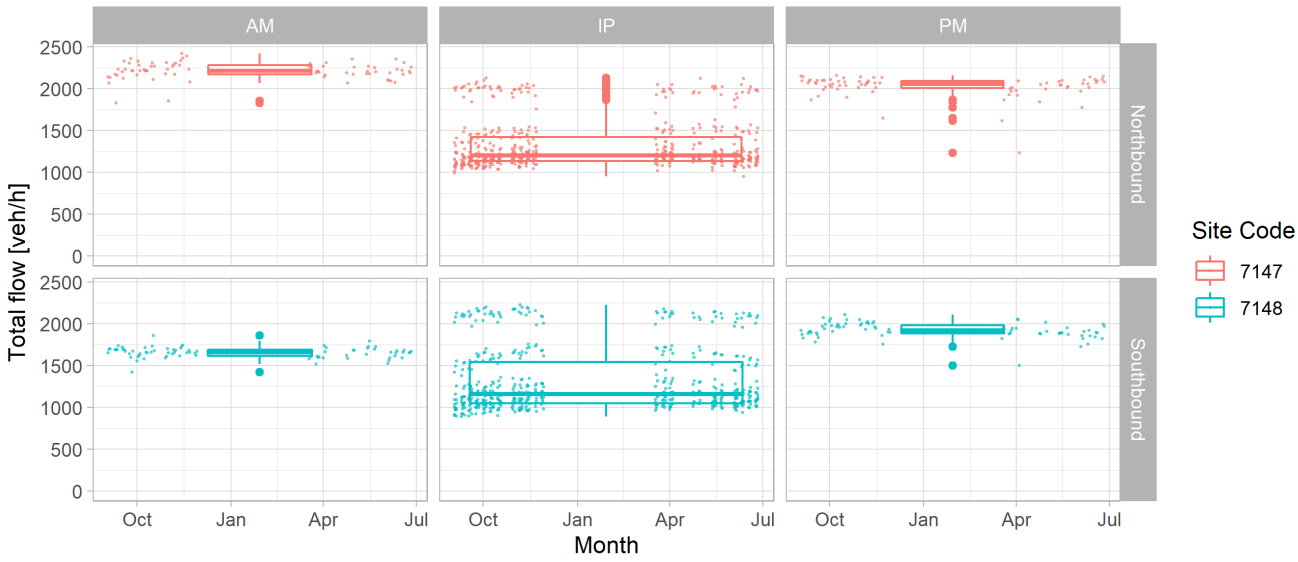
Site S3



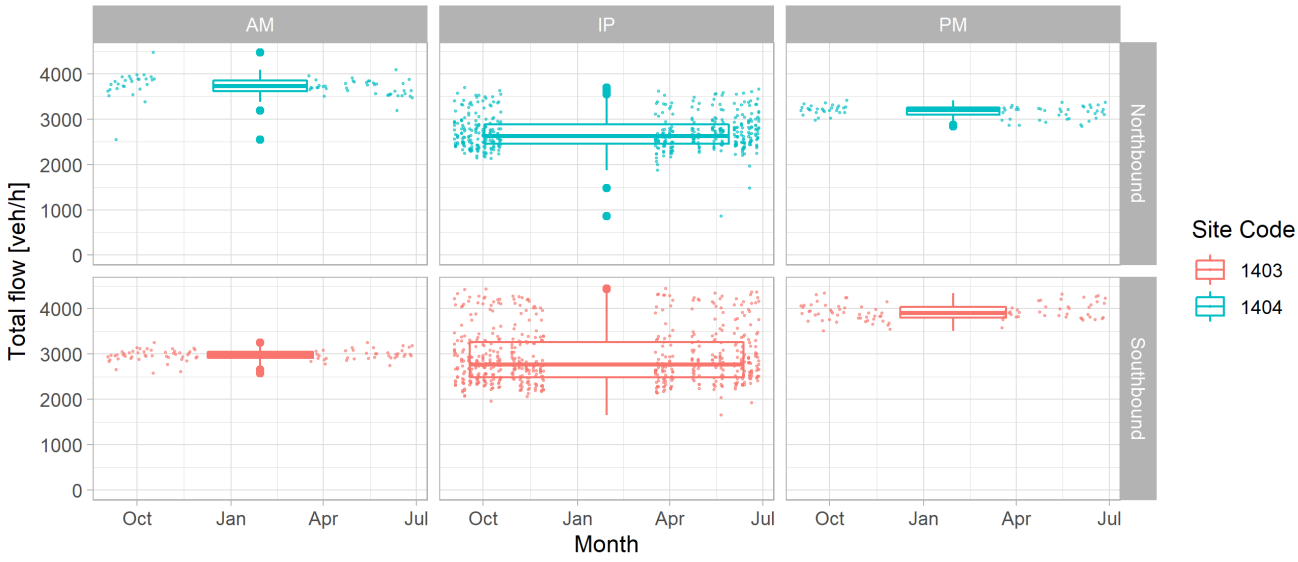
Site S4



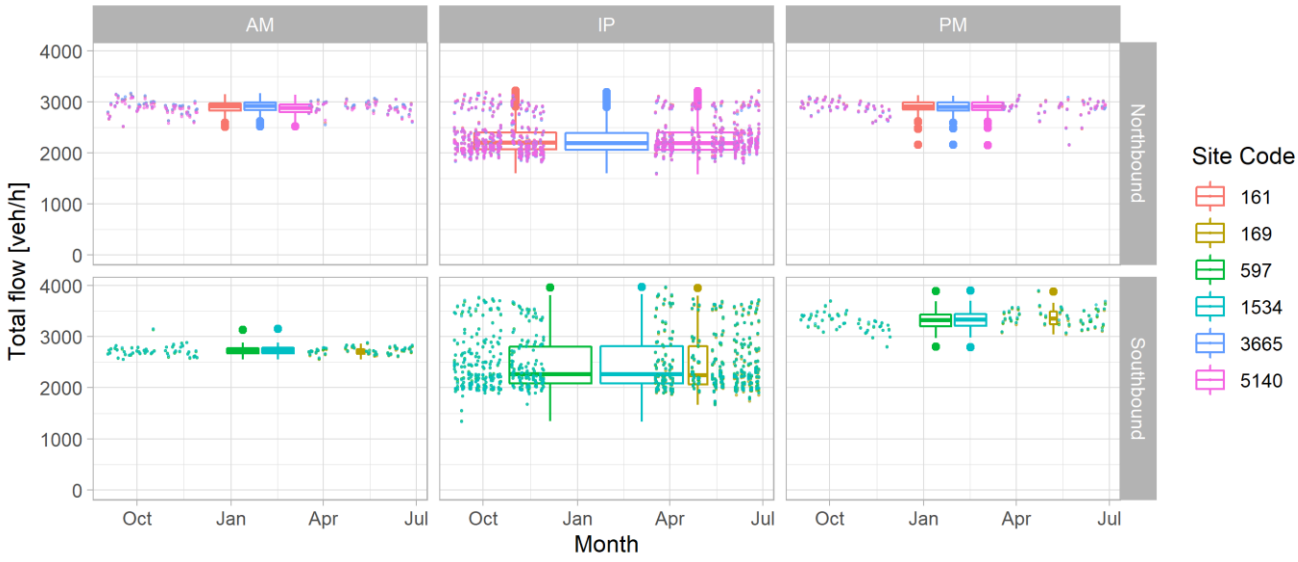
Site S5



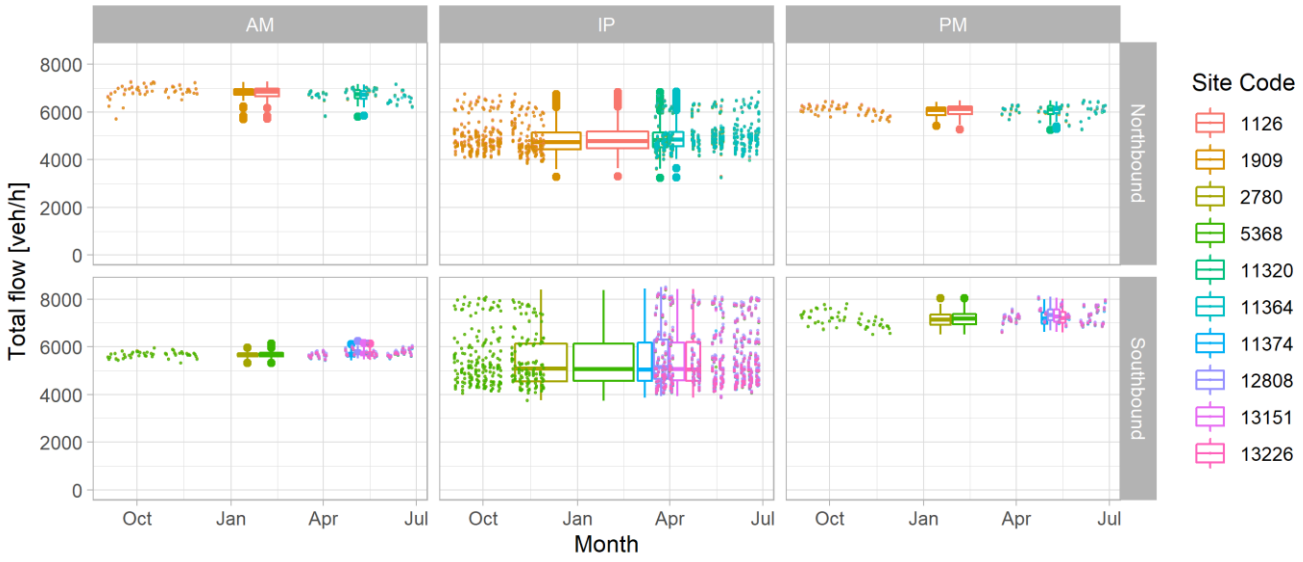
Site S6



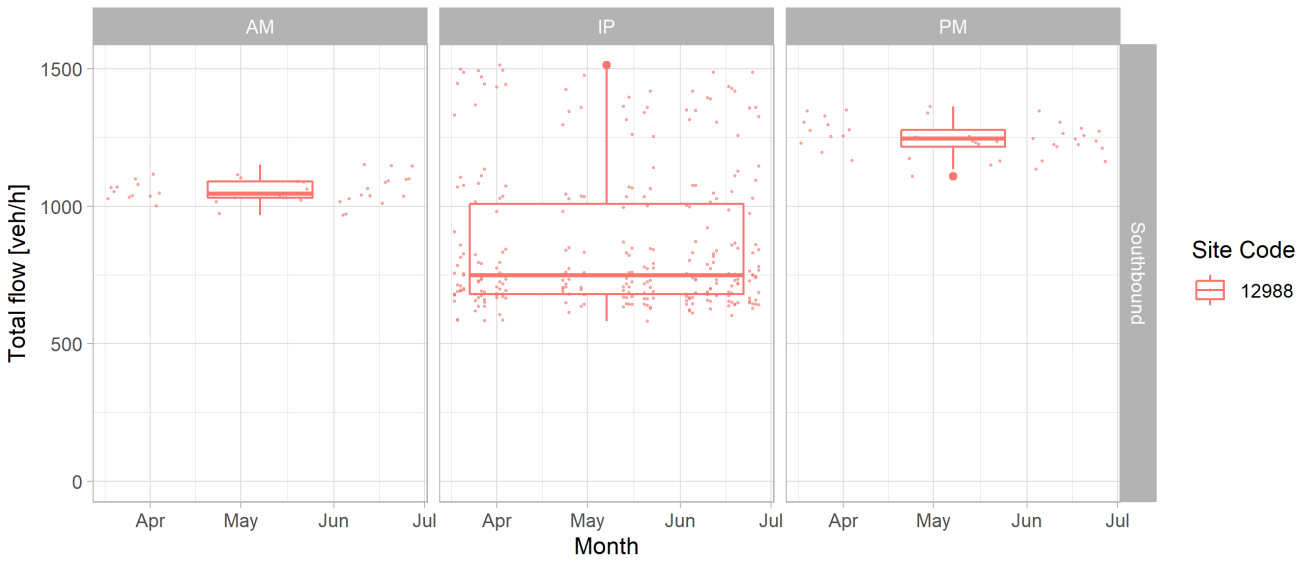
Site S7



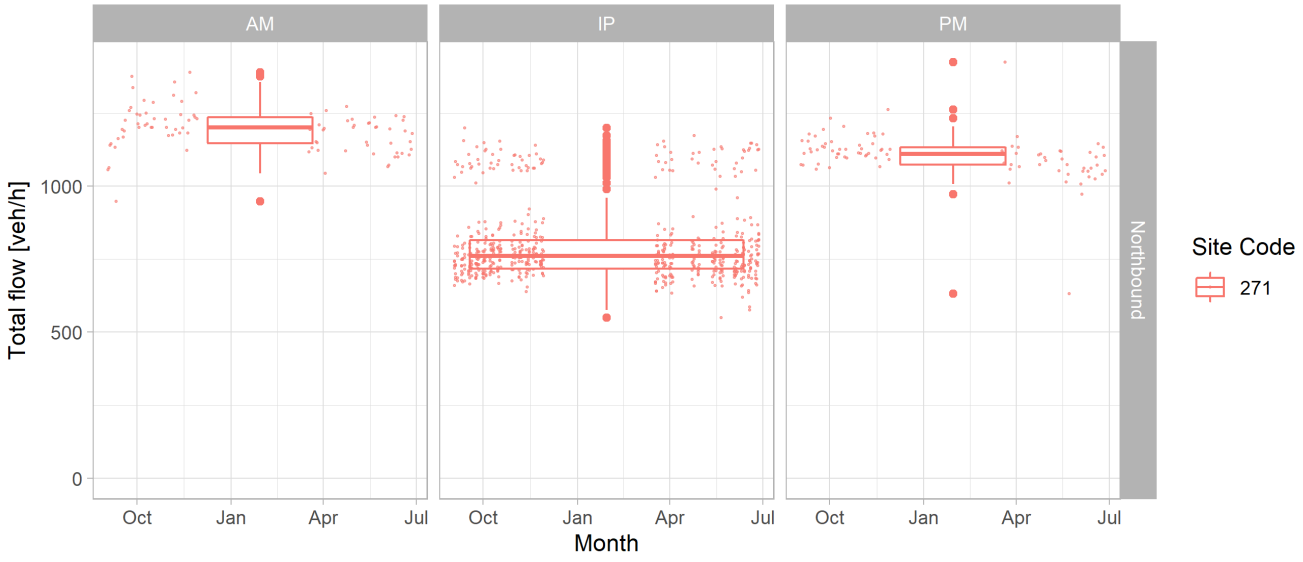
Site S8



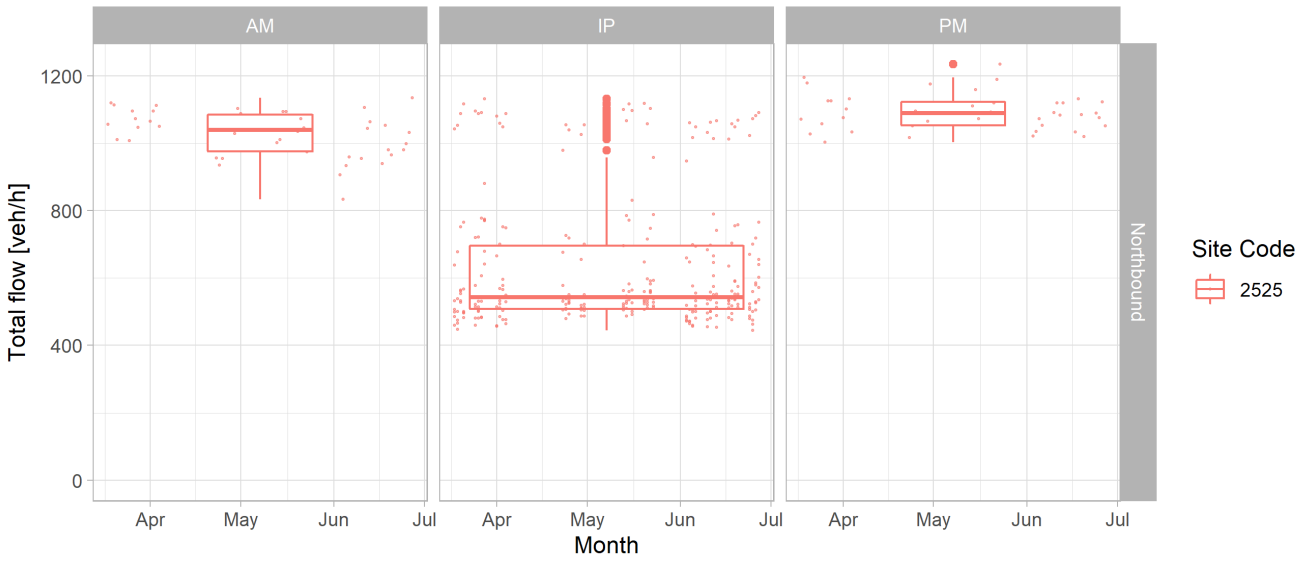
Site S9



Site S10

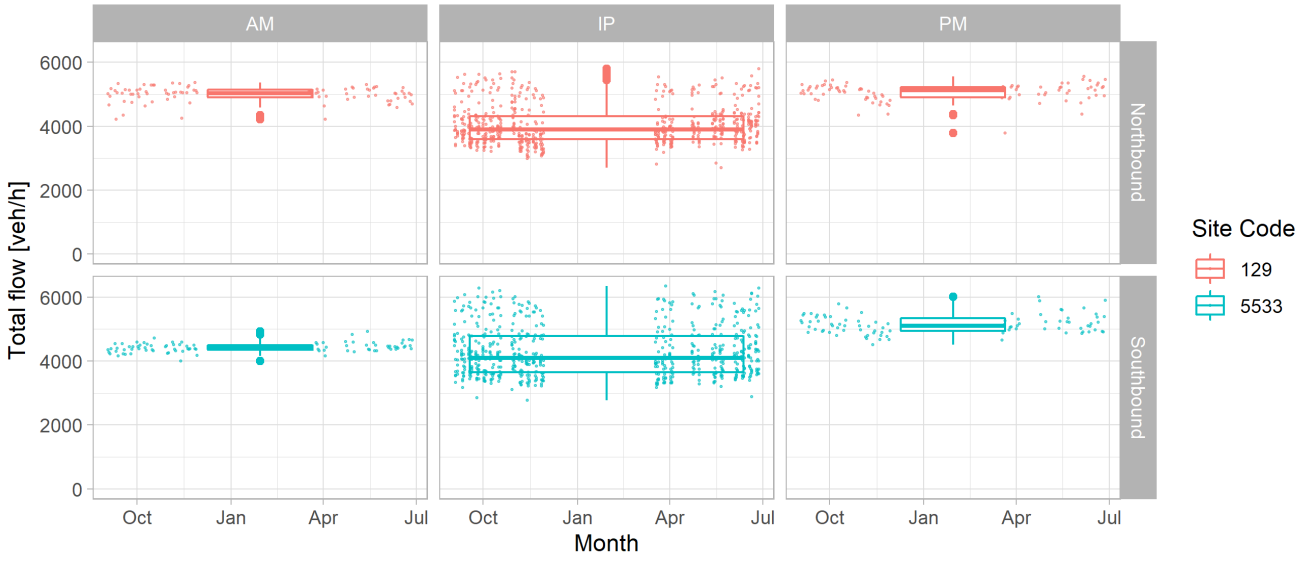


Site S11

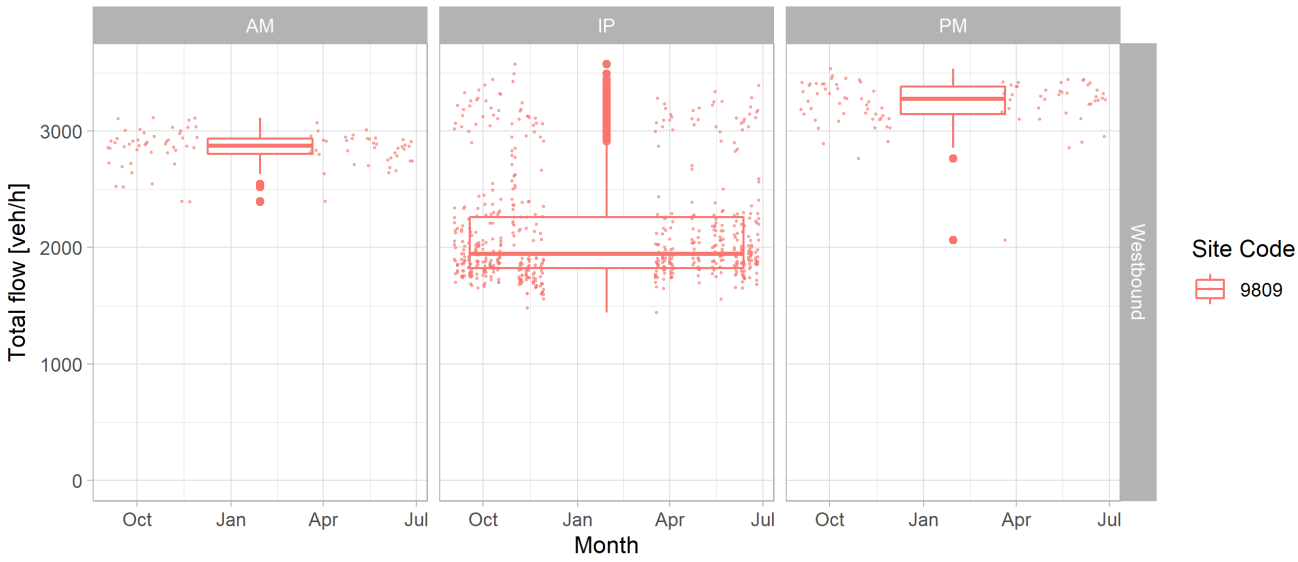


Site S12

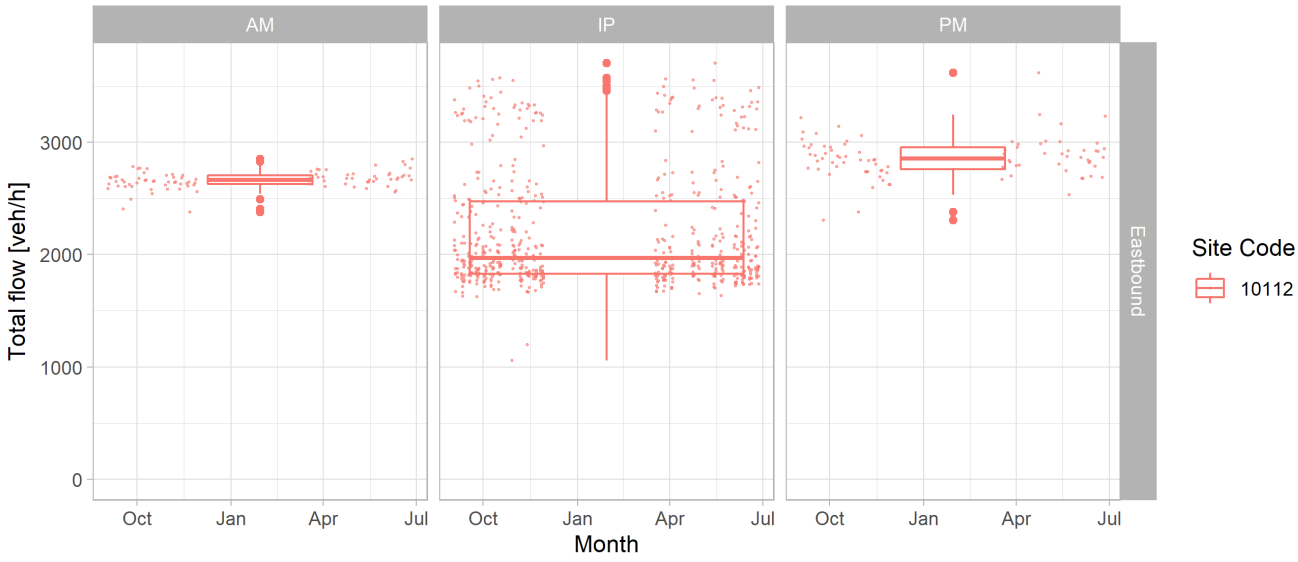
Site S13



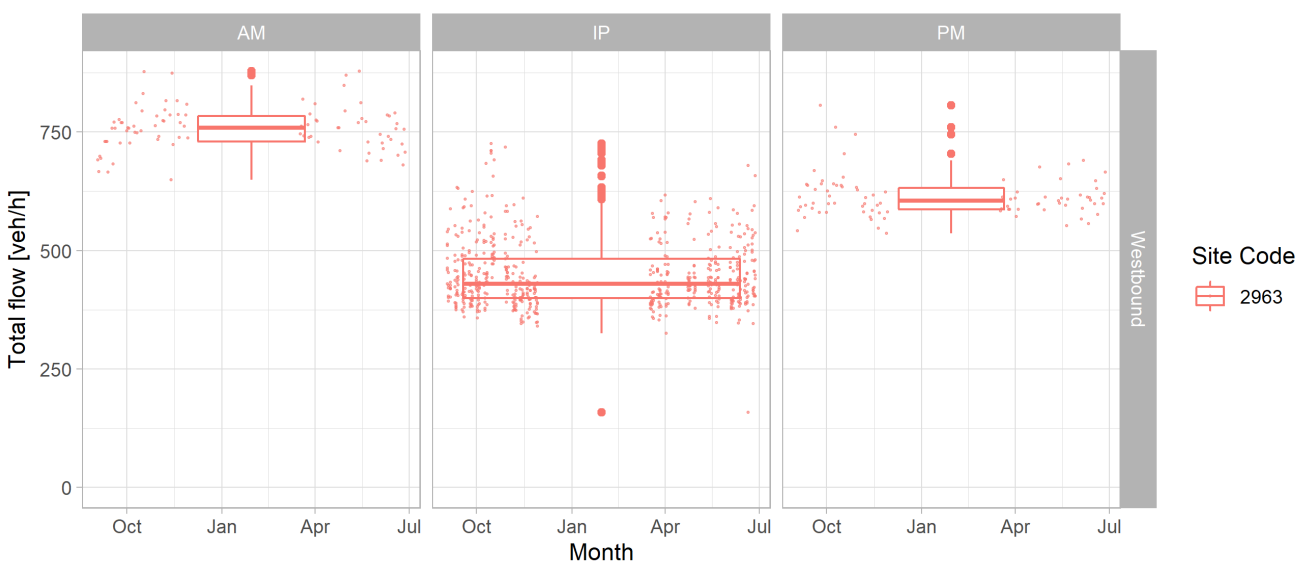
Site S14



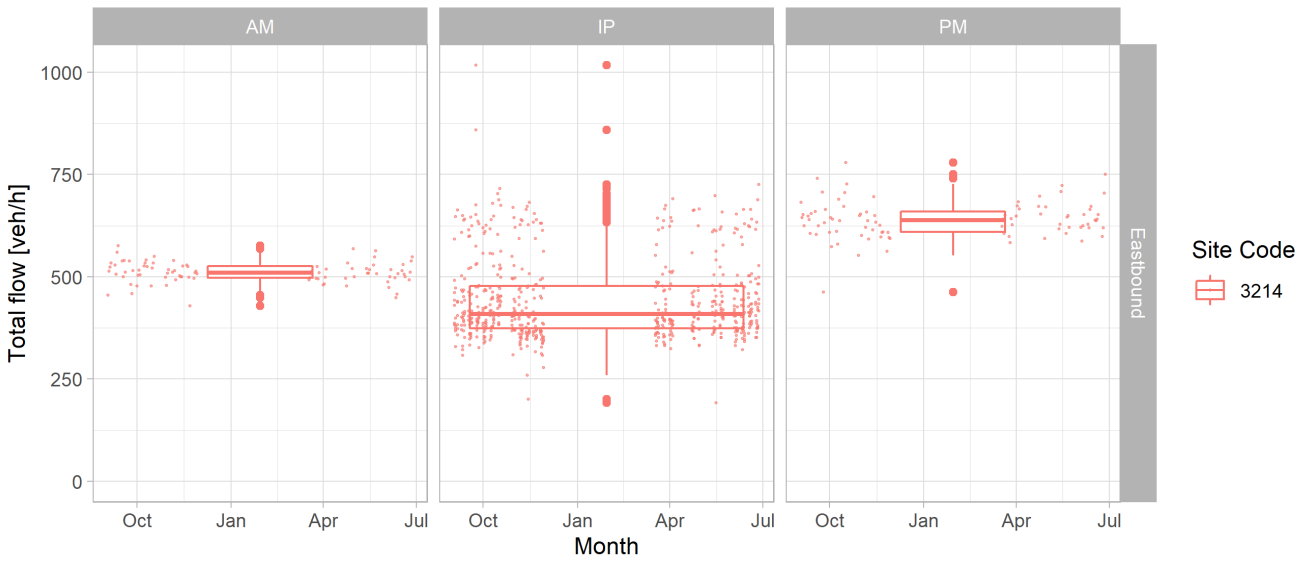
Site S15



Site S16



Site S17



Appendix C. Traffic surveys details

C.1 ATC Surveys

Site ID	Batch	Location Description	Data Loss	Resurvey Data Loss
1	E	A59 Liverpool Road		
2	E	Pope Lane	Power Event, no data from 0615 on 06/10 to 11/10	0915 on 17/10 - 1315 on 21/10
3	E	Chain House Lane		
4	M	A852 Penwortham Way		
5	E	B5254 Leyland Road		
6	F	Todd Lane North		
8	F	B6258 Chorley Road		
9	F	A675 Higher Walton Road		
10	G	B6230 Cuerdale Lane		
11	M	A5083 Stanifield Lane		
13	F	Craven Drive		
14	F	A49 Wigan Road		
15	M	A59 Liverpool Road		
16	B	B5248 North Road		
17	B	B5247 South Road		
18	B	A581 Westhead Road		
19	B	Tinckler's Lane		
20	B	Cadley Causeway		
21	B	B5250 Wood Lane		
22	P	A49 Preston Road	2300 on 07/10 to 1015 on 10/10	B tube damaged 28/11 (PM) to 12/11 (AM)
23	C	B5251 New Road	1600 on 18/10 to 1500 on 21/10	
24	P	A6 Bolton Road		
25	C	B6229 Moss Lane		
26	P	Lytham Road		
27	C	B6229 Harpers Lane		
28	C	B6228 Lyons Lane		
29	C	A49 Wigan Road		
30	C	A6 Preston Road		
31	P	A674		

Site ID	Batch	Location Description	Data Loss	Resurvey Data Loss
32	C	Briers Brow		
33	C	A674 Blackburn Road		
34	P	Marsh Lane		
35	F	Stony Bank		
36	F	Gregson Lane	Mismatch through eco file between 11/10 and 16/10	
37	F	A675 Hoghton Lane		
38	G	B6230 Cuerdale Lane		
40	P	Sheep Hill Lane	14:30 on 21/10 to 11:45 on 24/10	
41	P	B5248 Dawson Lane		
43	M	Longmeanygate		
44	M	B5253 Schleswig Way		
45	B	Dunkirk Lane		
46	M	Ulnes Walton Lane		
47	B	B5253 Leyland Lane		
48	D	Runshaw Hall Lane		
49	C	B5248 Heald House Road		
50	D	B5256 Leyland Way		
51	D	B5254 Stanifield Lane		
52	D	Wheelton Lane		
53	D	Croston Road		
54	M	B5253 Flensburg Way		
55	D	Reiver Road		
57	A	Hillock Lane		
58	A	B5259 Ribby Road		
59	A	A583 Blackpool Road		
60	N	A585 Fleetwood Road	15:00 3/10 - 17:40 10/10 due to broken tubes	A tube damaged 25/11 (PM) to 04/11 (PM)
62	A	B5192 Preston Street	09:00 on 11/10 to 07:30 on 14/10 B tube failed after check on 14/10	
66	N	A5085 Blackpool Road		
68	J	Garstang Road	Power Event, no data except between 11/10 - 14/10	

Site ID	Batch	Location Description	Data Loss	Resurvey Data Loss
69	A	B5411 Plumpton Lane		
70	A	Rosemary Lane		
71	A	Blackleach Lane		
72	A	Salwick Road		
73	A	Church Road		
74	A	Moorside		
75	N	B5411 Tabley Lane		
76	N	A6 Garstang Road		
77	I	D'Urton Lane		
78	I	B5269 Whittingham Lane		
79	I	Haighton Green Lane		
80	I	B6243 Longridge Road		
82	O	A5072 Tulketh Road	20:00 on 05/10 to 14:15 on 10/10	
83	L	B6241 Tom Benson Way		
84	L	Eldon Street		
85	J	A6 Garstang Road		
86	H	A6063 Sir Tom Finney Way		
87	J	Plungington Road		
88	L	Egerton Road		
89	K	Navigation Way		
90	H	St Gregory Road		
91	G	B6243 Ribbleton Lane	14:00 on 13/10 until 16:45 on 16/10 00:00 on 18/10 to 13:45 on 22/10	
92	G	A59 New Hall Lane		
93	H	B6243 Ribbleton Lane		
94	H	A6063 Deepdale Road	Car parked on tube from 19:00 on 13/10 until 21:00 on 14/10	
95	H	Meadow Street	Mismatch 11/10 to 16/10 B tube failed since check on 16/10	One tube parked on 01/11 (PM) to 02/11 (AM) 07/11 (PM) to 08/11 (AM) & 09/11 (PM) to 11/11 (AM)
96	O	A6 North Road		
97	K	Friargate	10:00 on 17/10 to 02:30 on 22/10	Tube damage 31/10 (PM) to 04/11 (AM)

Site ID	Batch	Location Description	Data Loss	Resurvey Data Loss
98	K	A5071 Corporation Street	Mismatch between 15/10 & 22/10	
99	K	A583 Fylde Road	A tube damaged between 3/10 & 15/10 Mismatch between 15/10 & 22/10	Imbalance from 04/11 (PM) to 12/11 (PM)
100	O	A59 Marsh Lane		
101	O	Fishergate Hill		
102	K	Ribblesdale Place		
103	H	Manchester Road		
104	O	A6 London Road		
105	O	A59 New Hall Lane		
108	M	A6 London Road	Some mismatch between 6/10 & 9/10	
109	G	A675 Victoria Road		
111	E	B5254 Leyland Road		
113	O	A59 Liverpool Road		
114	K	Port Way	20:00 on 10/10 until 0515 on 15/10	
115	K	Channel Way		
116	O	A5072 Strand Road		
121	K	Marsh Lane		
122	G	B6230 Cuerdale Lane		
123	N	A59 Brockholes Brow		
124	I	B6243 Longridge Road		
125	I	B6241 Eastway		A tube damaged 07/11 (AM) until collection
126	J	A6 Garstang Road		
128	L	B5411 Tag Lane		
129	L	B6241 Tom Benson Way	16:00 on 20/10 to 24:00 on 22/10	
131	E	Lindle Lane		
132	E	Wham Lane		
133	D	A582 Farington Road	Mismatch from 10/10 to 22/10	A tube damaged 05/11 (AM) until collection
134	F	B6258 Station Road		
135	I	B6241 Eastway	04:30 on 12/10 to 08:00 on 16/10	
136	J	A6 Garstang Road		

Site ID	Batch	Location Description	Data Loss	Resurvey Data Loss
137	J	B6241 Tom Benson Way		
138	J	Lightfoot Lane		
139	I	B6242 Longsands Lane		
140	N	B6242 Bluebell Way		
141	L	A5085 Blackpool Road		
142	H	A5085 Blackpool Road		
143	G	A5085 Blackpool Road		
144	G	A5085 Blackpool Road		
145	D	A582 Penwortham Way		
146	D	A582 Flensburg Way		
148	P	A6 Church Road	15:00 on 21/10 to 11:15 on 24/10	B tube damaged 24/10 (PM) until 06/11 (AM)
149	C	Central Avenue		
150	J	Wychnor	Parked Cars	Tubes repeatedly parked on. Site is near a School
151	I	Sherwood Way		
152	H	Church Street		
153	H	Queen Street		
154	H	Carlisle Street	06:00 on 06/10 until 13:00 on 11/10	
155	K	Aqueduct Street		
156	F	B5257 Brownedge Road		
157	D	Croston Road		
158	B	A59 Bank Bridge		
159	B	A581 Southport Road	13:00 08.10 - 10:00 10.10	
160	G	A59 Myerscough Smithy Road	17:30 on 9/10 until 19:15 on 16/10	
161	G	A677 Preston New Road		
162	N	A59 Longsight Road	Mismatch 10/10 - 14/10	Imabalance shortly after install until 13/11 (AM) Tube breakage 13/11 (PM) until collection 20/11
163	E	Pope Lane		
164	E	Cop Lane		
165	K	Bow Lane		

Site ID	Batch	Location Description	Data Loss	Resurvey Data Loss
167	N	A6 James Towers Way	16:00 on 09/10 to 16:42 on 10/10 Mismatch between 10/10 - 22/10	
168	I	Haighton Green Lane		
169	J	B6241 Eastway		
170	L	Hoyle's Lane		

C.2 Radar Surveys

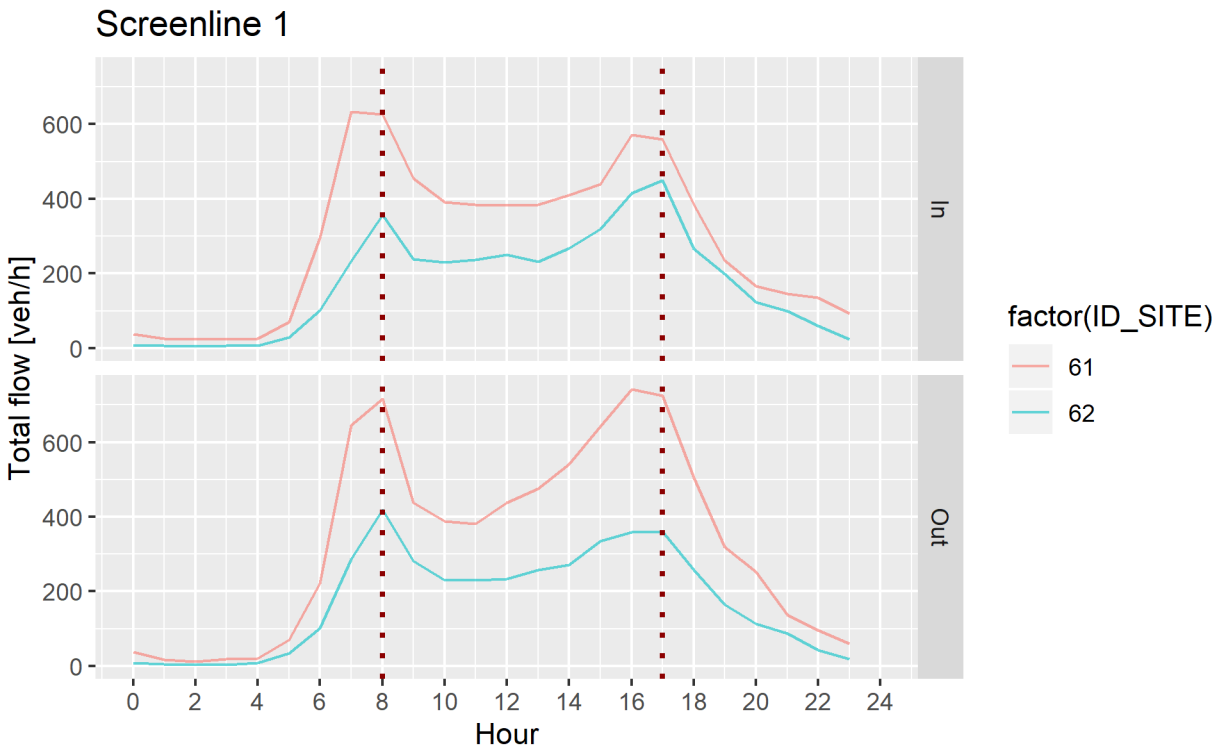
Site ID	Batch	Location Description	Data Loss	Resurvey Data Loss
7	Radar	A6 London Way	Unit vandalised - unit dislocated from proper positioning	
12	Radar	A6/M65 Slip Road		
39	Radar	A59 Preston New Road		
42	Radar	A59 Longton By-pass	Battery failure	
56	Radar	A584 Preston New Road		
61	Radar	A583 Kirkham Bypass		
63	Radar	A583 Blackpool Road		
64	Radar	A584 Preston New Road		
65	Radar	A583 Riversway	Battery failure	
67	Radar	A6 James Towers Way		
81	Radar	A583 Watery Lane	Battery failure	
106	Radar	A59 Guild Way		
107	Radar	Liverpool Road		
110	Radar	A6 London Way		
112	Radar	A582 Golden Way		
117	Radar	A59 Ring Way		
118	Radar	A59 Ring Way		
119	Radar	A59 Ring Way		
120	Radar	Fishergate		
130	Radar	A583 Blackpool Road	Unit vandalised - unit turned away from road.	
147	T	A582 Lostock Lane (EB)		
147	T	A582 Lostock Lane (WB)		
166	Radar	Corporation Street		

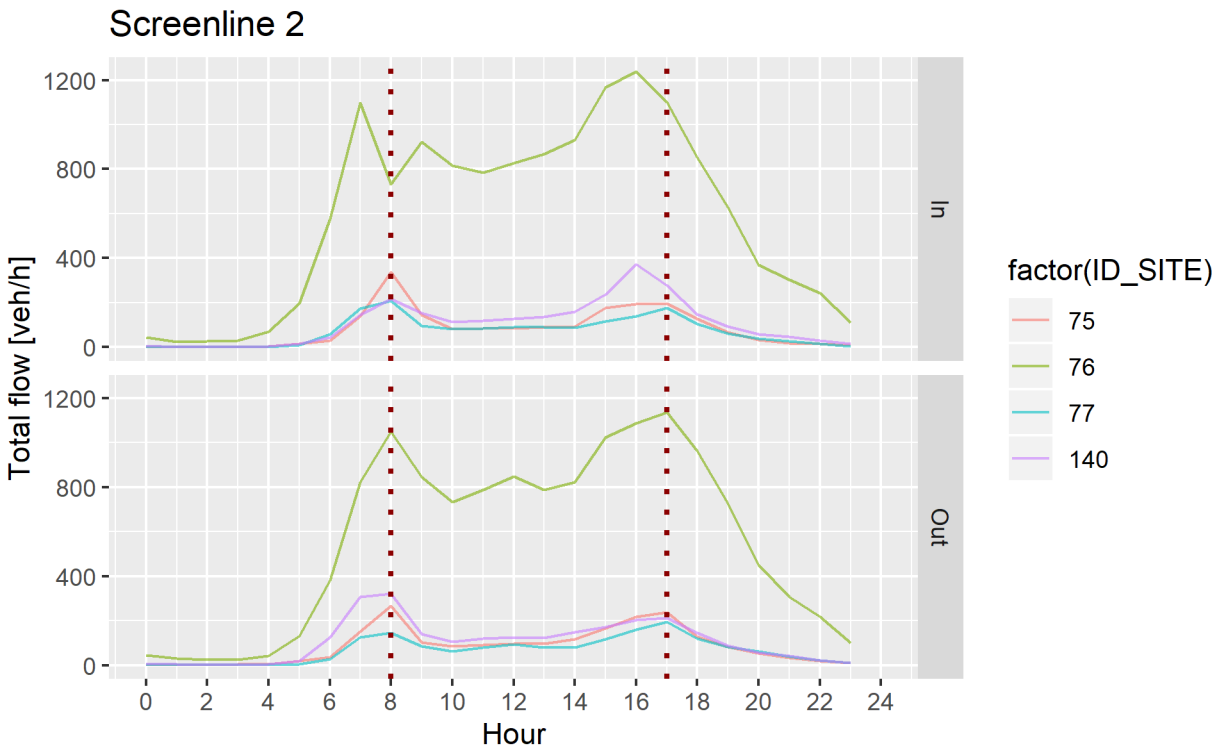
C.3 MCC Surveys

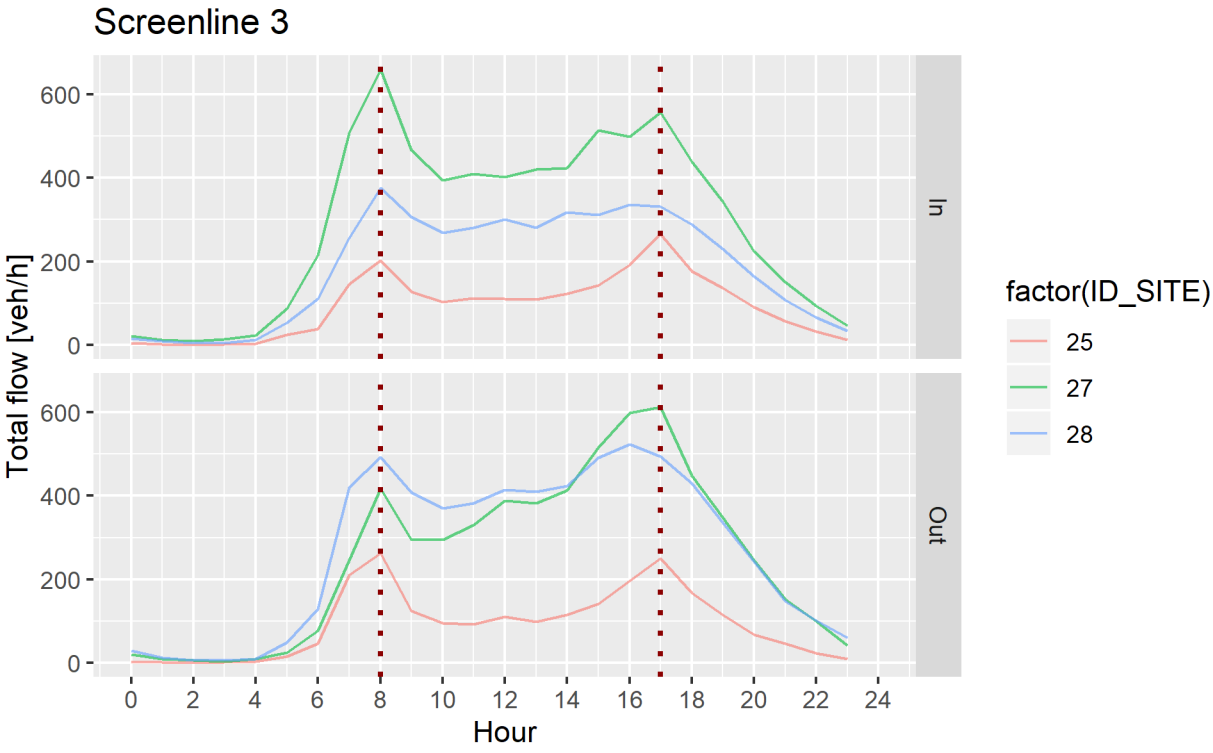
Site ID	Batch	Location Description	Data Loss
1	S	A59 Liverpool Road	
5	S	B5254 Leyland Road	
6	S	Todd Lane North	
7	S	A6 London Way	
9	S	A675 Higher Walton Road	
54	S	B5253 Flenburgh Way	
122	S	B6230 Cuerdale Lane	
123	S	A59 Brockholes Brow	
124	S	B6243 Londridge Road	
125	S	Eastway	
126	S	A6 Garstang Road	
127	S	Balck Bull Lane	
128	S	B5411 Tag Lane	
129	S	B6241 Tom Benson Way	
130	S	A583 Blackpool Road	
131	S	Lindle Lane	
132	S	Wham Lane	
133	S	A582 Farrington Road	
134	S	B6258 Station Road	

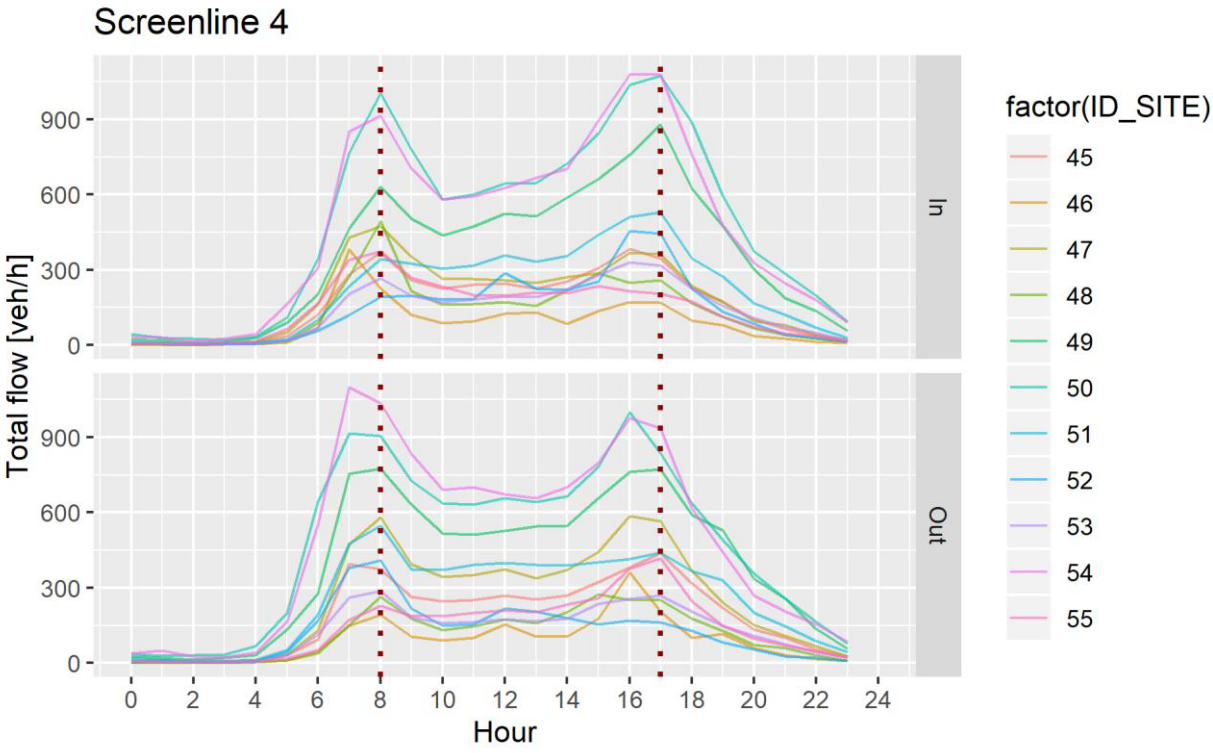
Appendix D. Traffic Count Data

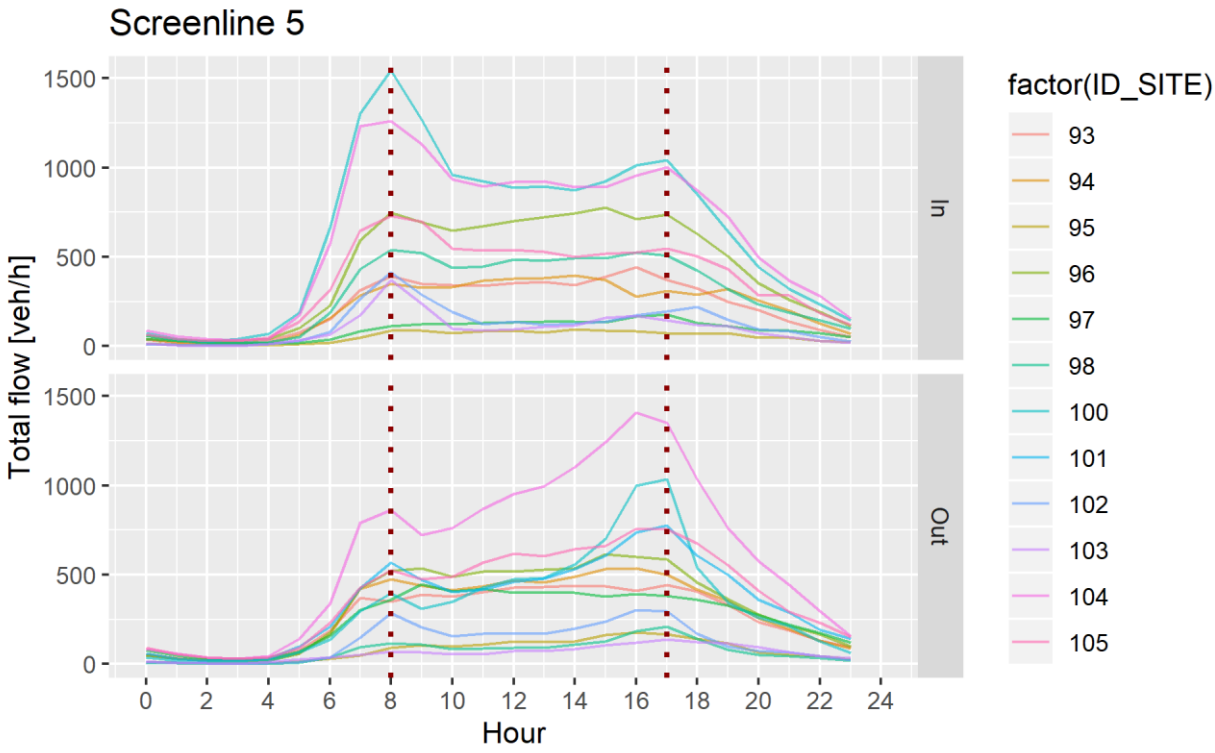
D.1 Hourly Traffic Profile by Screenline

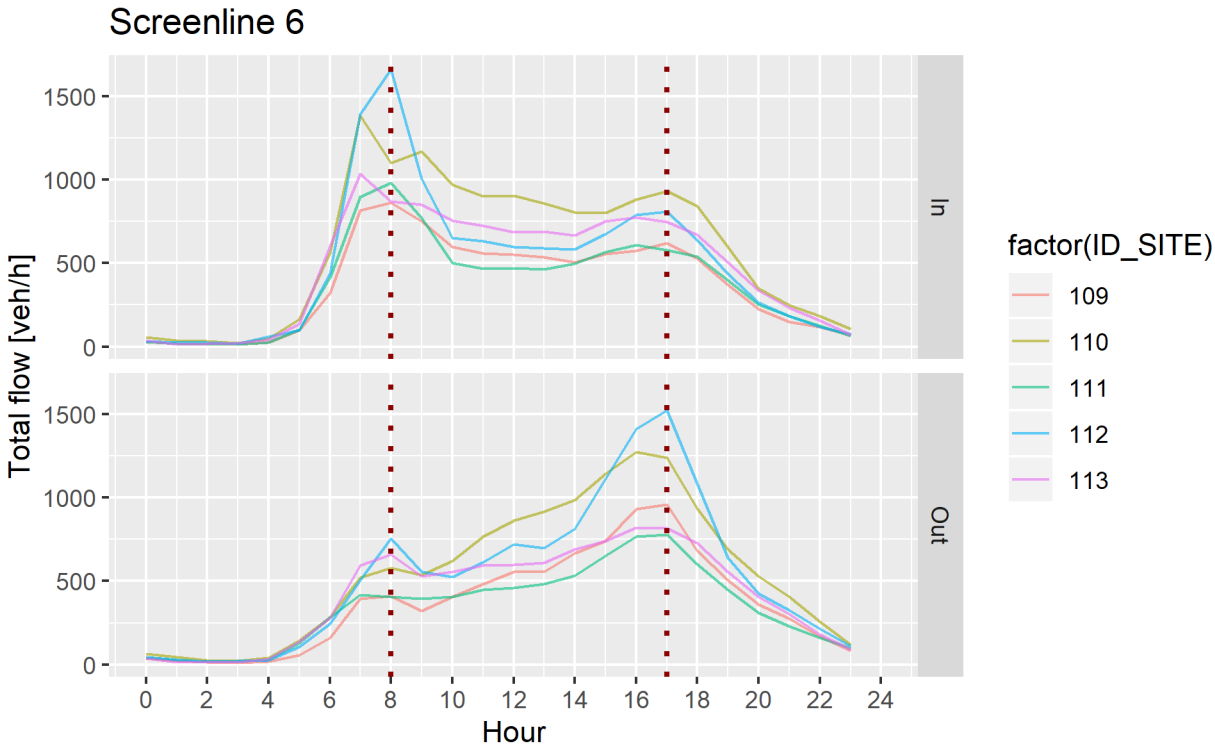


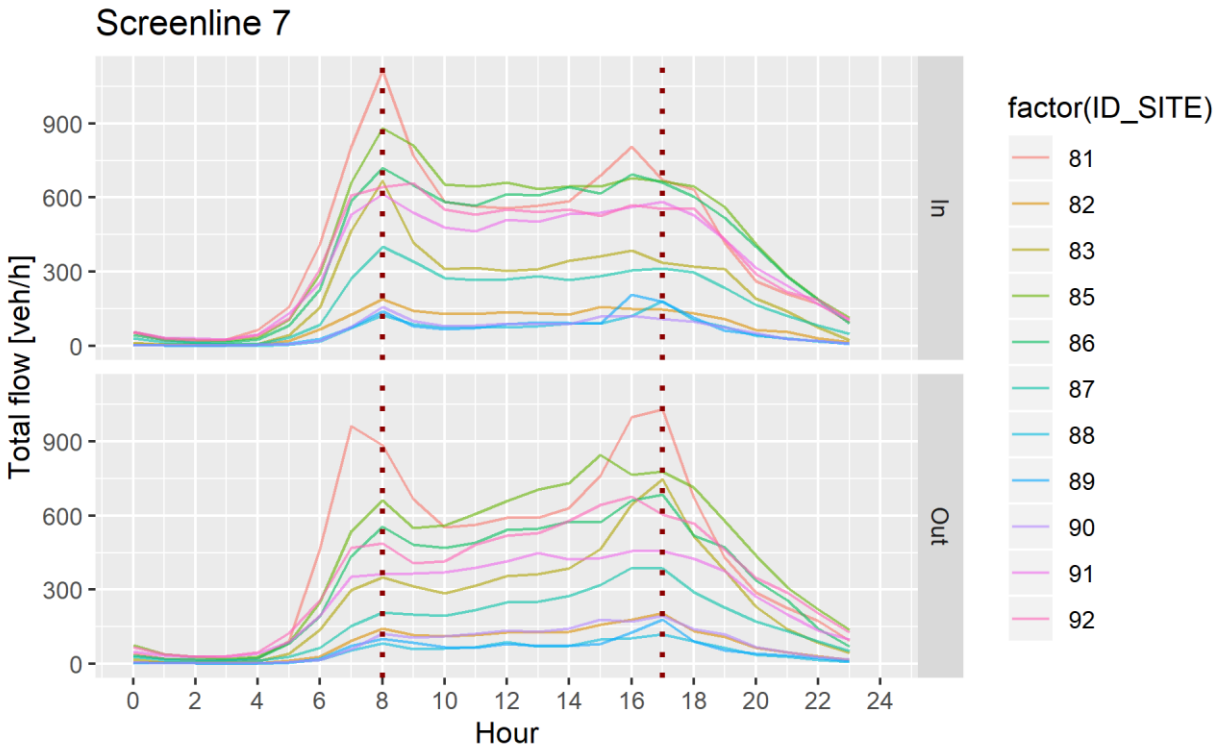


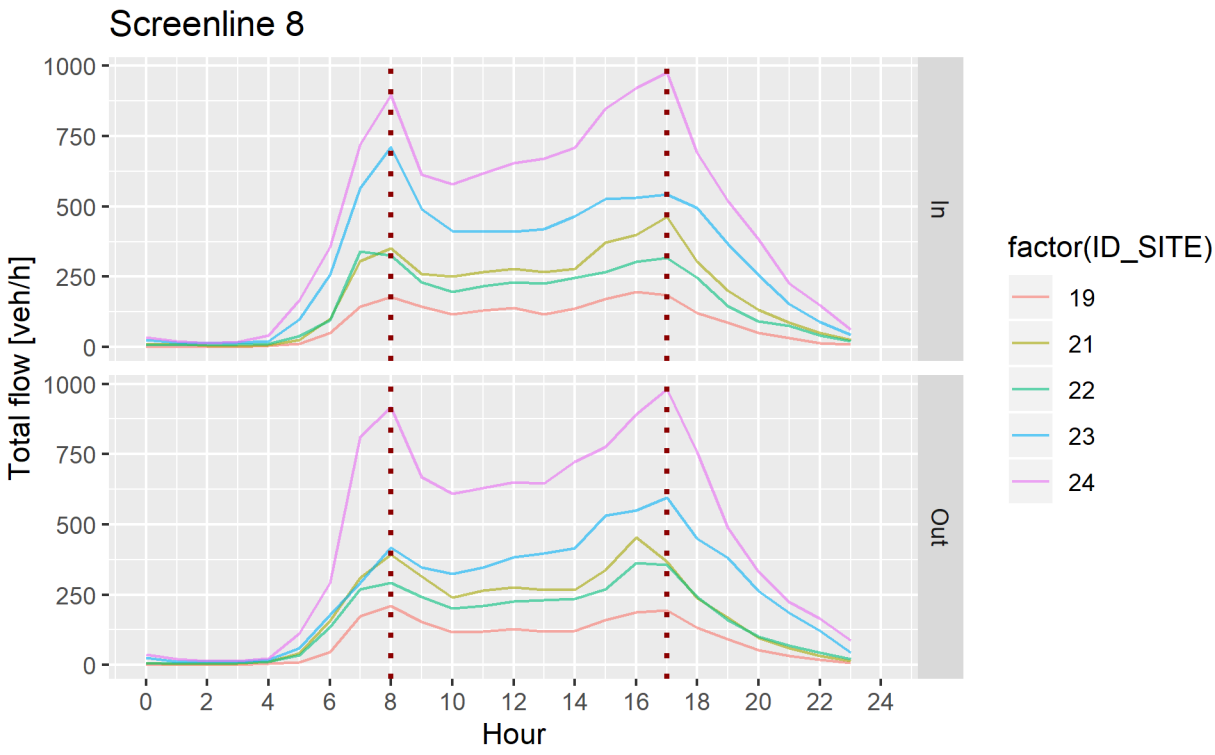

Screenline 3
Total flow [veh/h]
600
400
200
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
25
27
28


Screenline 4
Total flow [veh/h]
900
600
300
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
45
46
47
48
49
50
51
52
53
54
55

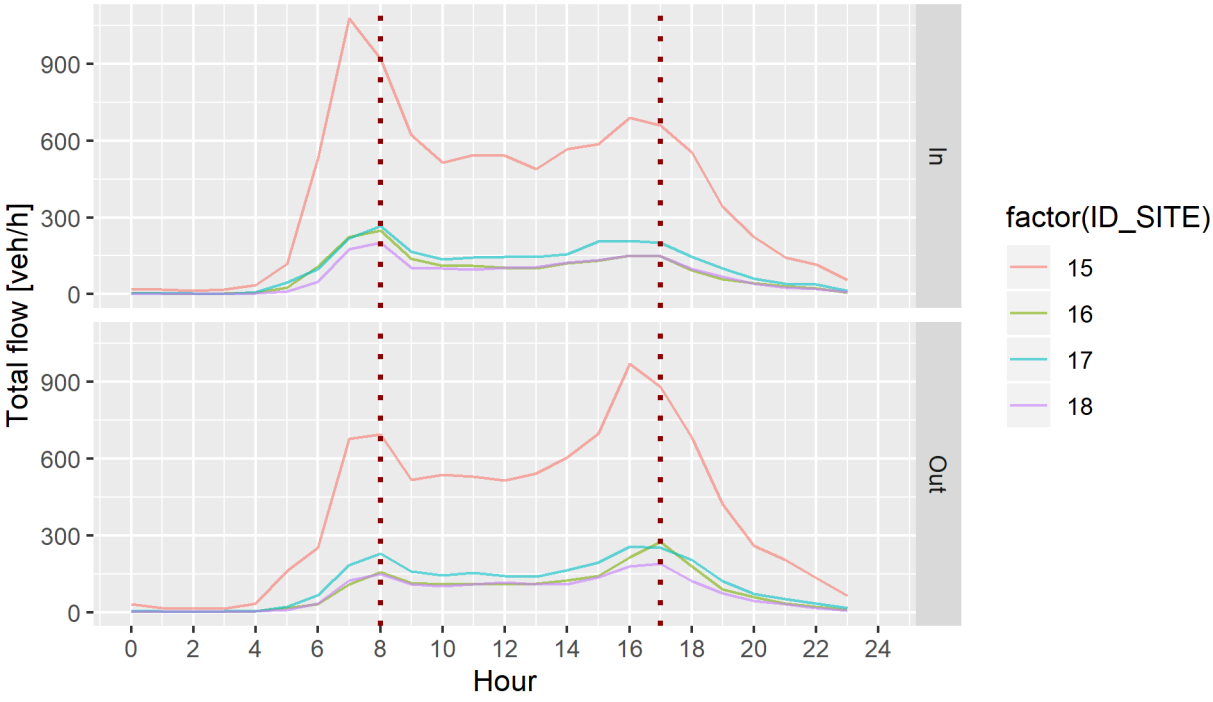

Screenline 5
Total flow [veh/h]
1500
1000
500
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
93
94
95
96
97
98
100
101
102
103
104
105


Screenline 6
Total flow [veh/h]
1500
1000
500
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
109
110
111
112
113

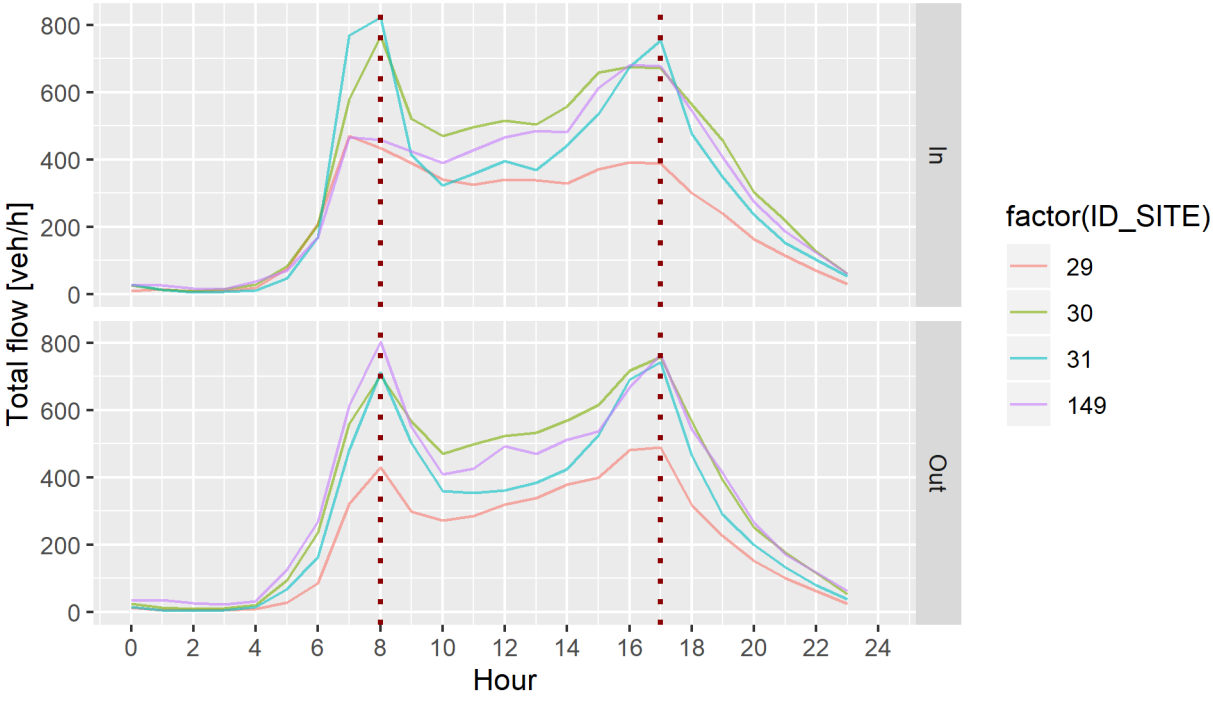

Screenline 7
Total flow [veh/h]
900
600
300
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
81
82
83
85
86
87
88
89
90
91
92


Screenline 8
Total flow [veh/h]
1000
750
500
250
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
19
21
22
23
24

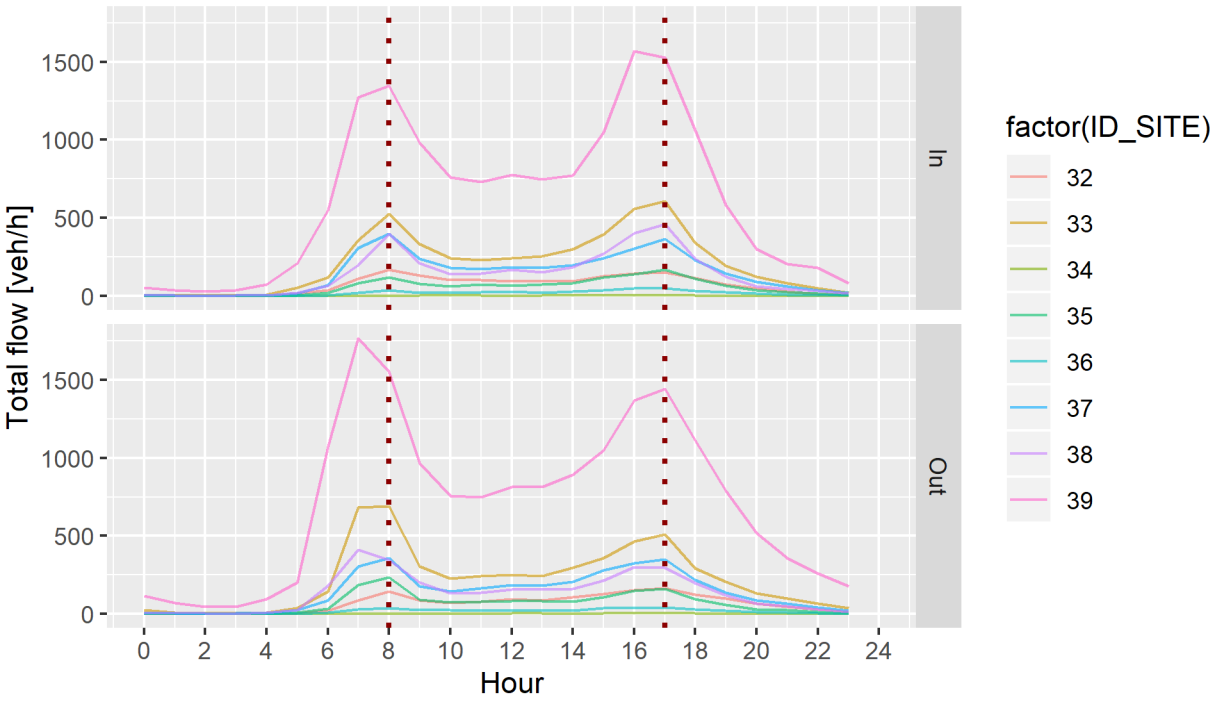
Screenline 9



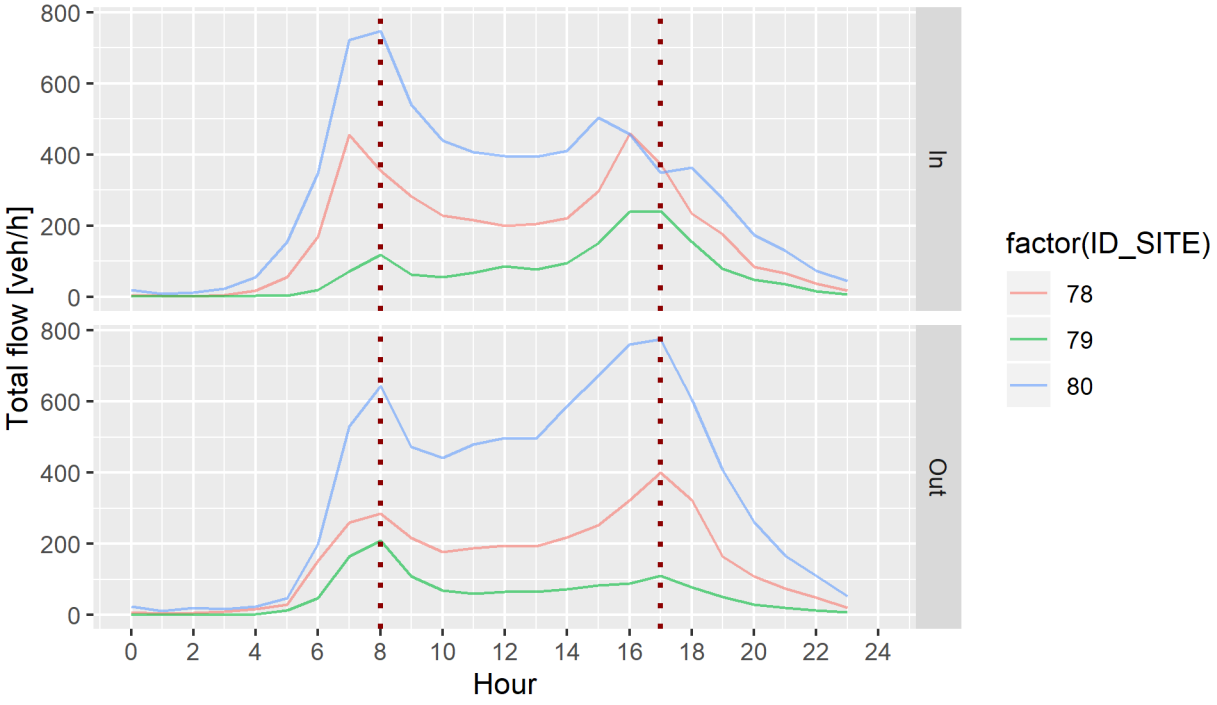
Screenline 10

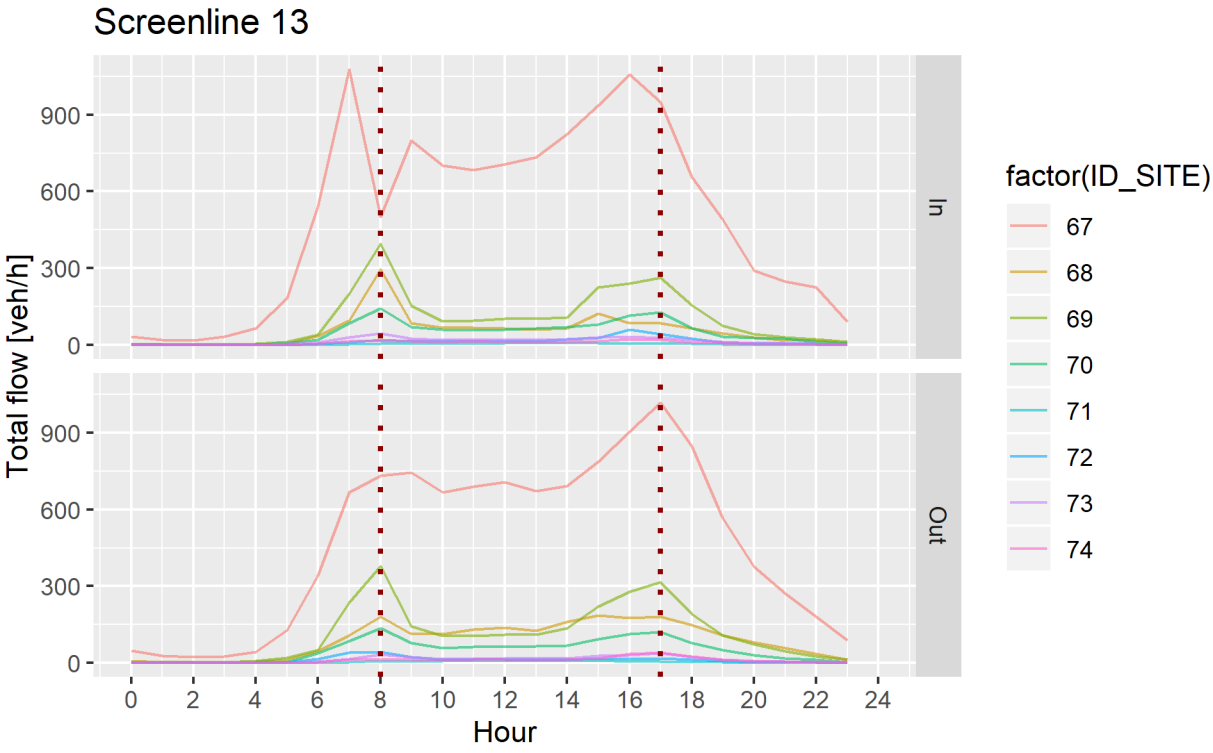


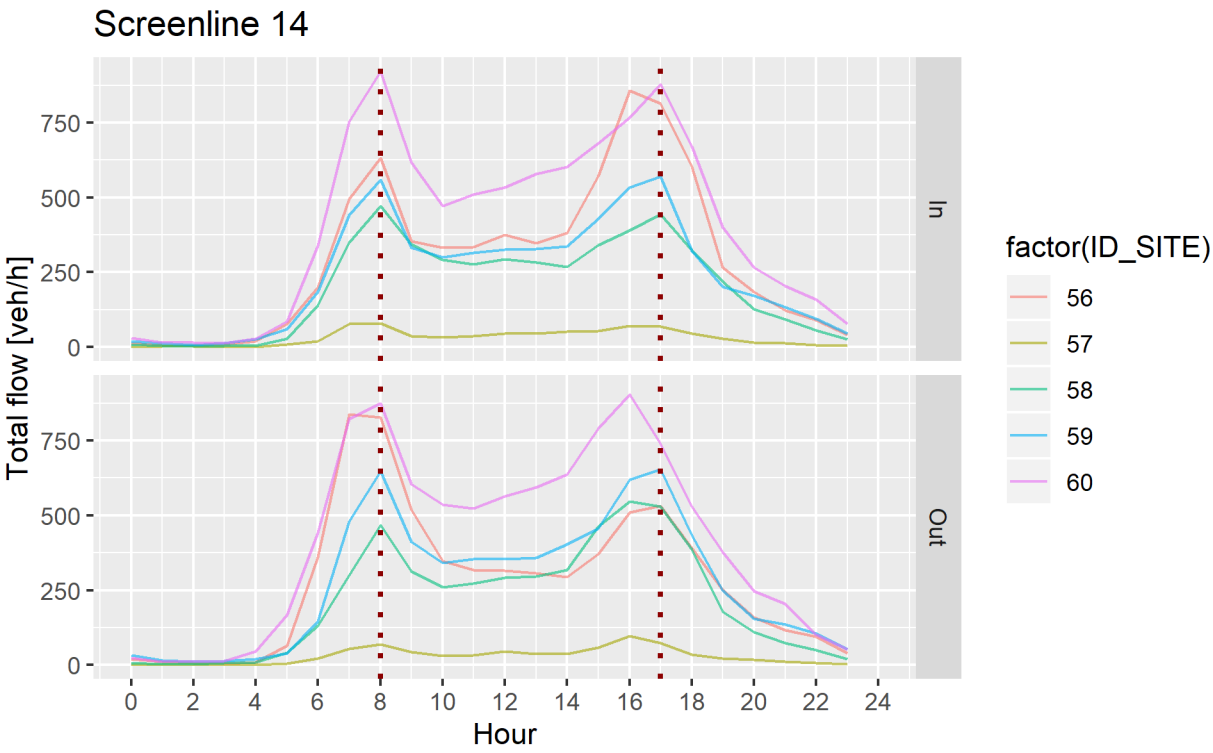
Screenline 11

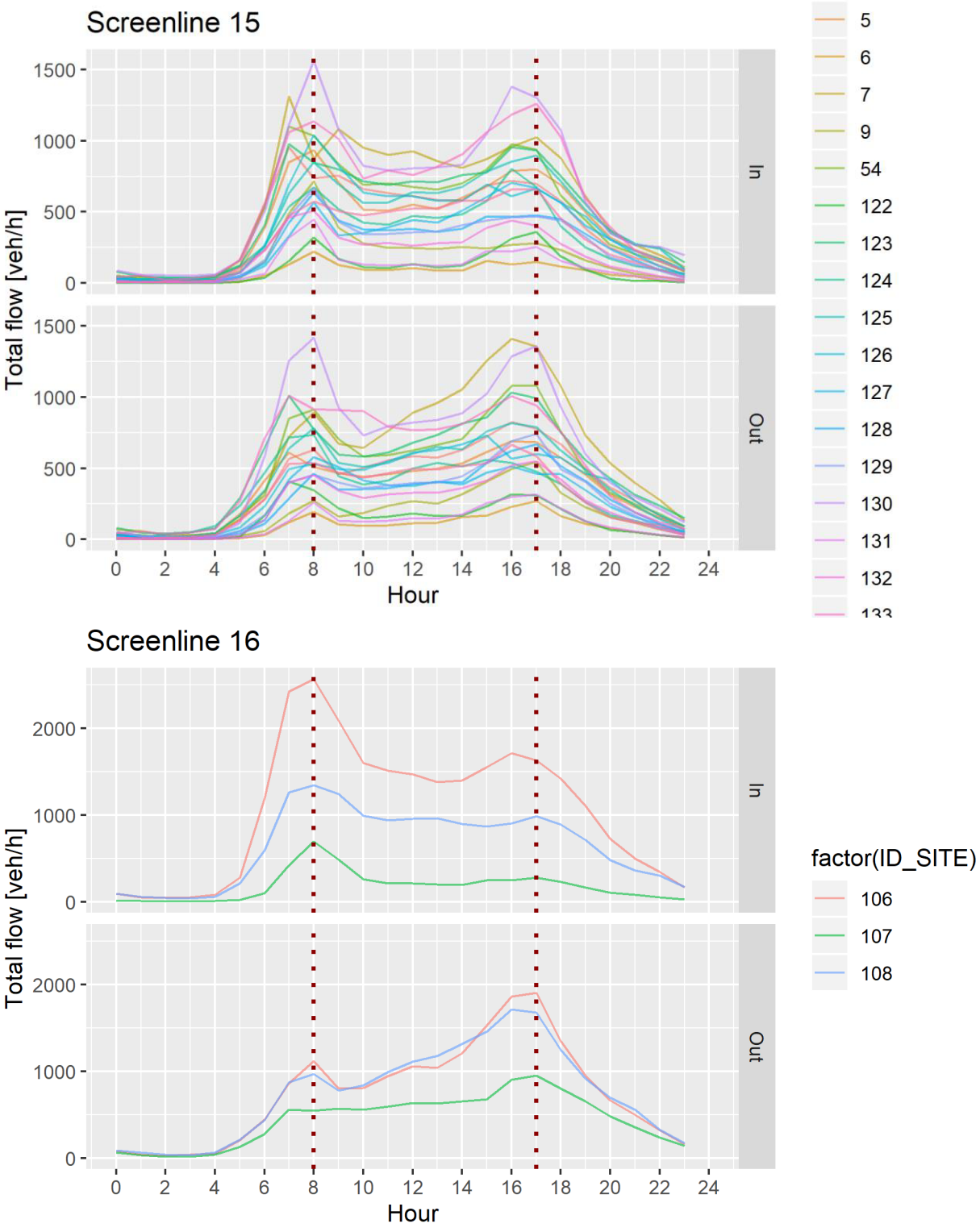


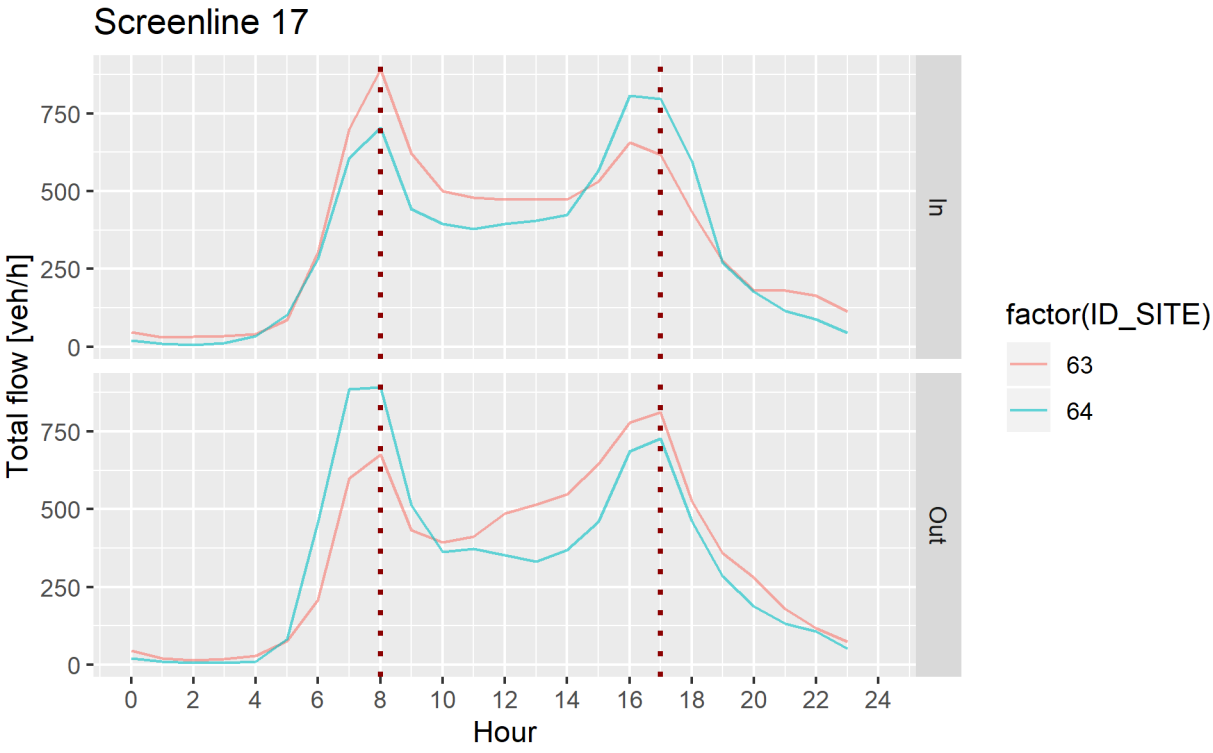
Screenline 12

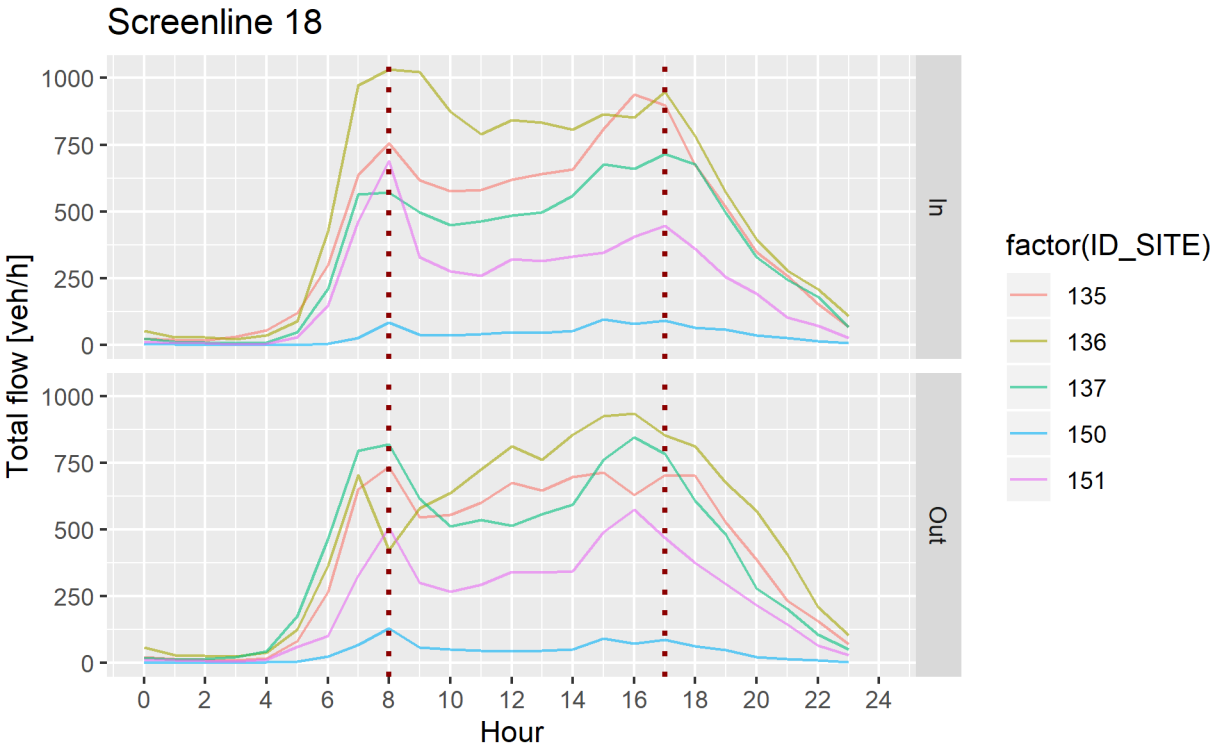


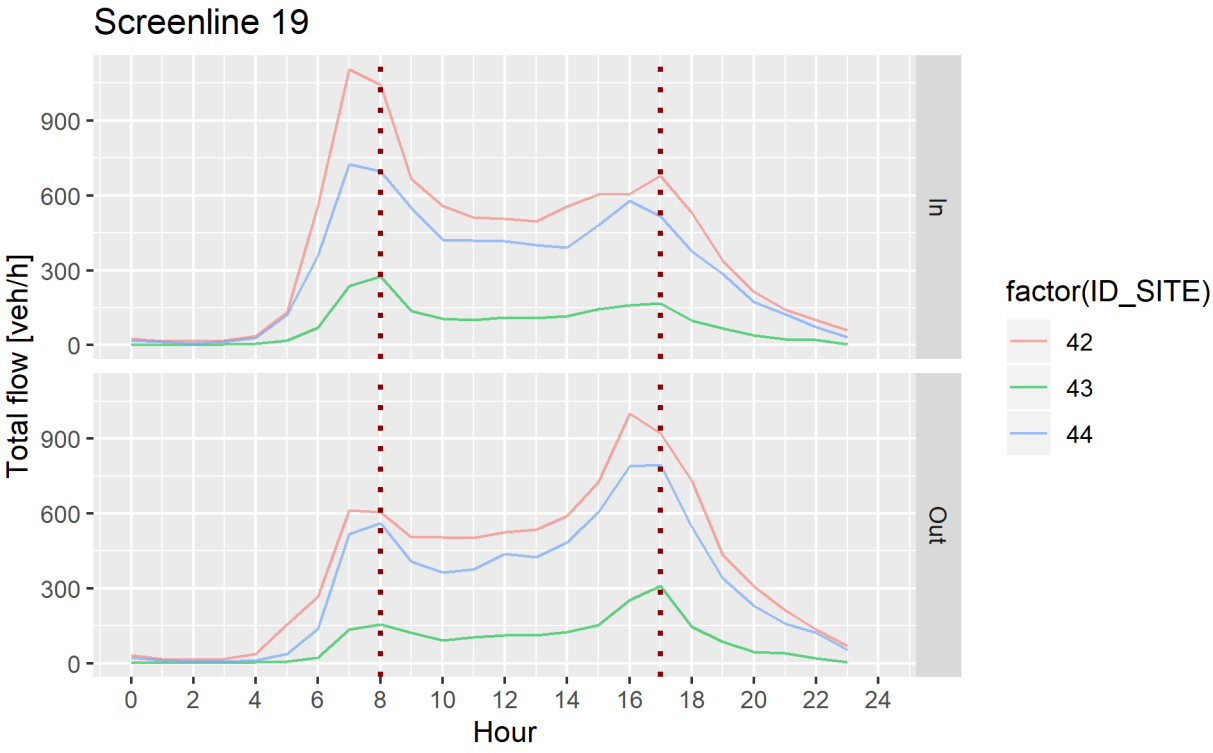

Screenline 13
Total flow [veh/h]
900
600
300
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
67
68
69
70
71
72
73
74

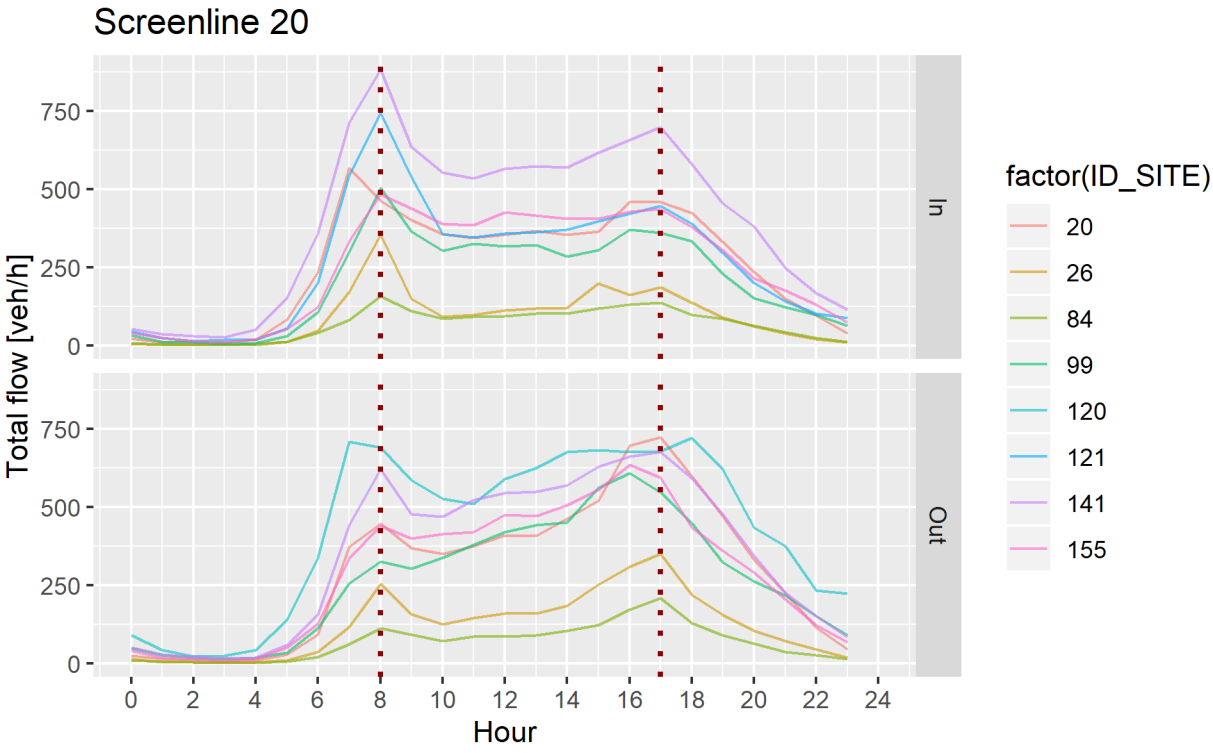

Screenline 14
Total flow [veh/h]
750
500
250
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
56
57
58
59
60

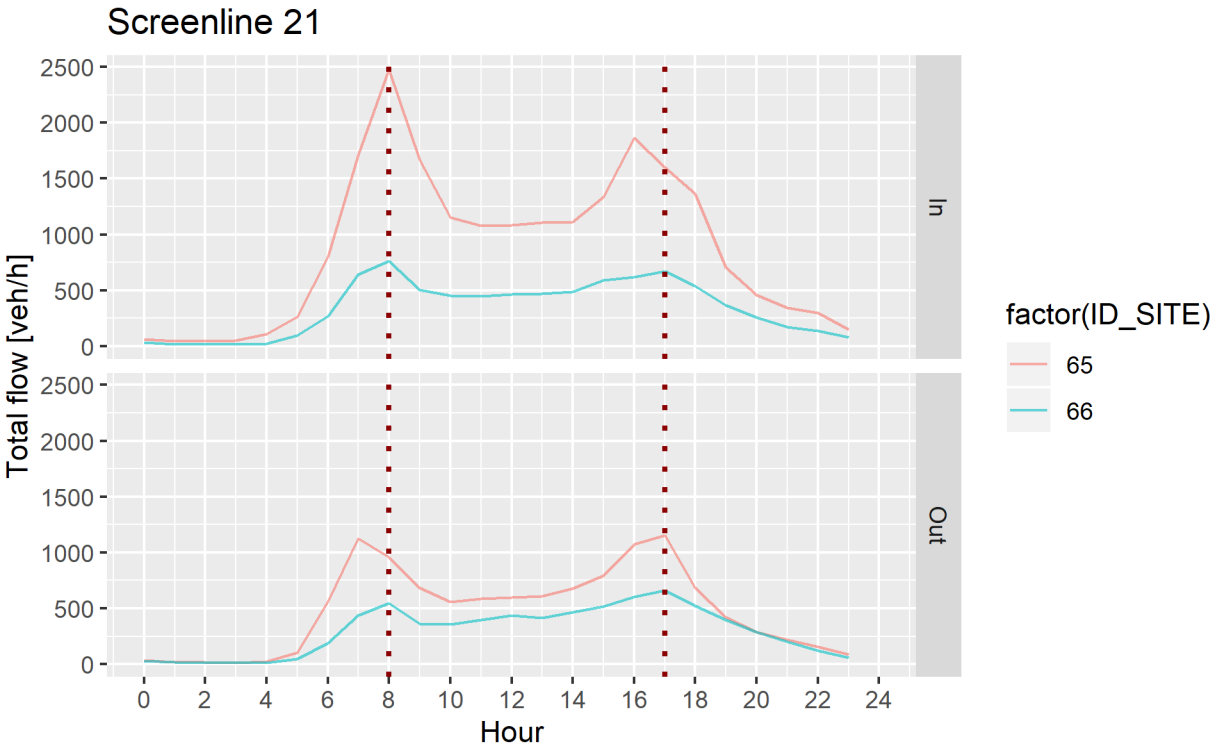

Screenline 15
Total flow [veh/h]
1500
1000
500
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
5
6
7
9
54
122
123
124
125
126
127
128
129
130
131
132
133
Screenline 16
Total flow [veh/h]
2000
1000
0
In
Out
Hour
factor(ID_SITE)
106
107
108

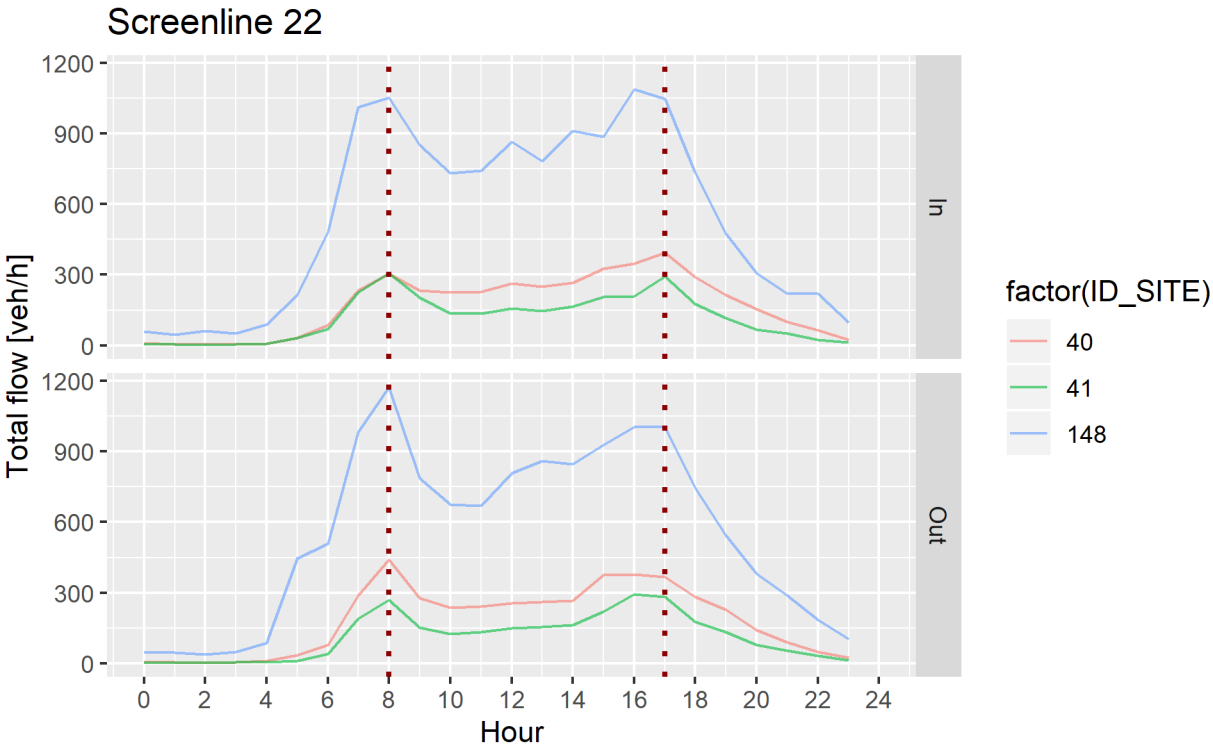

Screenline 17
Total flow [veh/h]
750
500
250
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
63
64


Screenline 18
Total flow [veh/h]
1000
750
500
250
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
135
136
137
150
151

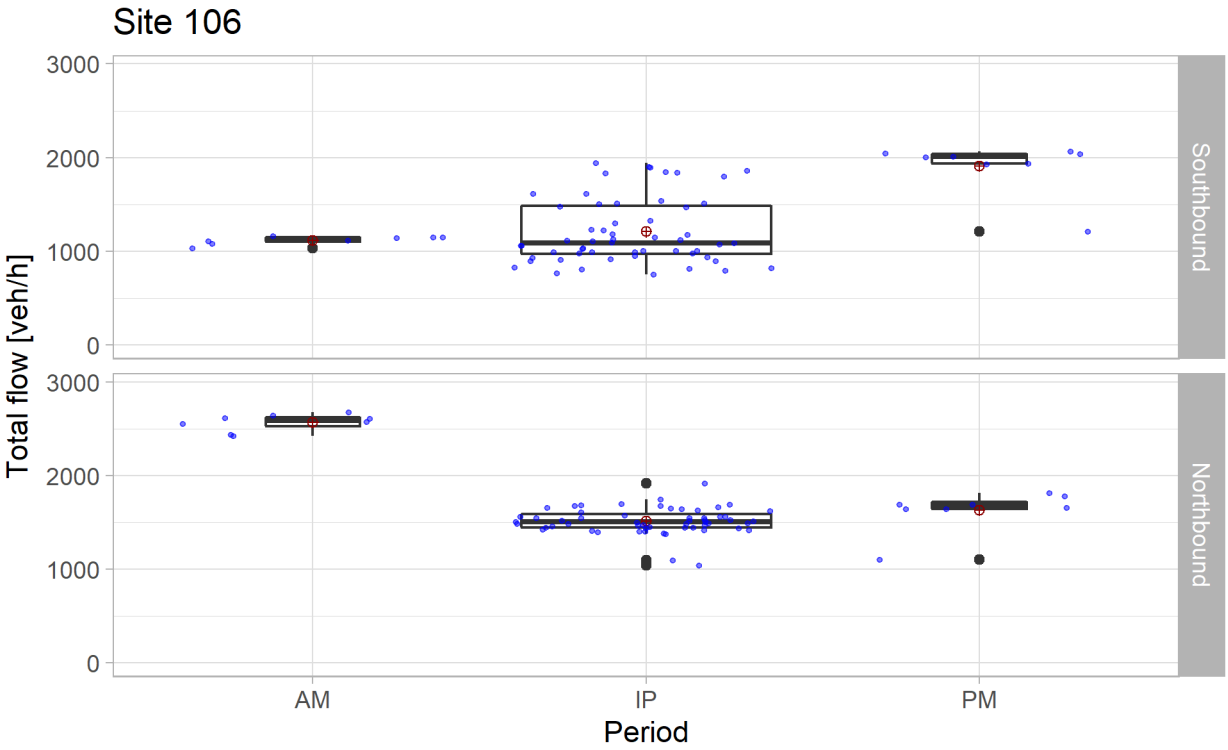

Screenline 19
Total flow [veh/h]
900
600
300
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
42
43
44

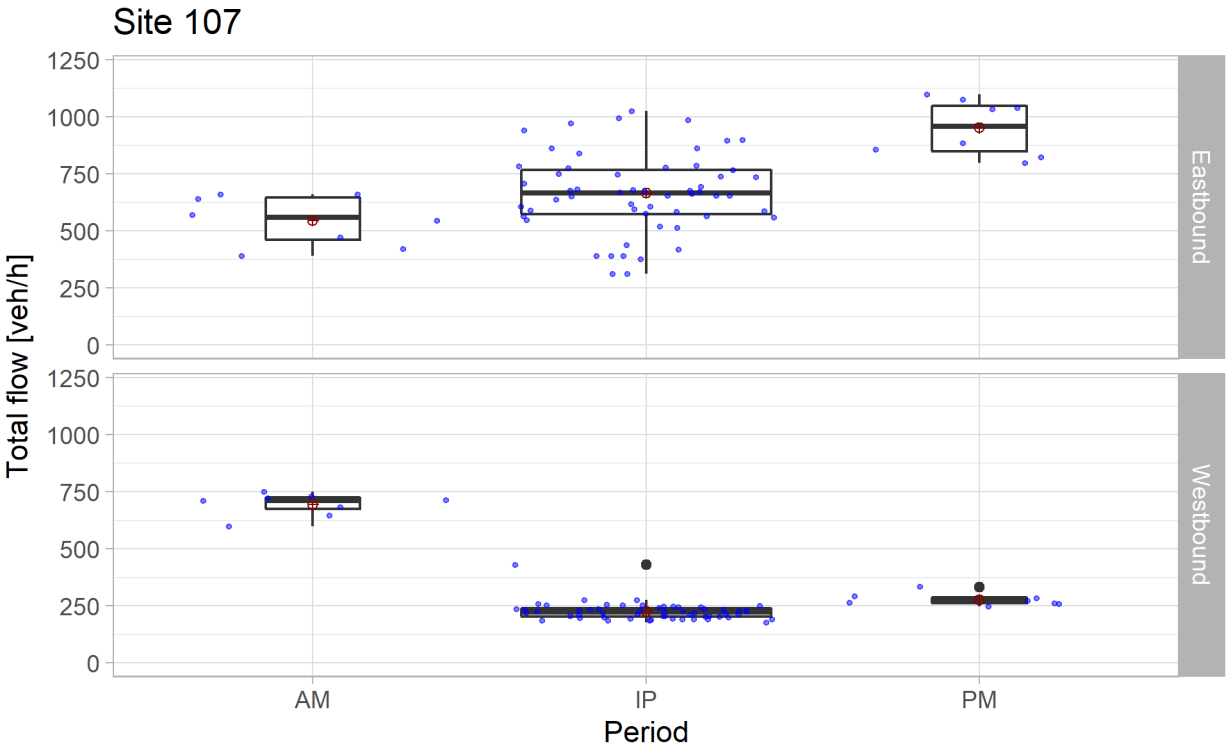

Screenline 20
Total flow [veh/h]
750
500
250
0
In
Out
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
factor(ID_SITE)
20
26
84
99
120
121
141
155

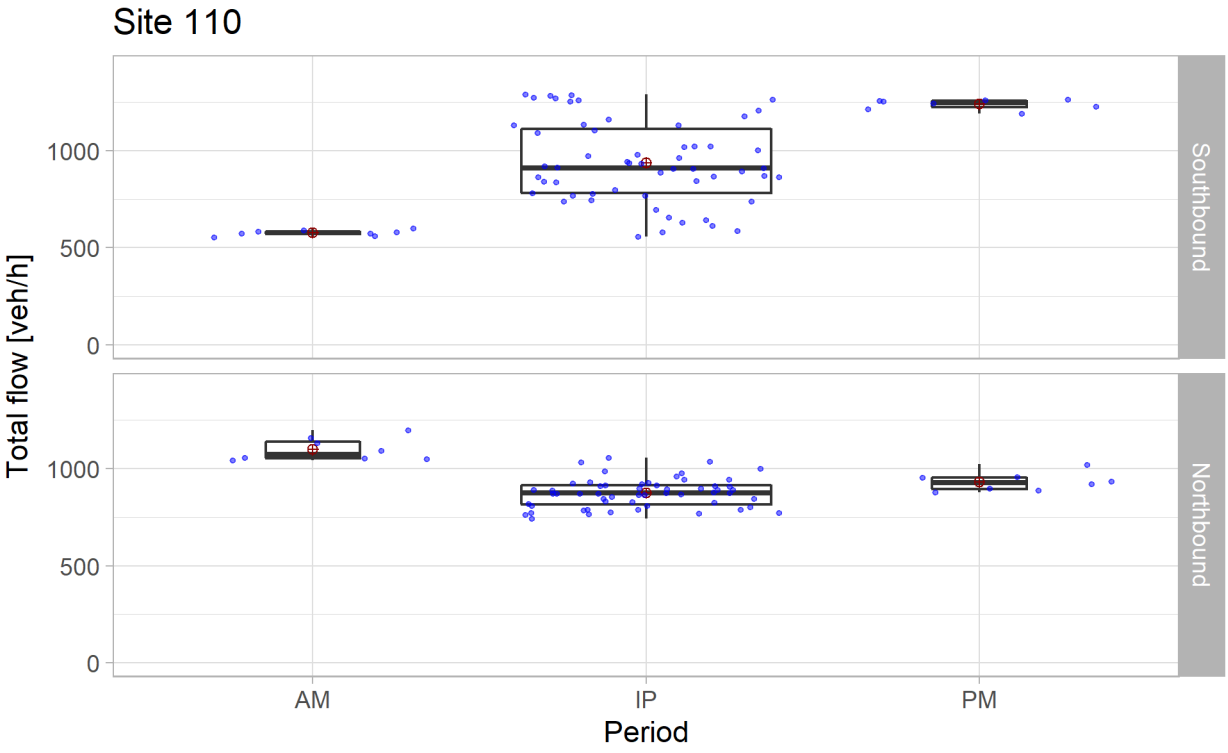


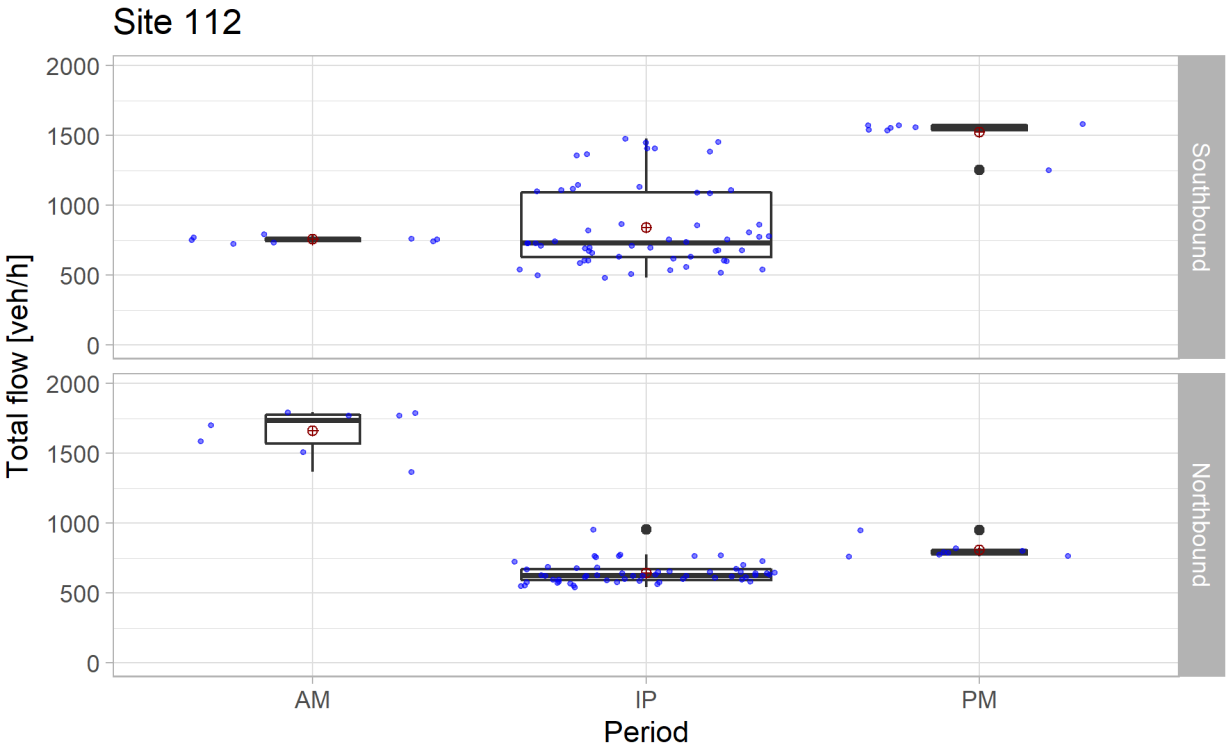


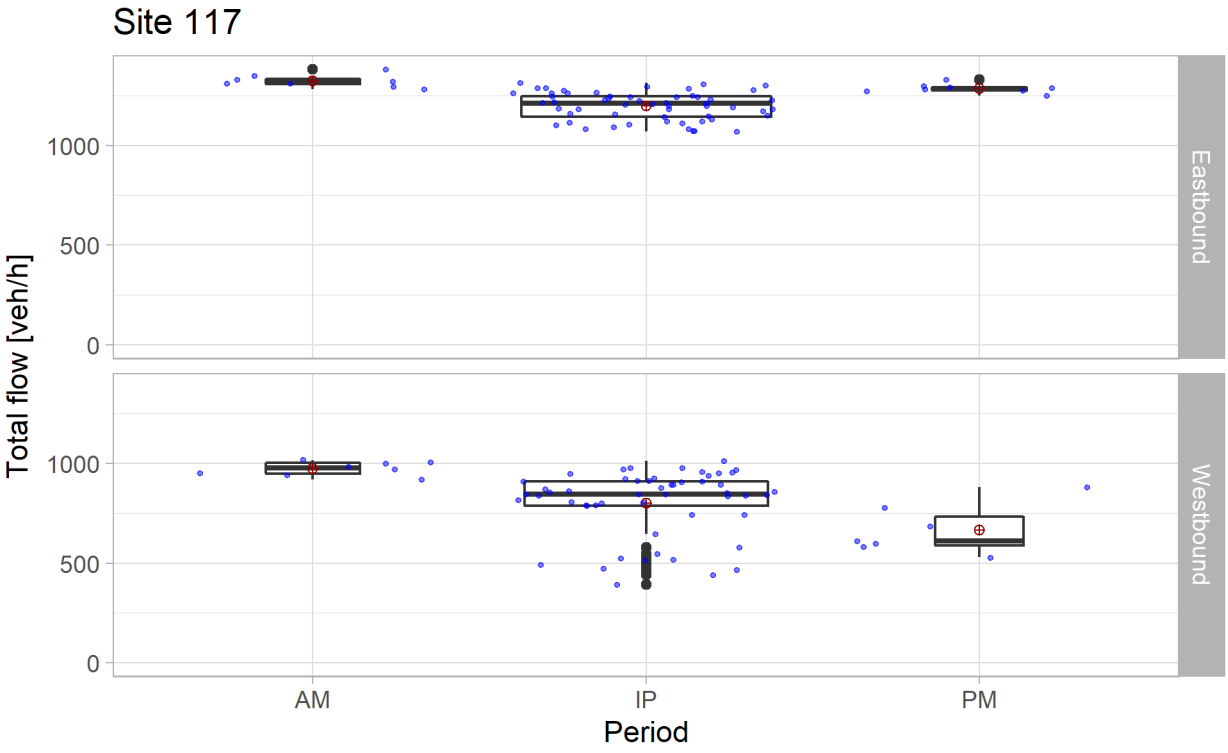
D.2 Variation checks for all the sites

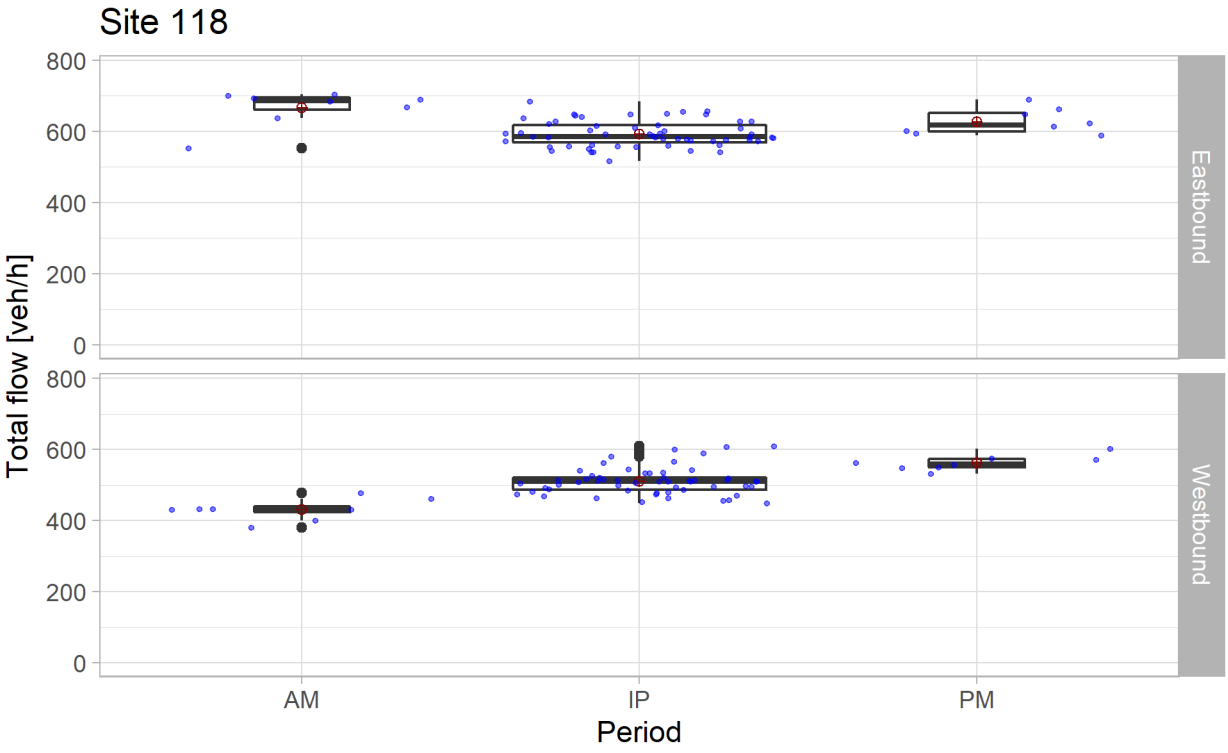

Site 106
Total flow [veh/h]
3000
2000
1000
0
Southbound
Northbound
AM
IP
PM
Period

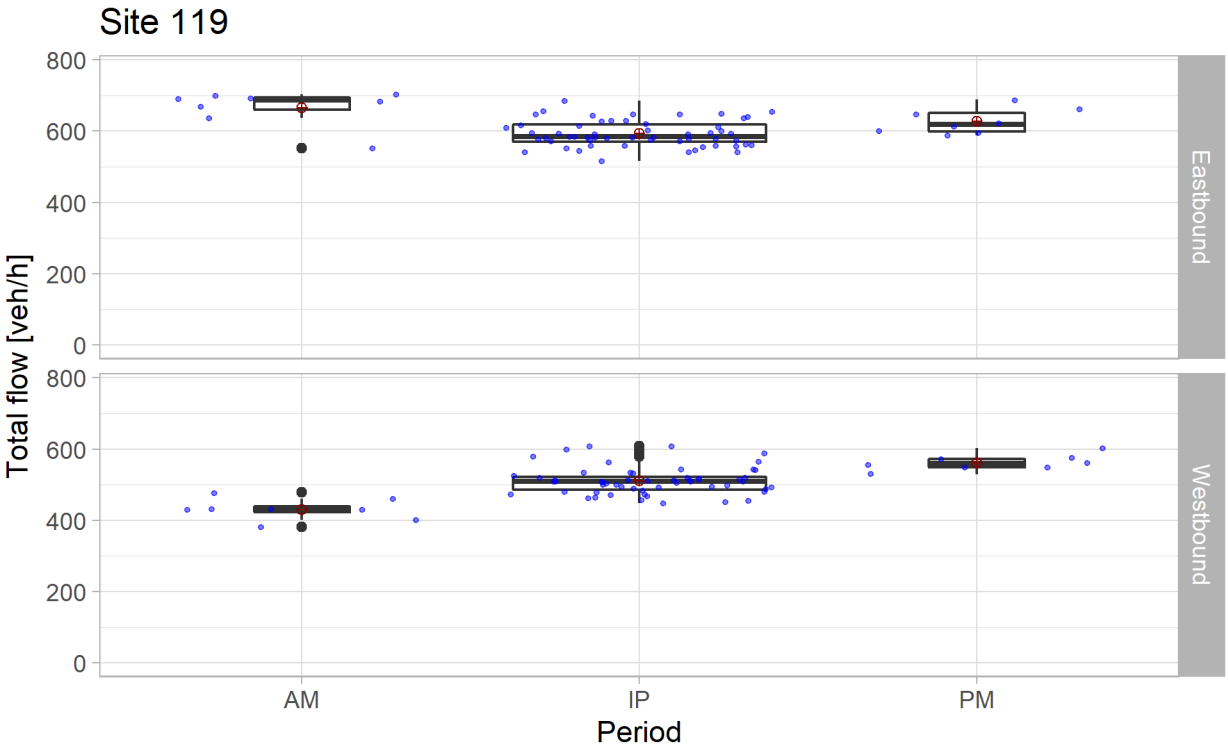

Site 107
Total flow [veh/h]
1250
1000
750
500
250
0
Eastbound
Westbound
AM
IP
PM
Period

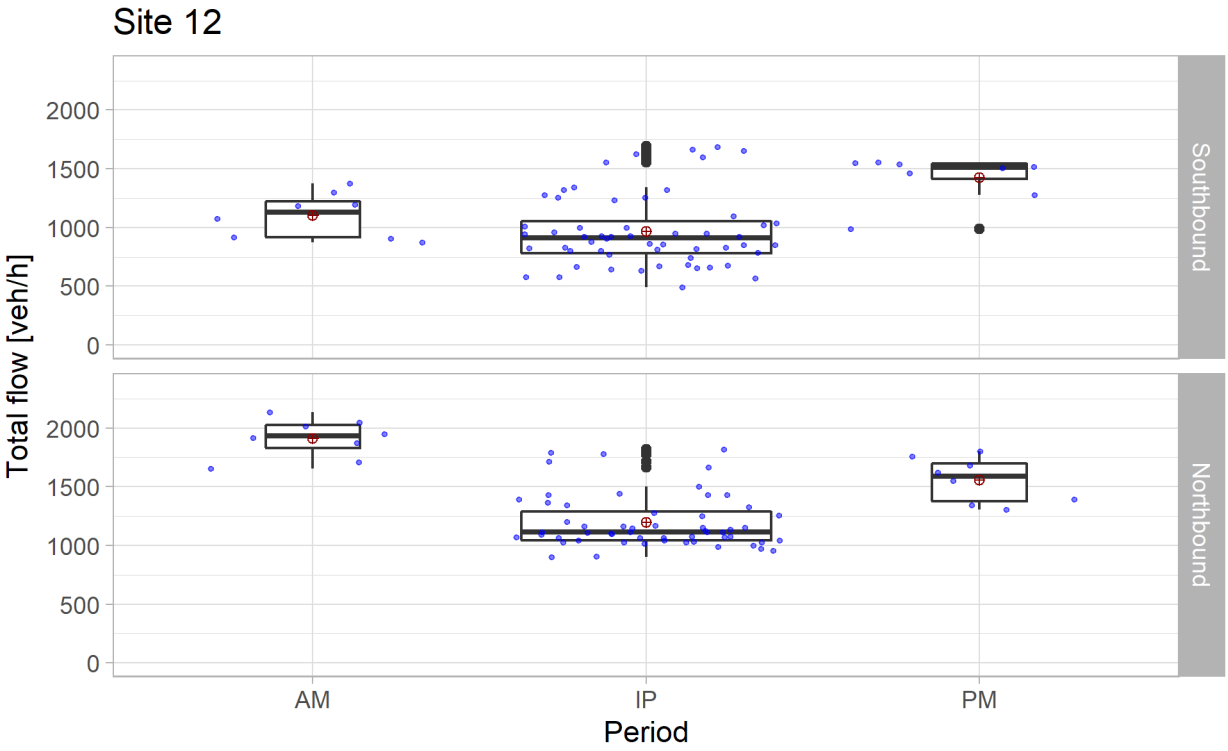

Site 110
Total flow [veh/h]
0
500
1000
Southbound
Northbound
AM
IP
PM
Period

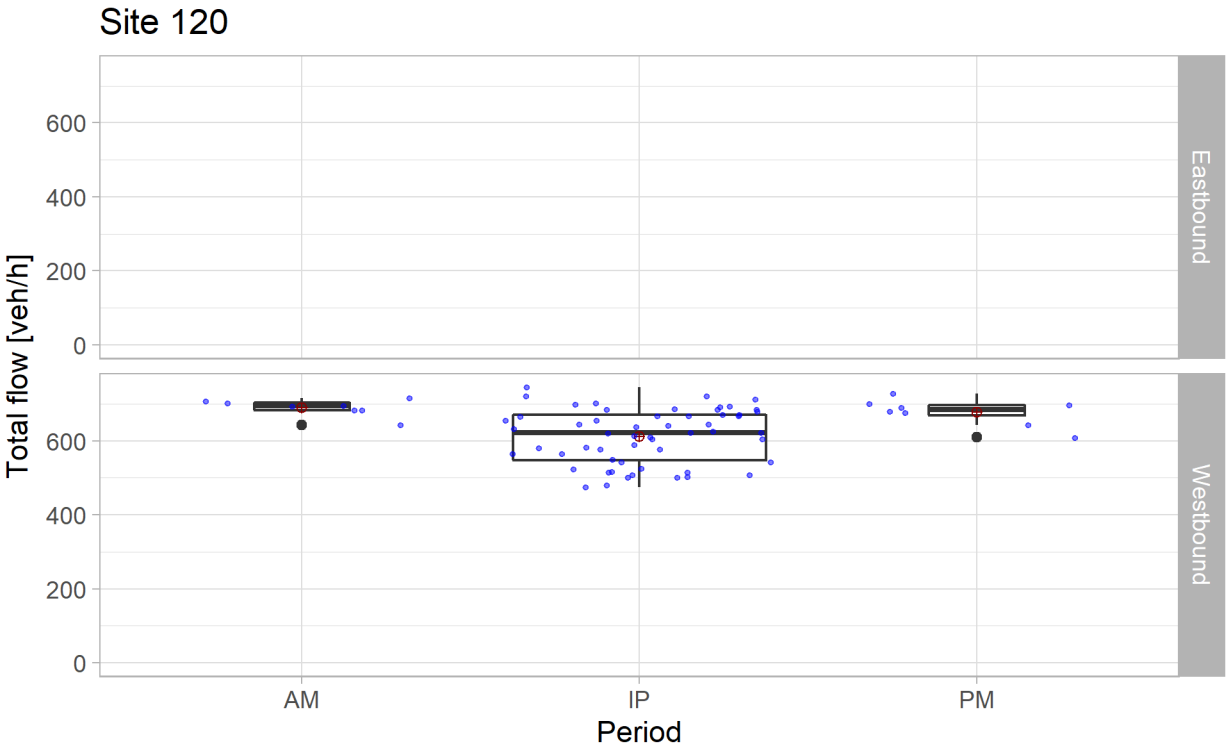

Site 112
Total flow [veh/h]
0
500
1000
1500
2000
Southbound
Northbound
AM
IP
PM
Period

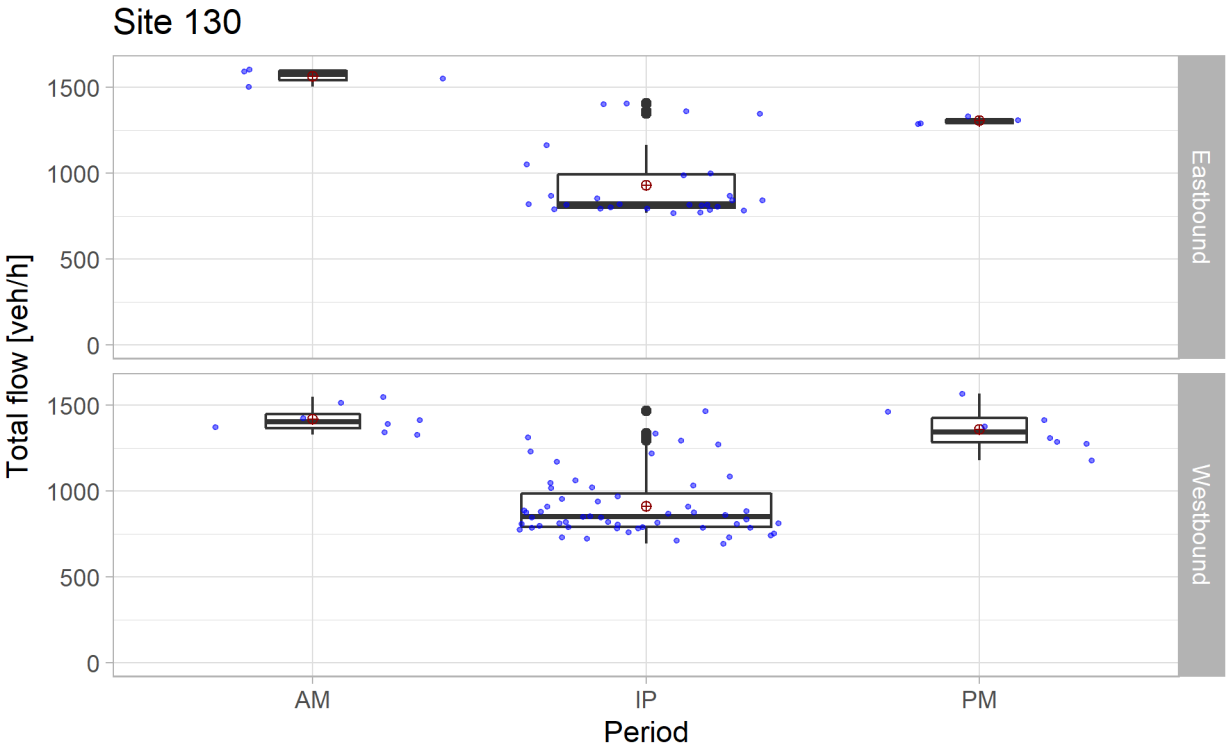

Site 117
Total flow [veh/h]
1000
500
0
Eastbound
Westbound
AM
IP
PM
Period


Site 118
Total flow [veh/h]
800
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period

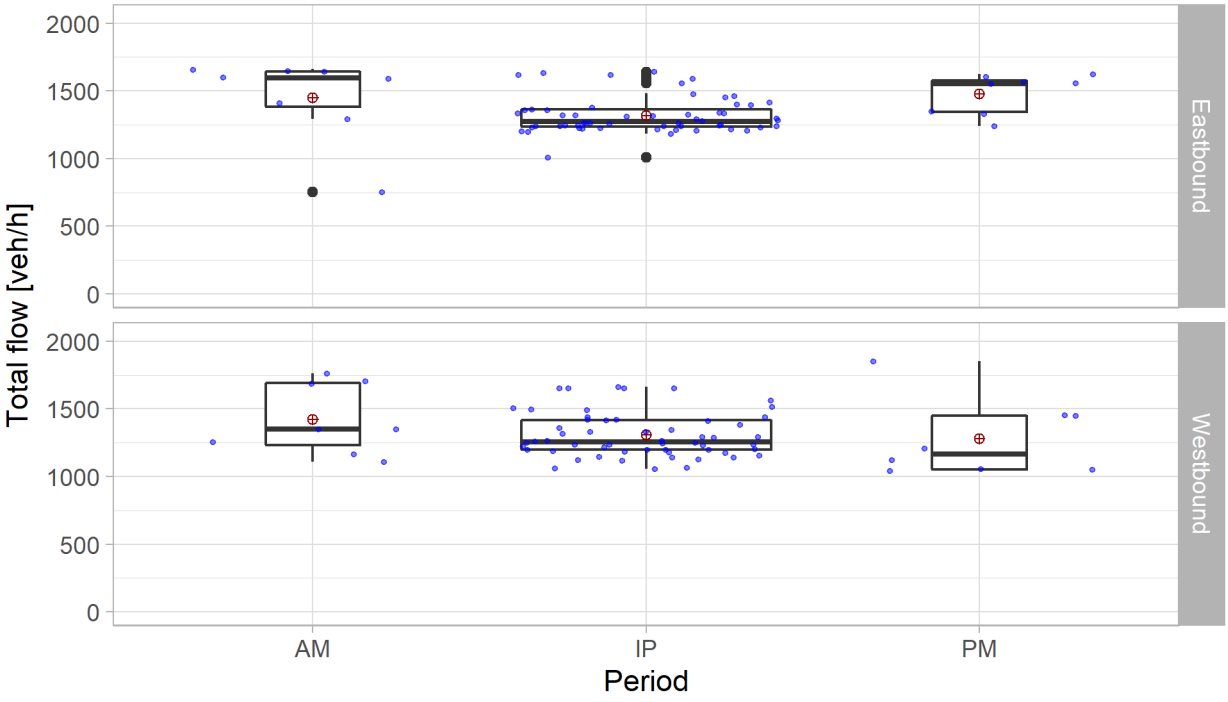

Site 119
Total flow [veh/h]
800
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period


Site 12
Total flow [veh/h]
2000
1500
1000
500
0
Southbound
Northbound
AM
IP
PM
Period

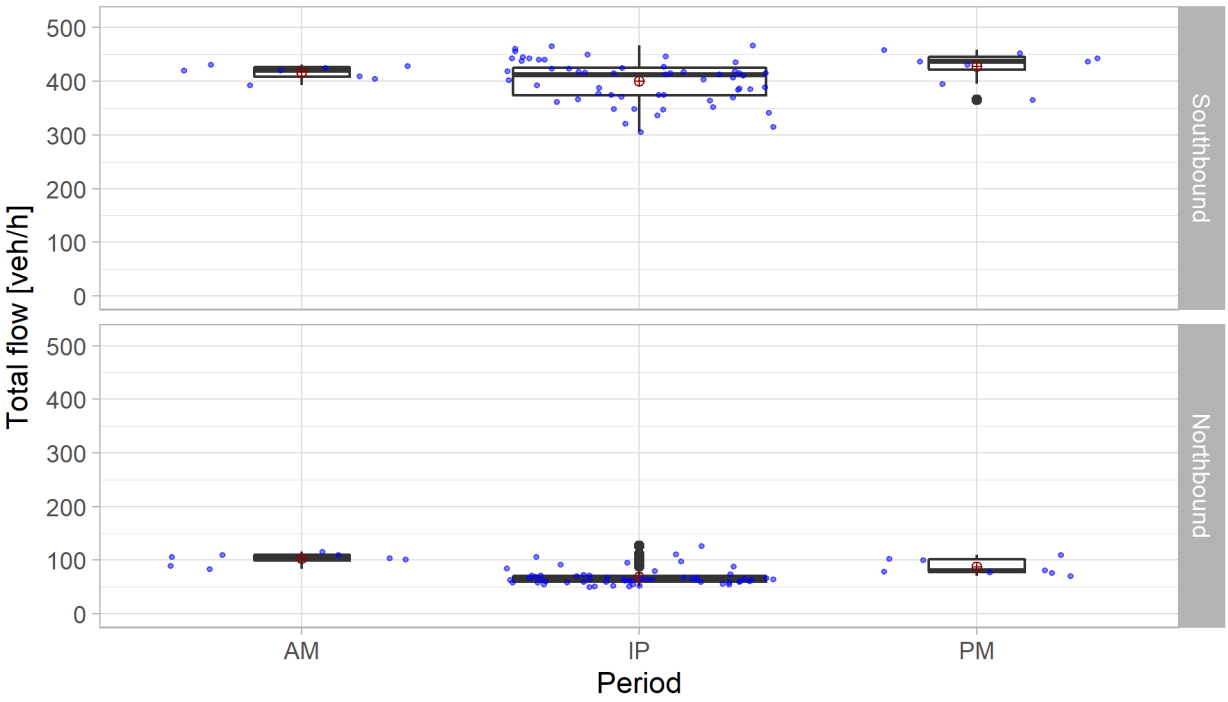

Site 120
Total flow [veh/h]
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period

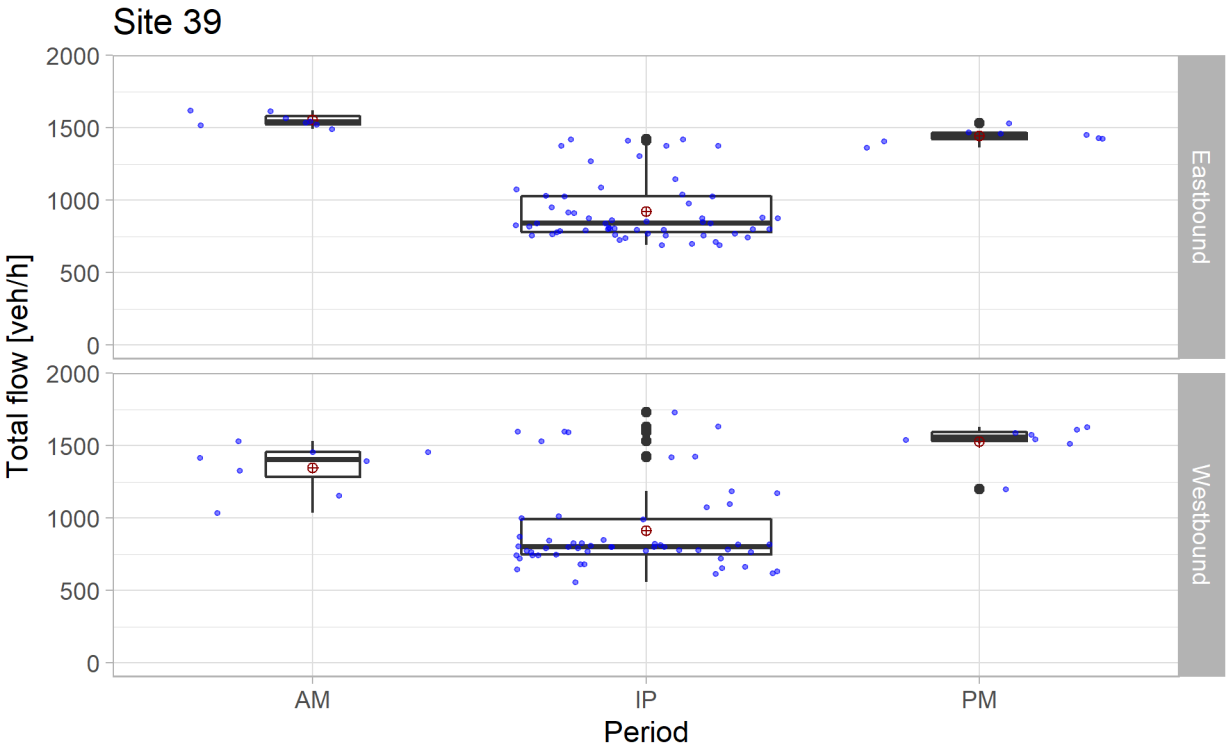

Site 130
Total flow [veh/h]
1500
1000
500
0
Eastbound
Westbound
AM
IP
PM
Period

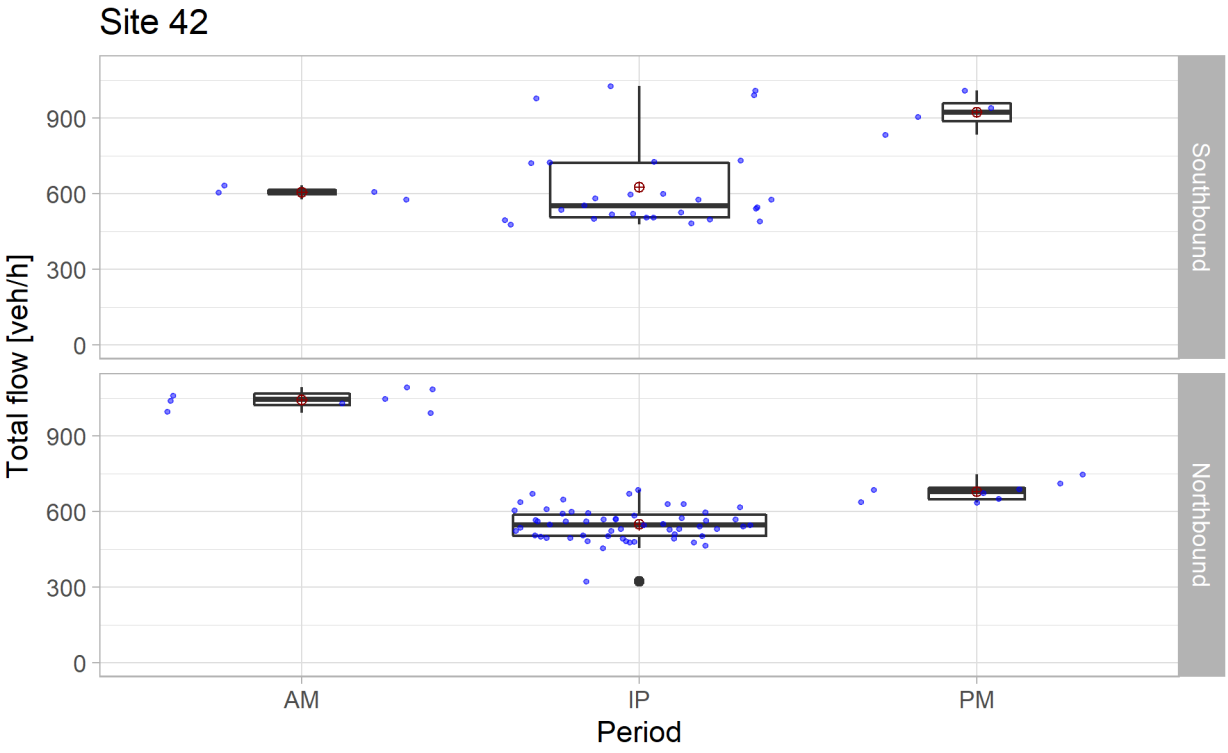
Site 147

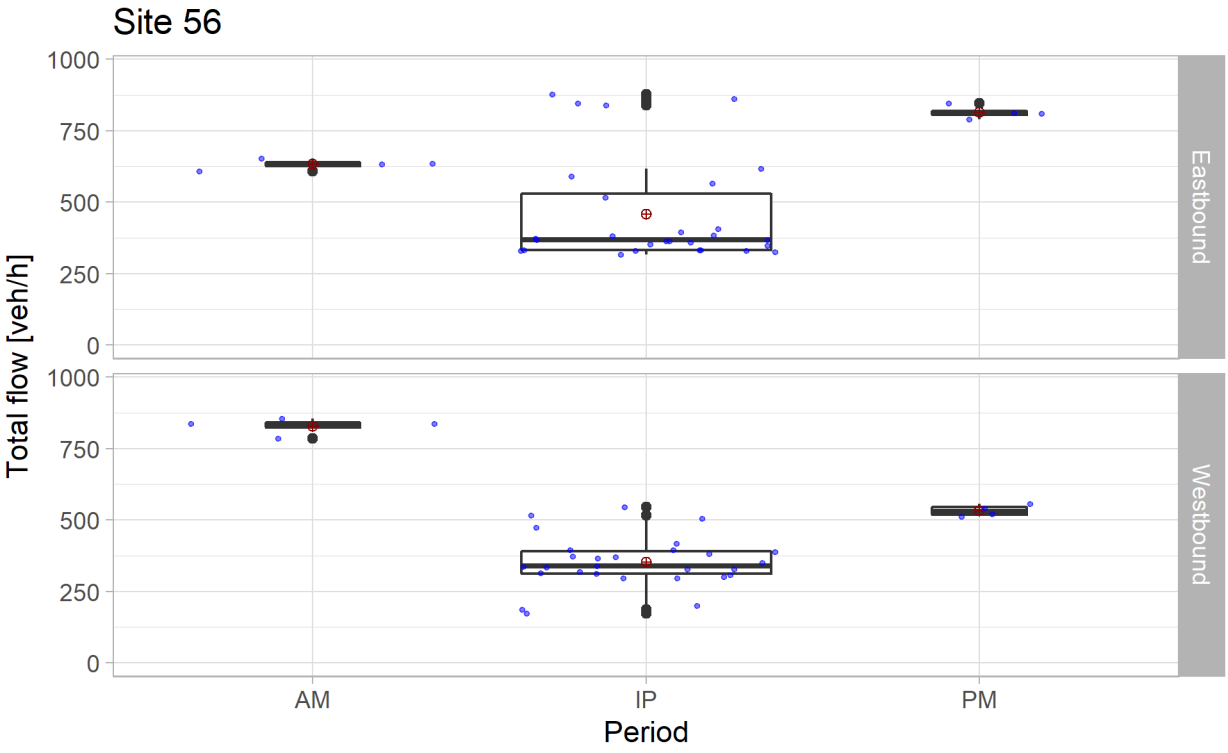


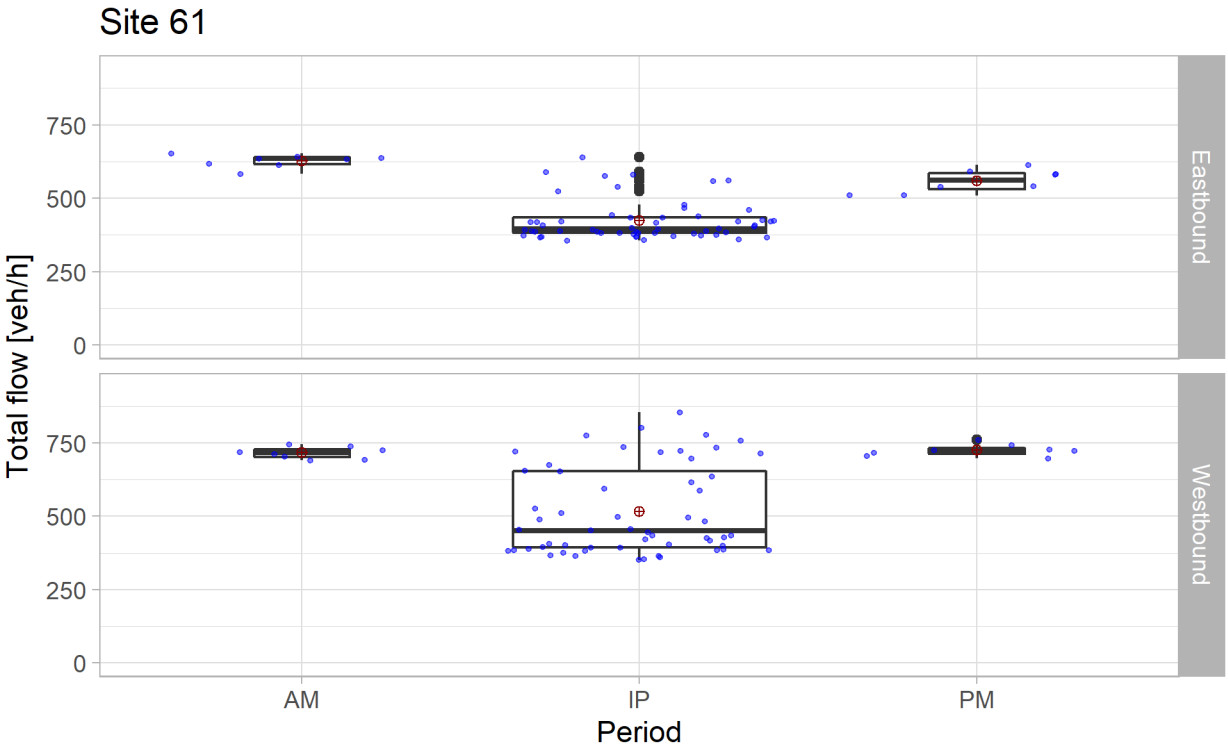
Site 166



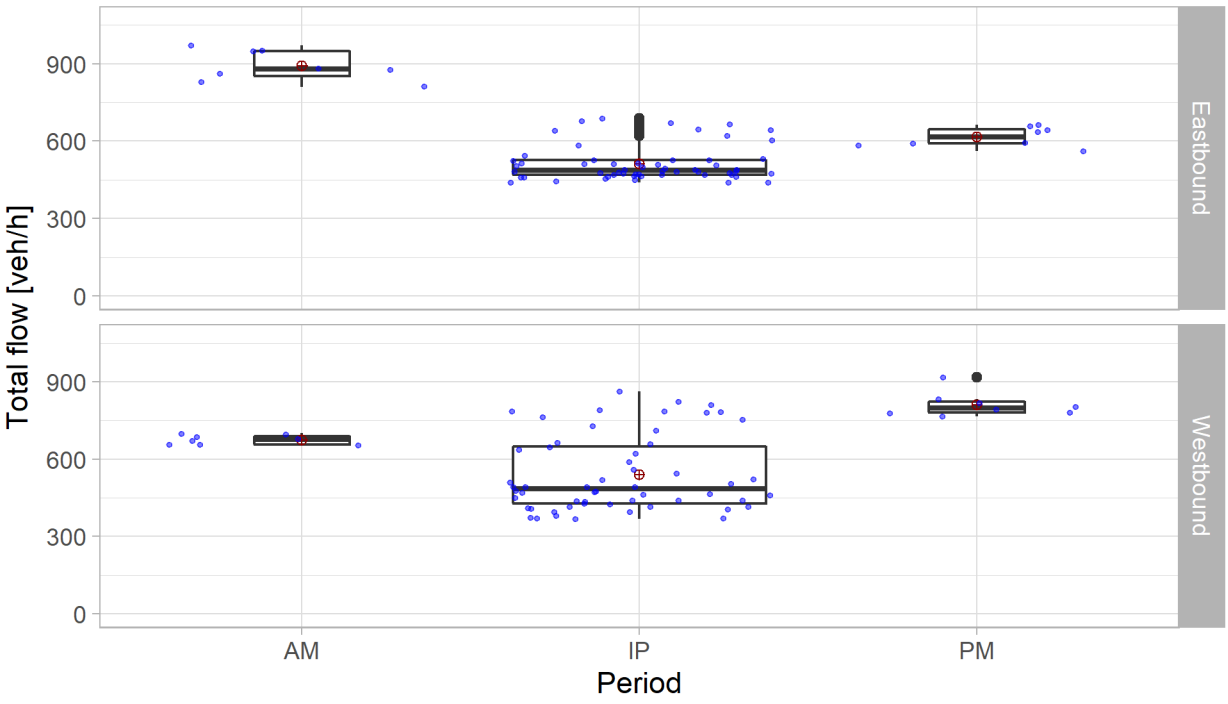

Site 39
Total flow [veh/h]
2000
1500
1000
500
0
Eastbound
Westbound
AM
IP
PM
Period


Site 42
Total flow [veh/h]
900
600
300
0
Southbound
Northbound
AM
IP
PM
Period

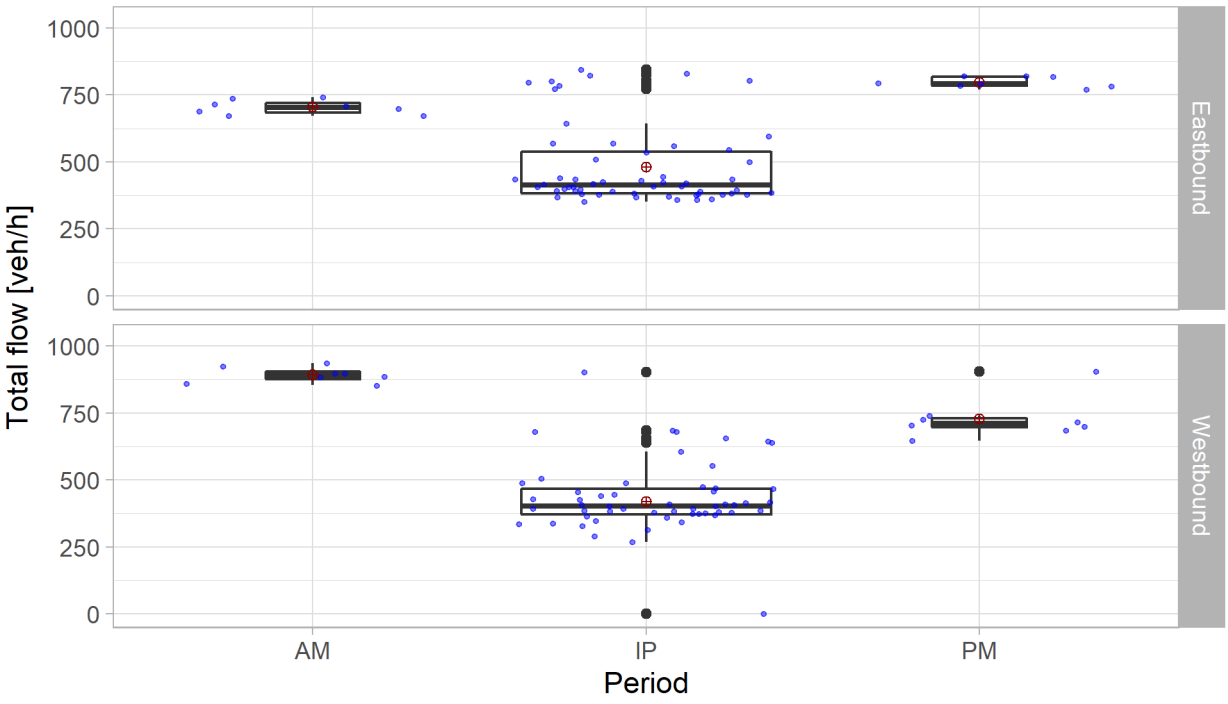

Site 56
Total flow [veh/h]
1000
750
500
250
0
Eastbound
Westbound
AM
IP
PM
Period

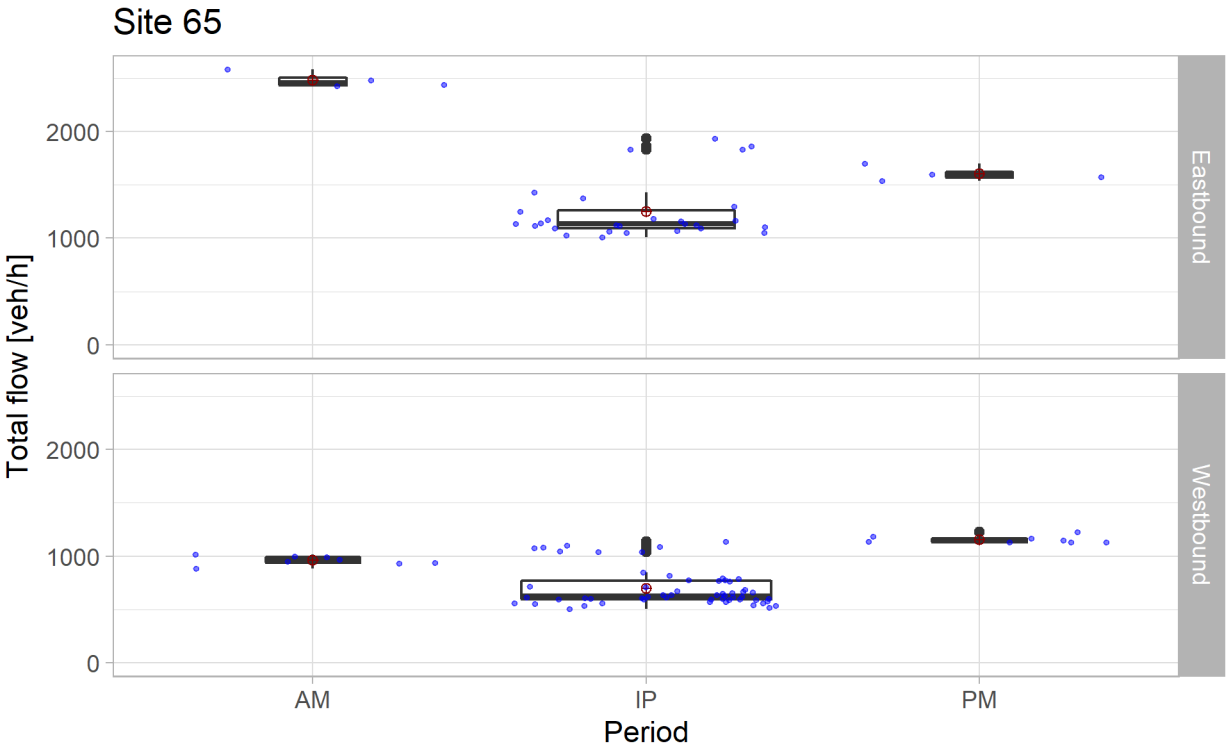

Site 61
Total flow [veh/h]
750
500
250
0
Eastbound
Westbound
AM
IP
PM
Period

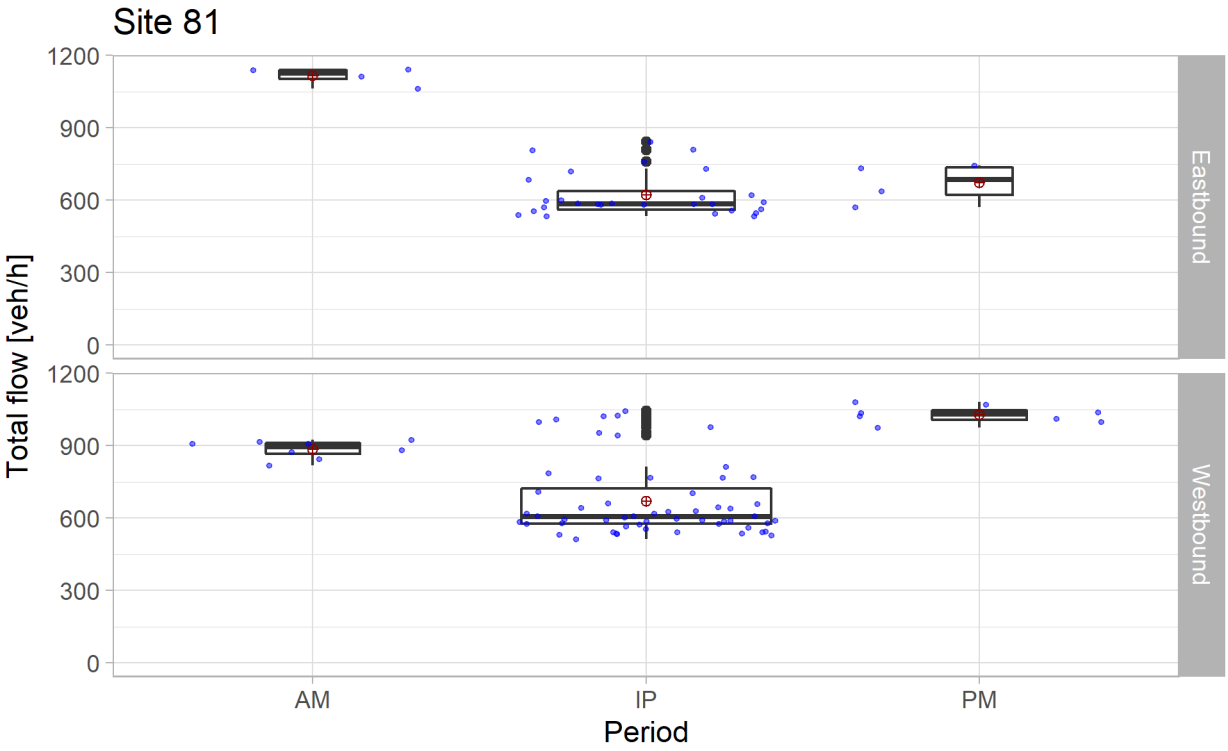
Site 63

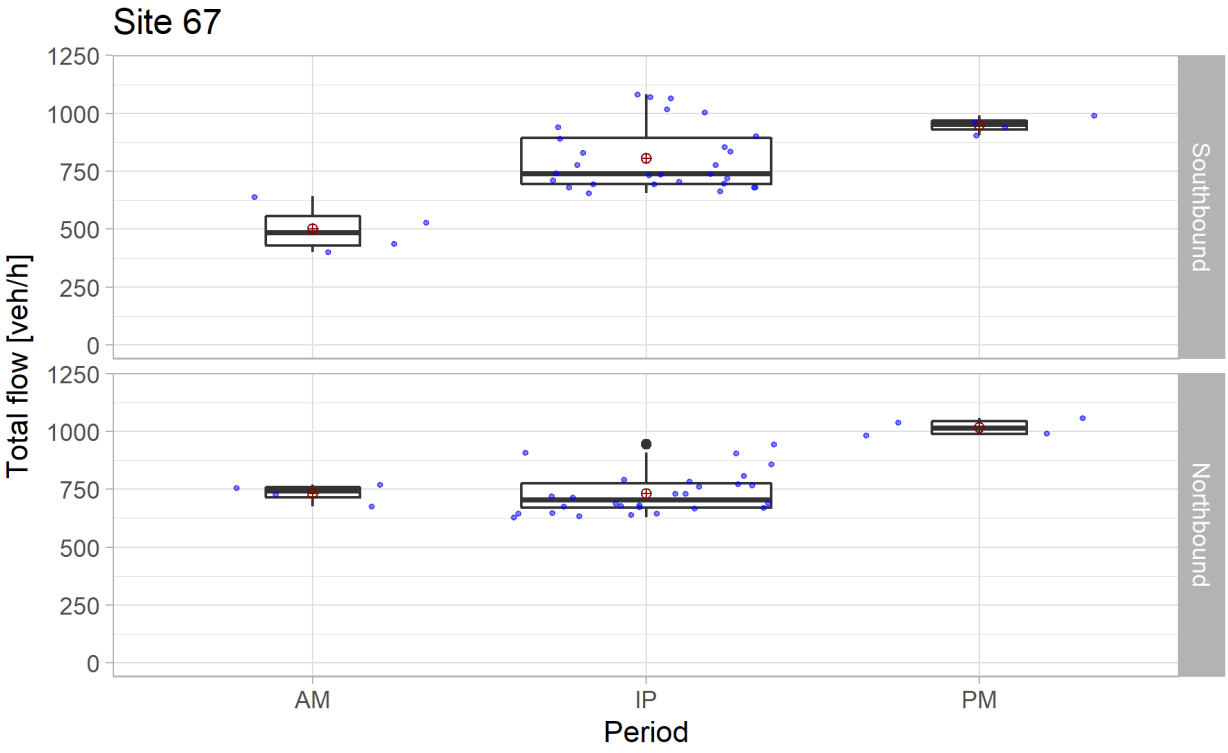


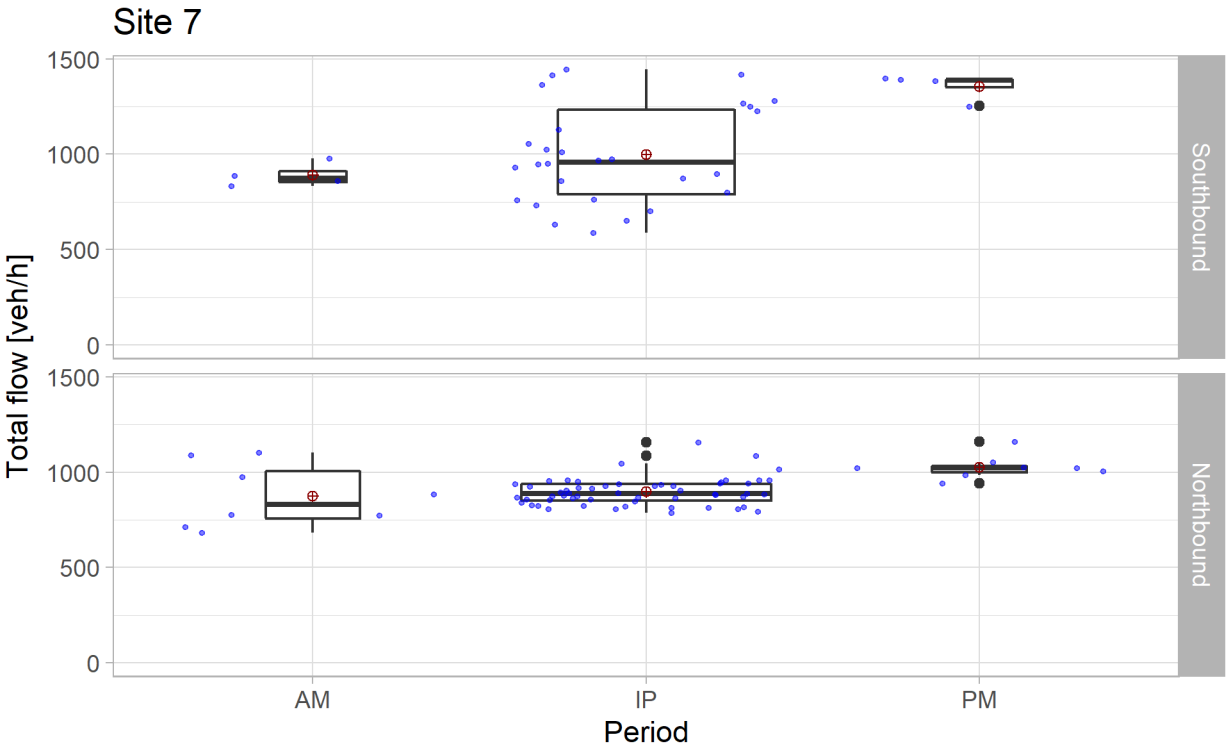
Site 64

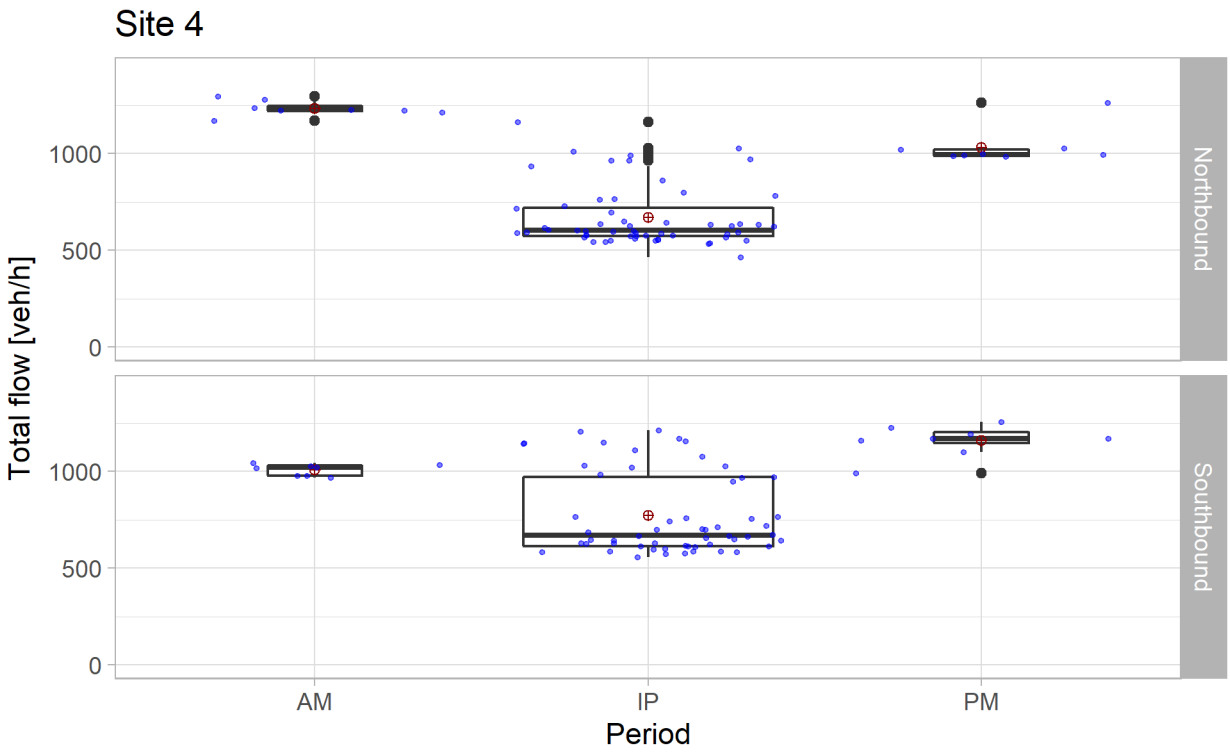


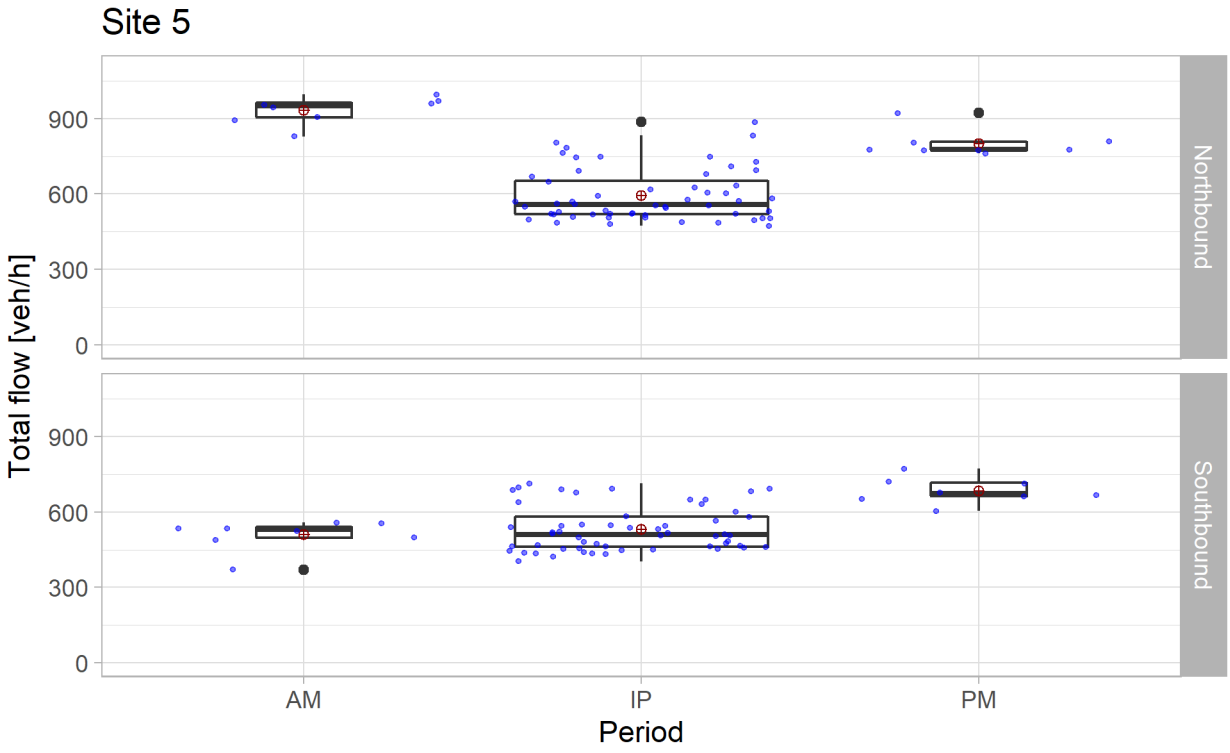

Site 65
Total flow [veh/h]
2000
1000
0
Eastbound
Westbound
AM
IP
PM
Period

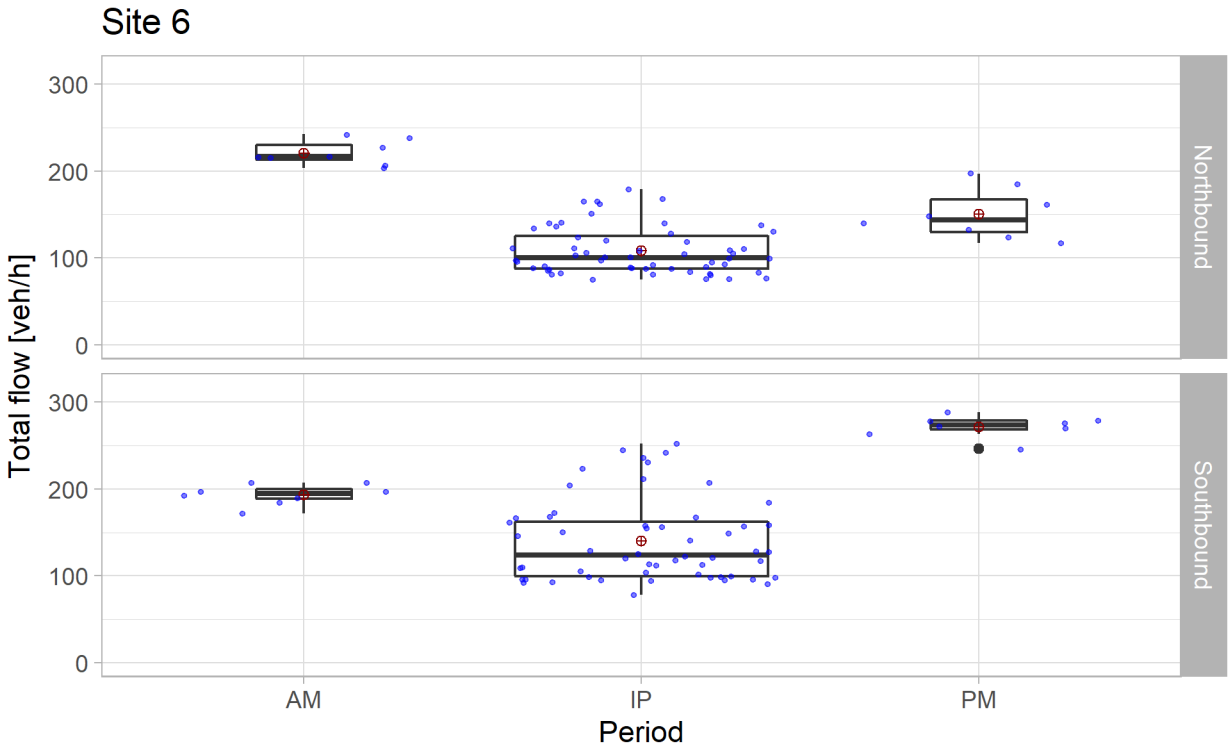

Site 81
Total flow [veh/h]
1200
900
600
300
0
Eastbound
Westbound
AM
IP
PM
Period

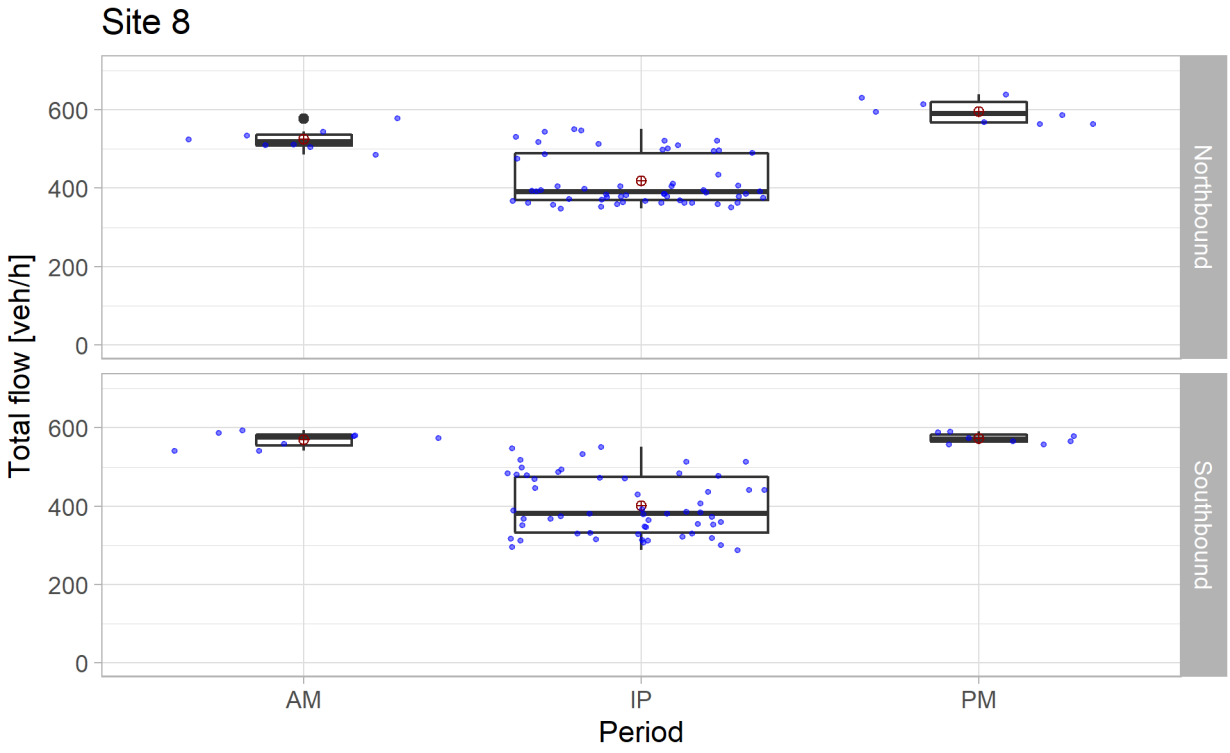

Site 67
Total flow [veh/h]
1250
1000
750
500
250
0
Southbound
Northbound
AM
IP
PM
Period

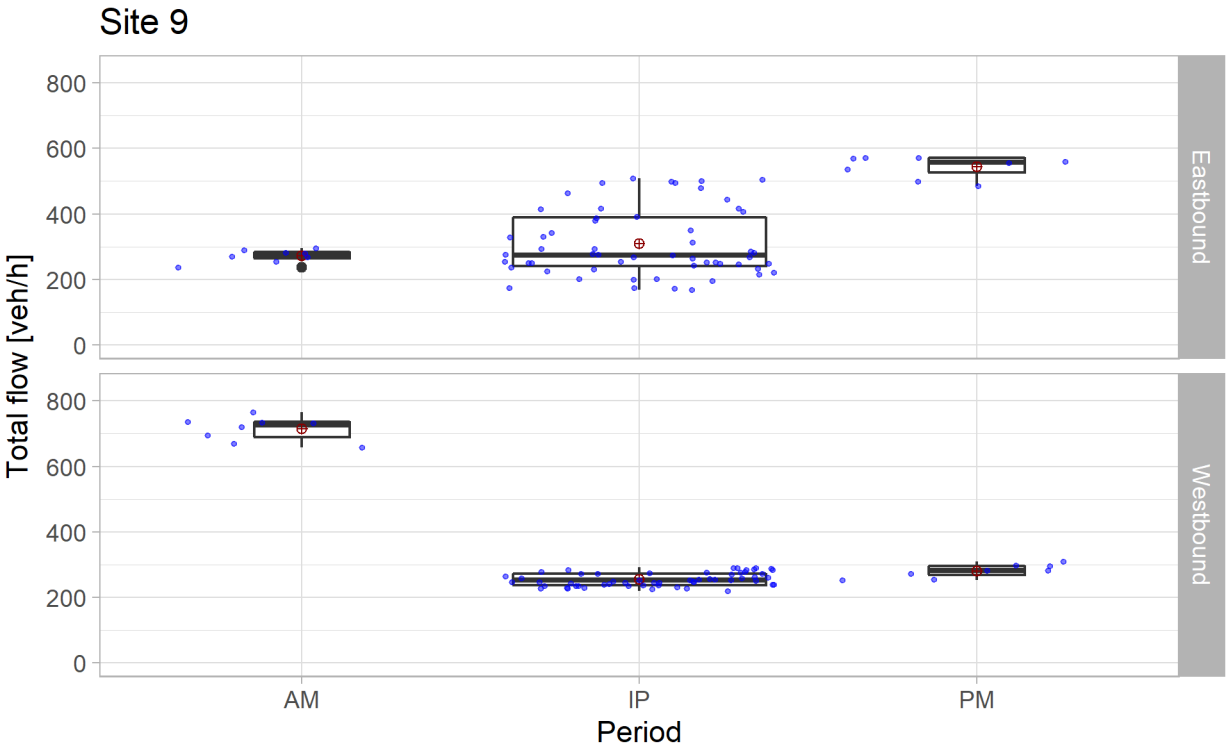

Site 7
Total flow [veh/h]
1500
1000
500
0
Southbound
Northbound
AM
IP
PM
Period

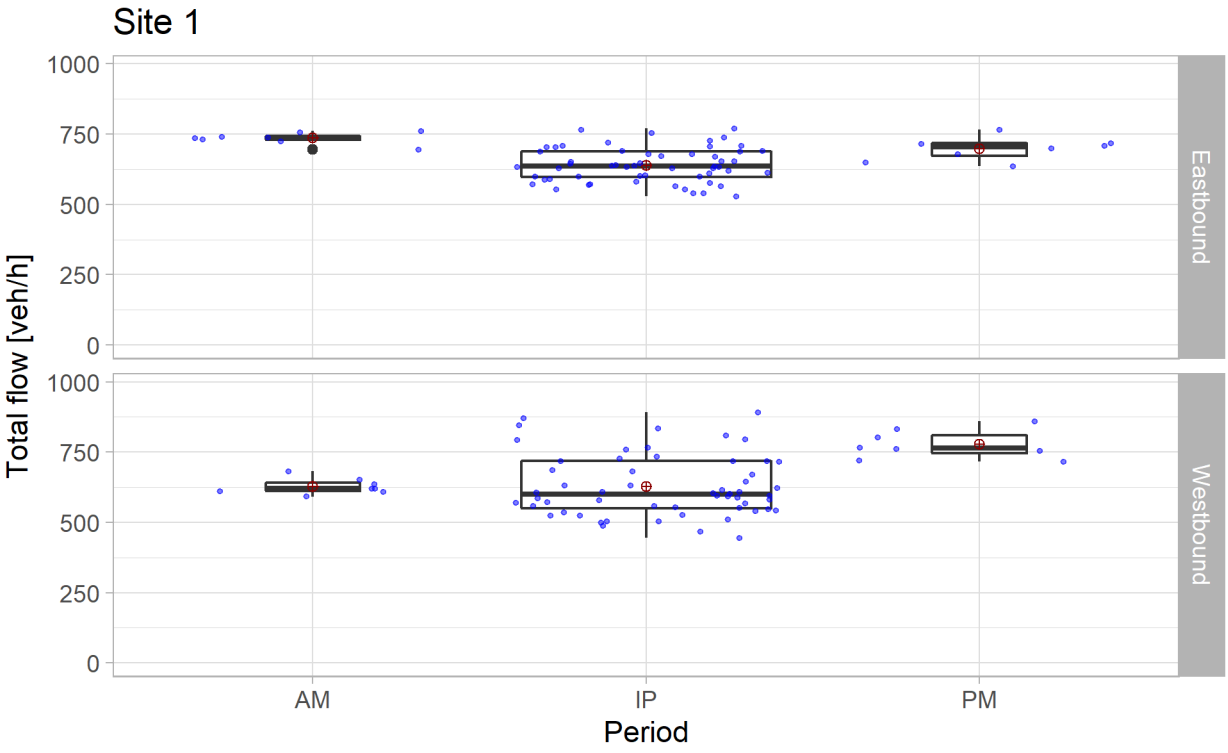

Site 4
Total flow [veh/h]
1000
500
0
Northbound
Southbound
AM
IP
PM
Period

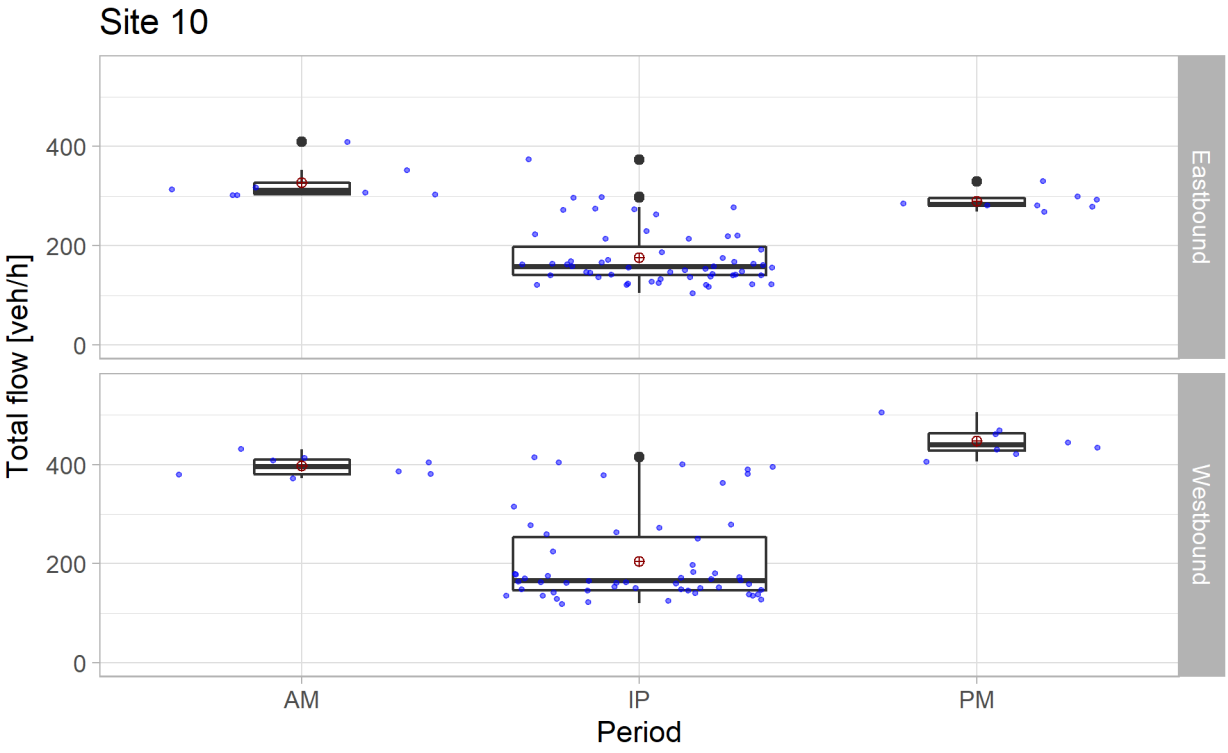

Site 5
Total flow [veh/h]
900
600
300
0
Northbound
Southbound
AM
IP
PM
Period

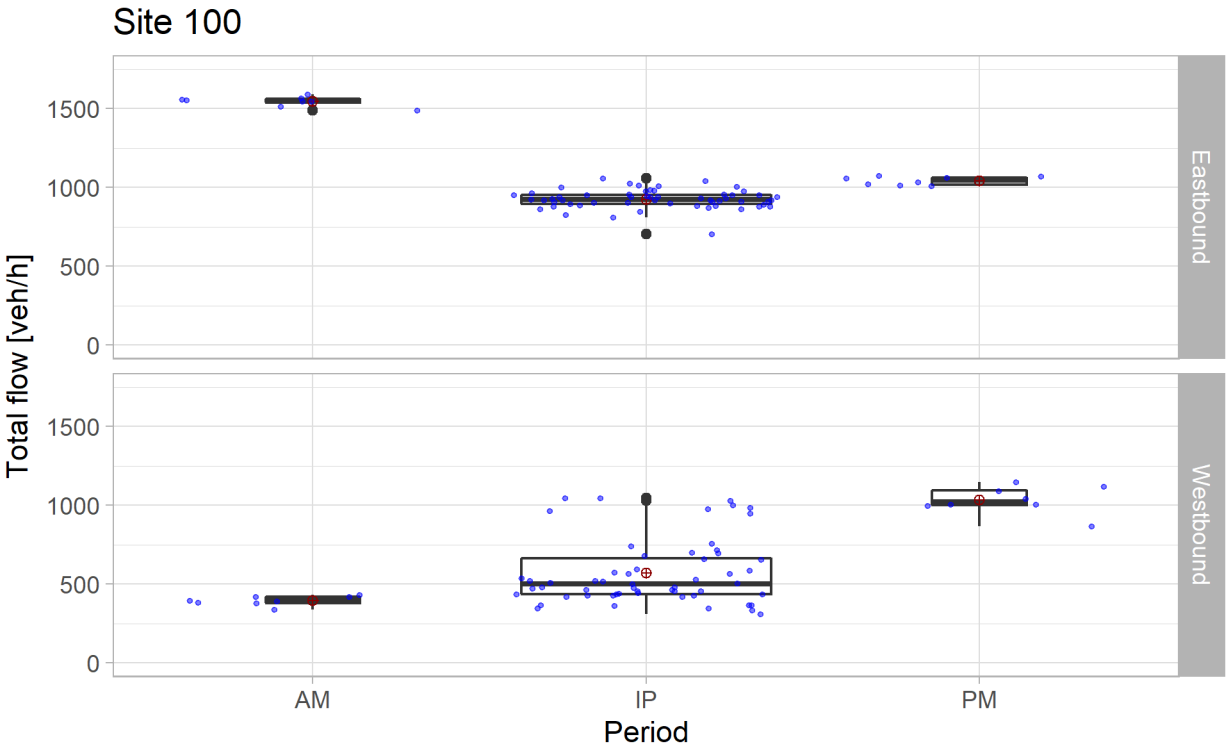

Site 6
Total flow [veh/h]
300
200
100
0
Northbound
Southbound
AM
IP
PM
Period

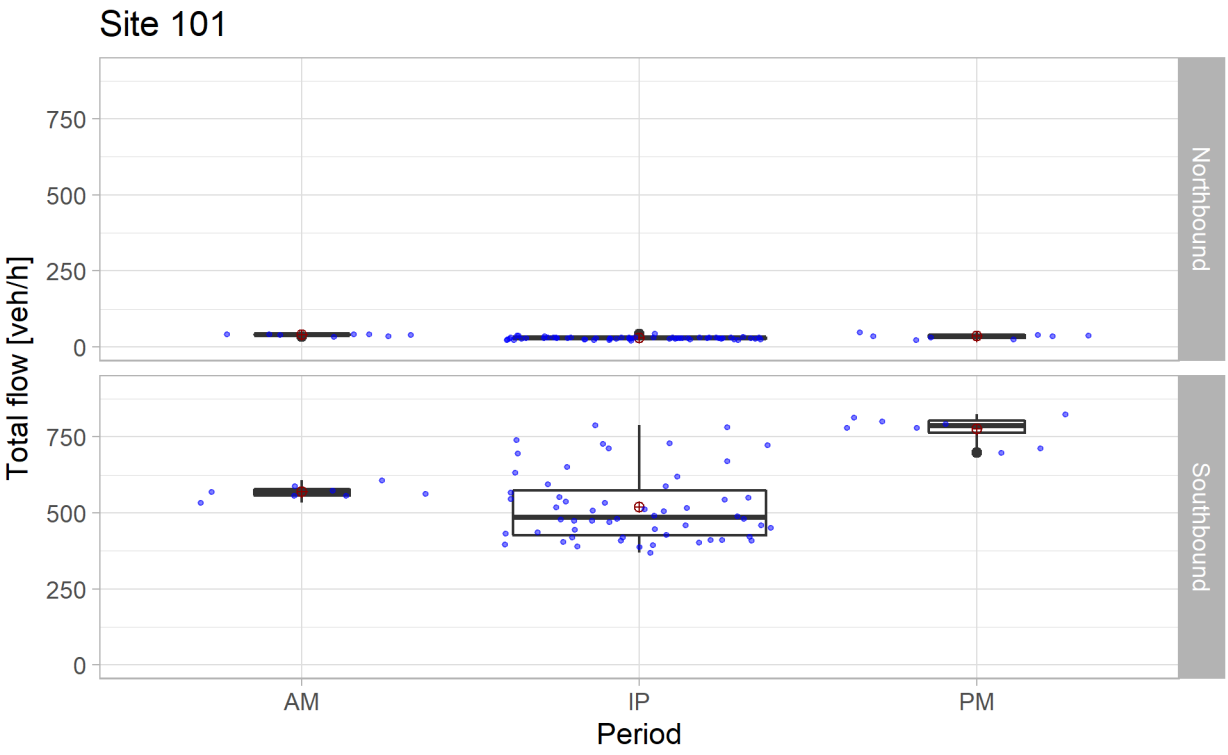

Site 8
Total flow [veh/h]
600
400
200
0
Northbound
Southbound
AM
IP
PM
Period

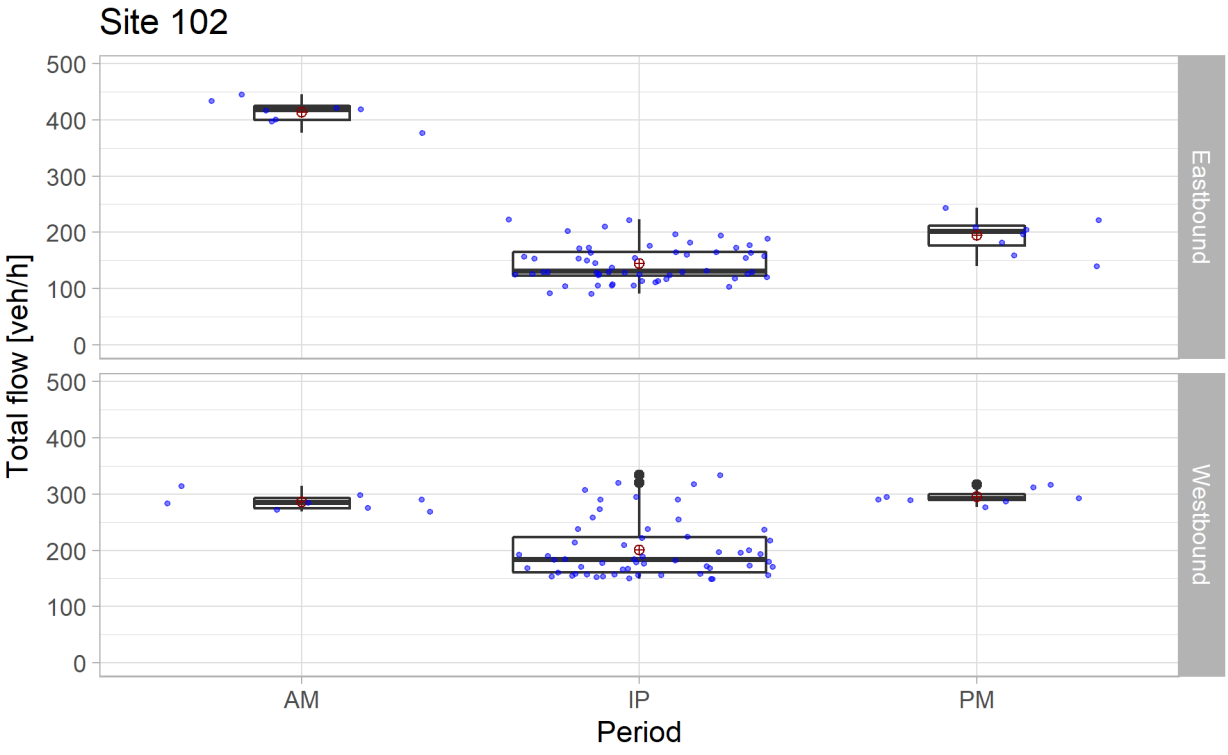

Site 9
Total flow [veh/h]
800
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period

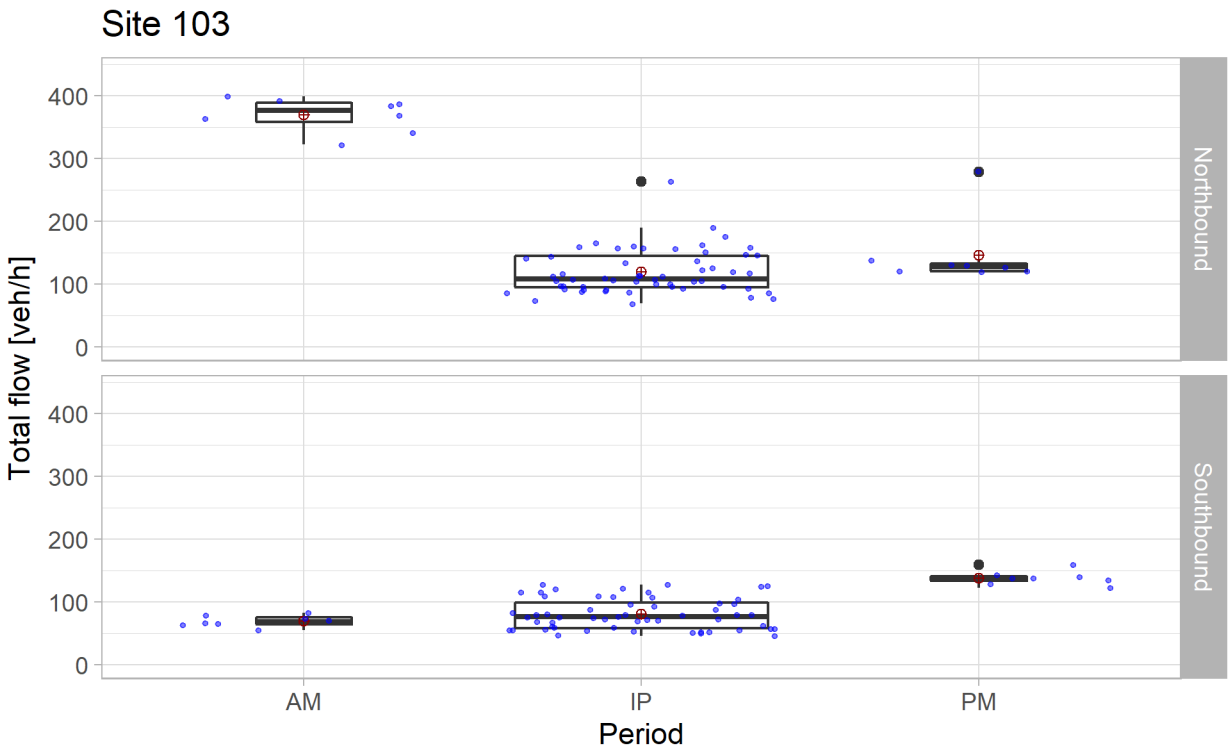

Site 1
Total flow [veh/h]
1000
750
500
250
0
Eastbound
Westbound
AM
IP
PM
Period

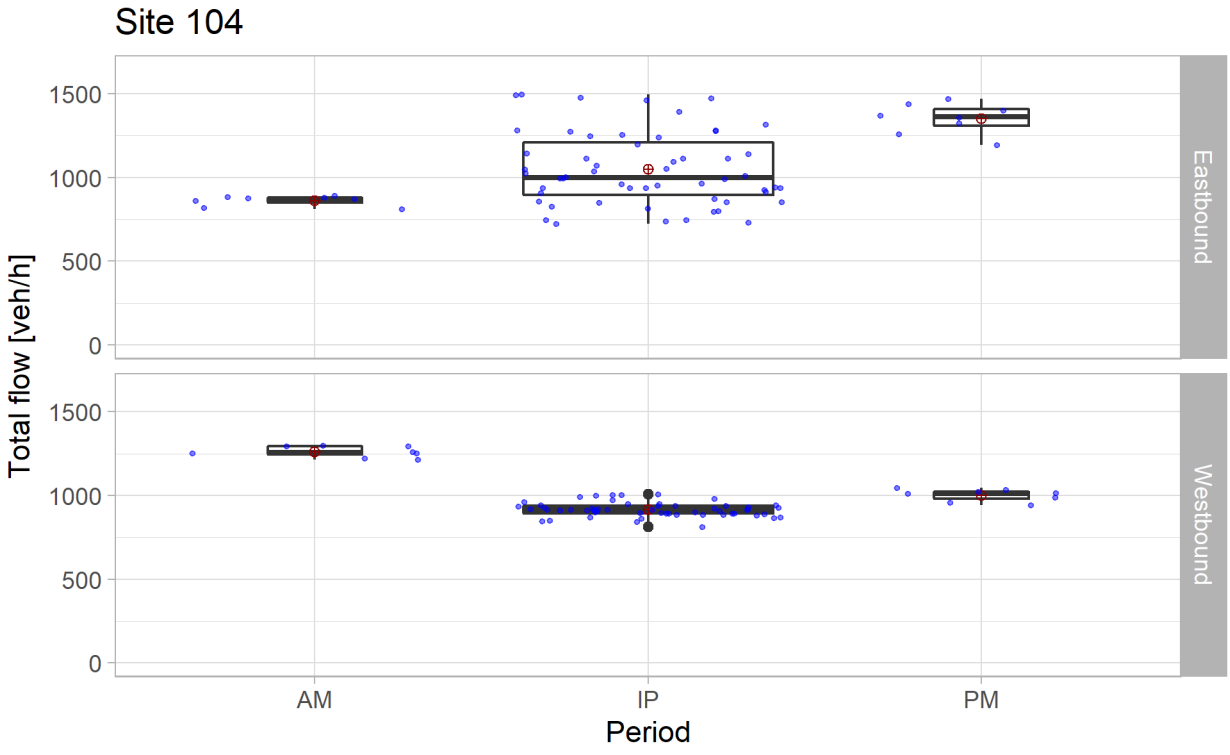

Site 10
Total flow [veh/h]
400
200
0
Eastbound
Westbound
AM
IP
PM
Period


Site 100
Total flow [veh/h]
1500
1000
500
0
Eastbound
Westbound
AM
IP
PM
Period

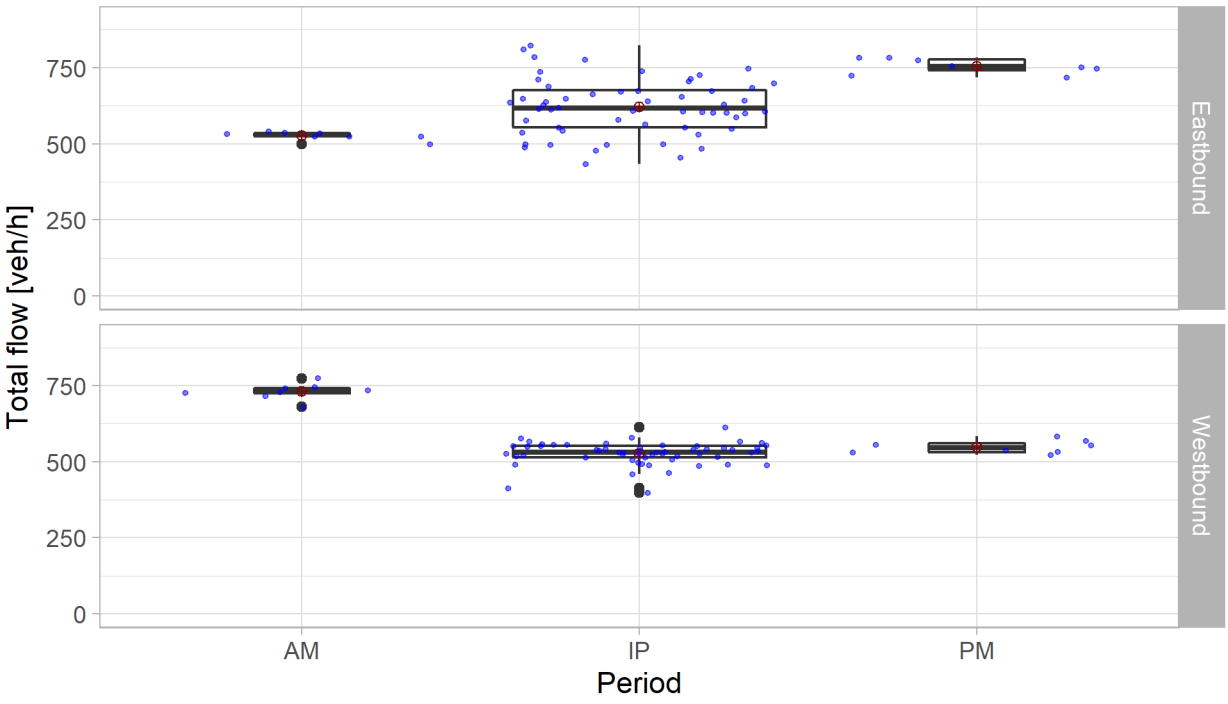

Site 101
Total flow [veh/h]
750
500
250
0
Northbound
Southbound
AM
IP
PM
Period


Site 102
Total flow [veh/h]
500
400
300
200
100
0
Eastbound
Westbound
AM
IP
PM
Period

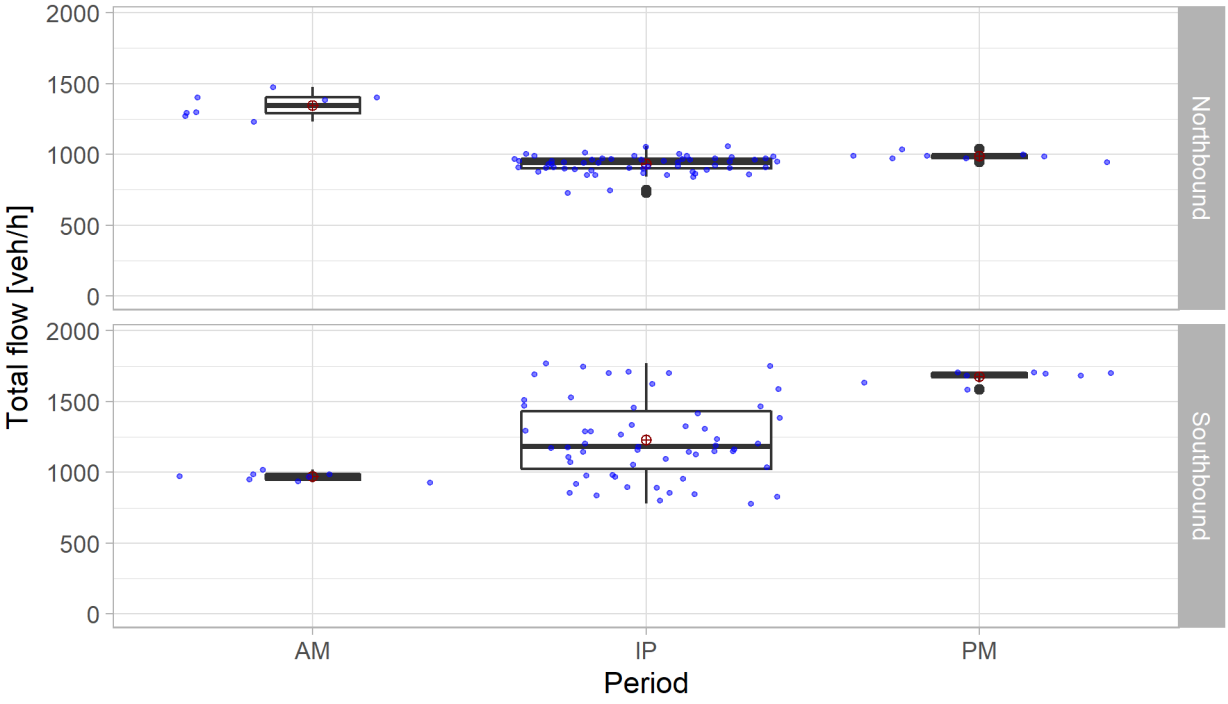

Site 103
Total flow [veh/h]
400
300
200
100
0
Northbound
Southbound
AM
IP
PM
Period


Site 104
Total flow [veh/h]
1500
1000
500
0
Eastbound
Westbound
AM
IP
PM
Period

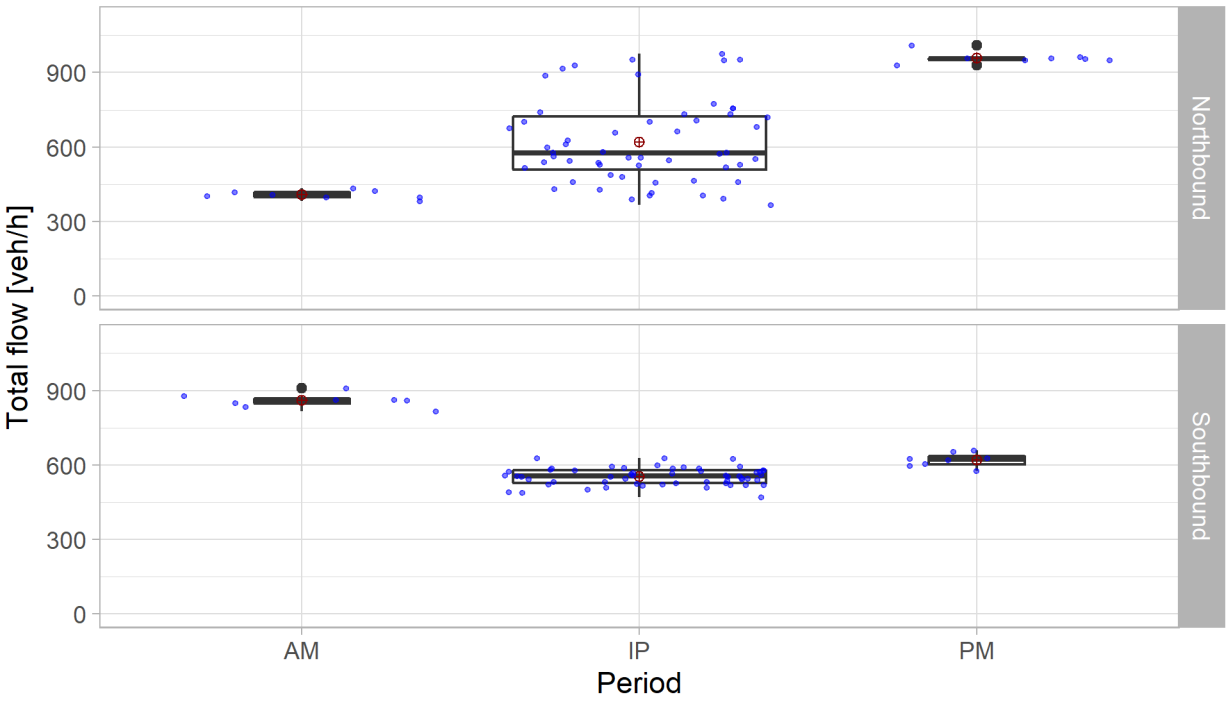
Site 105



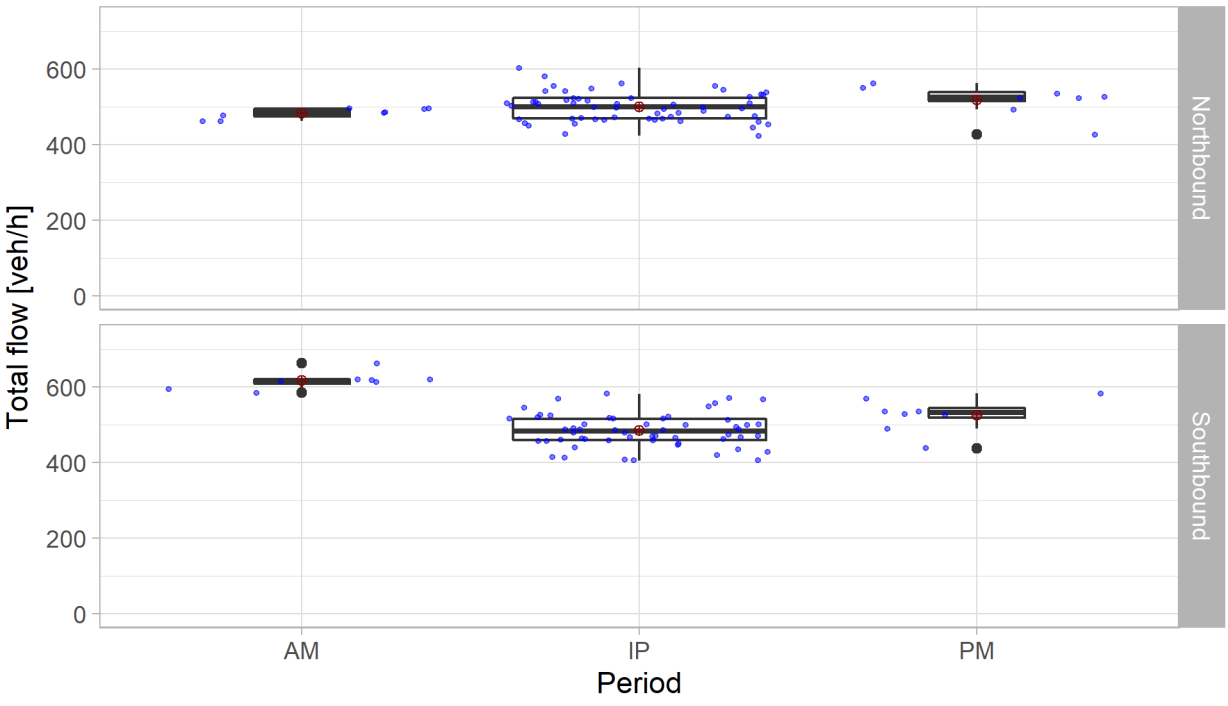
Site 108



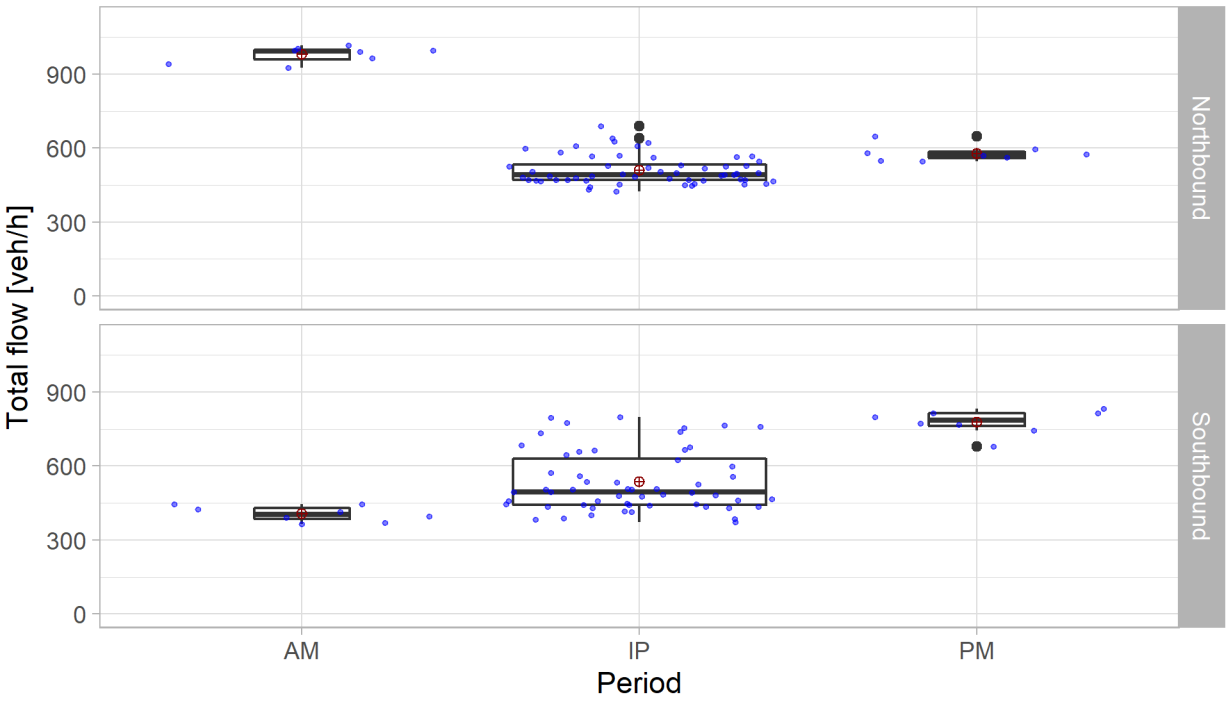
Site 109



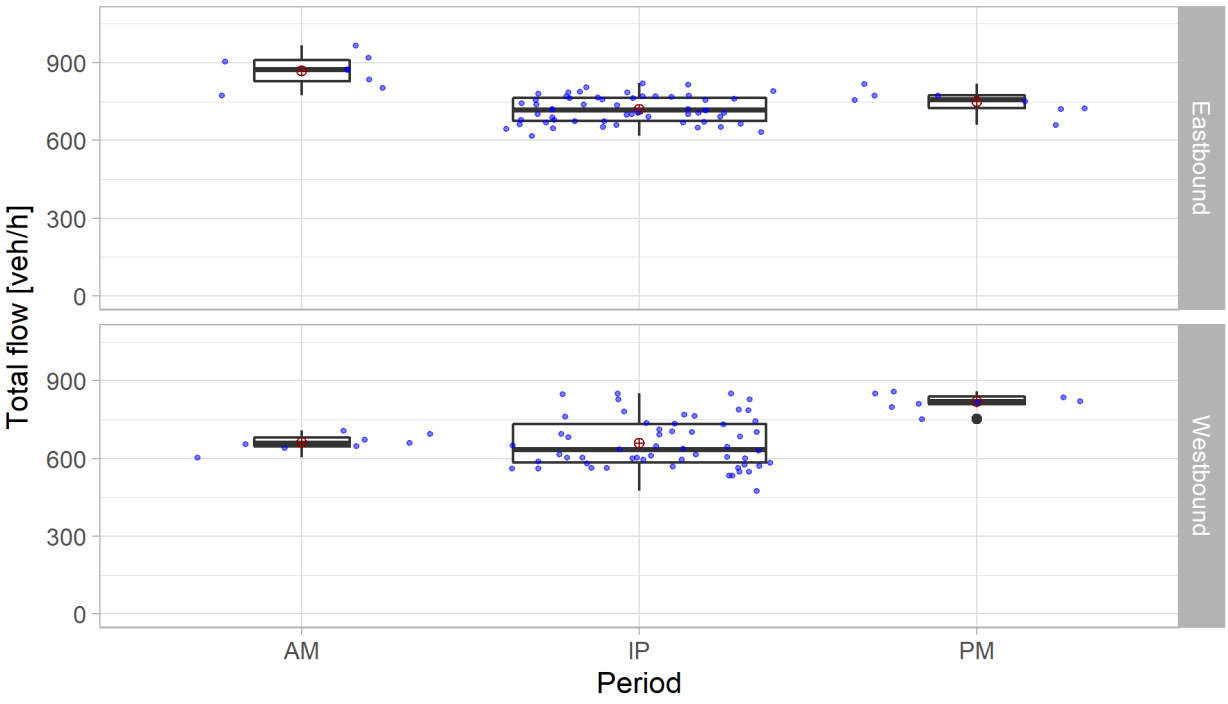
Site 11



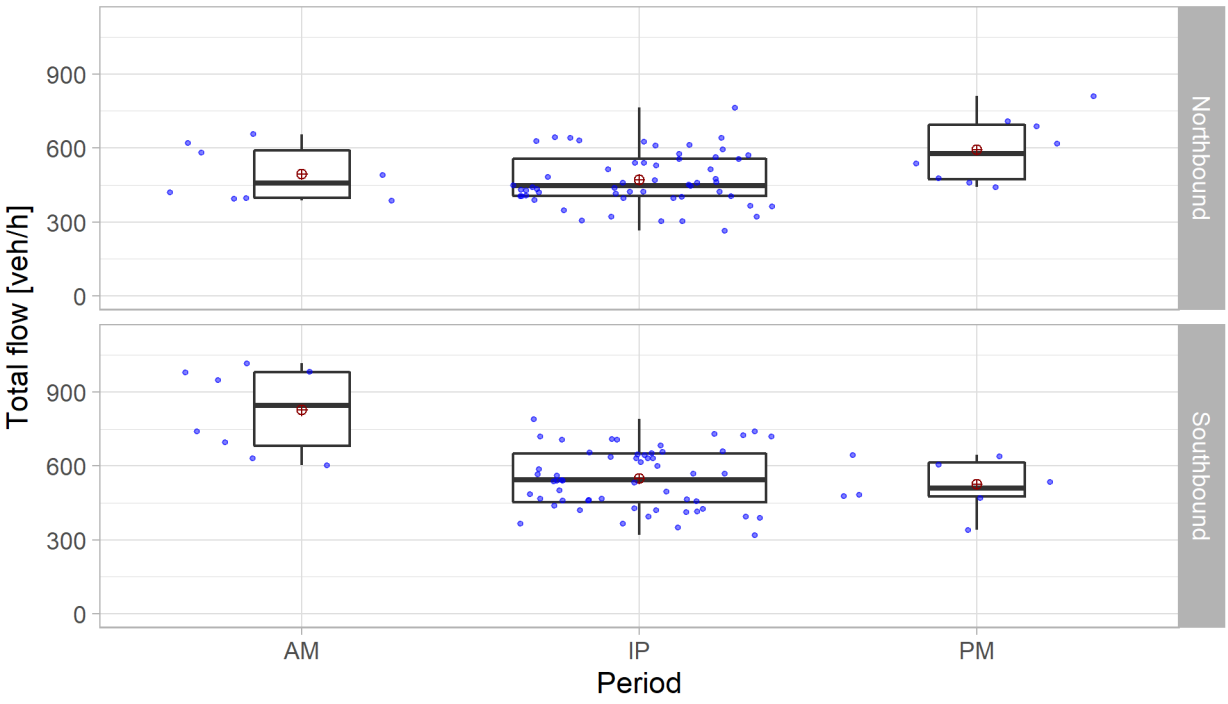
Site 111



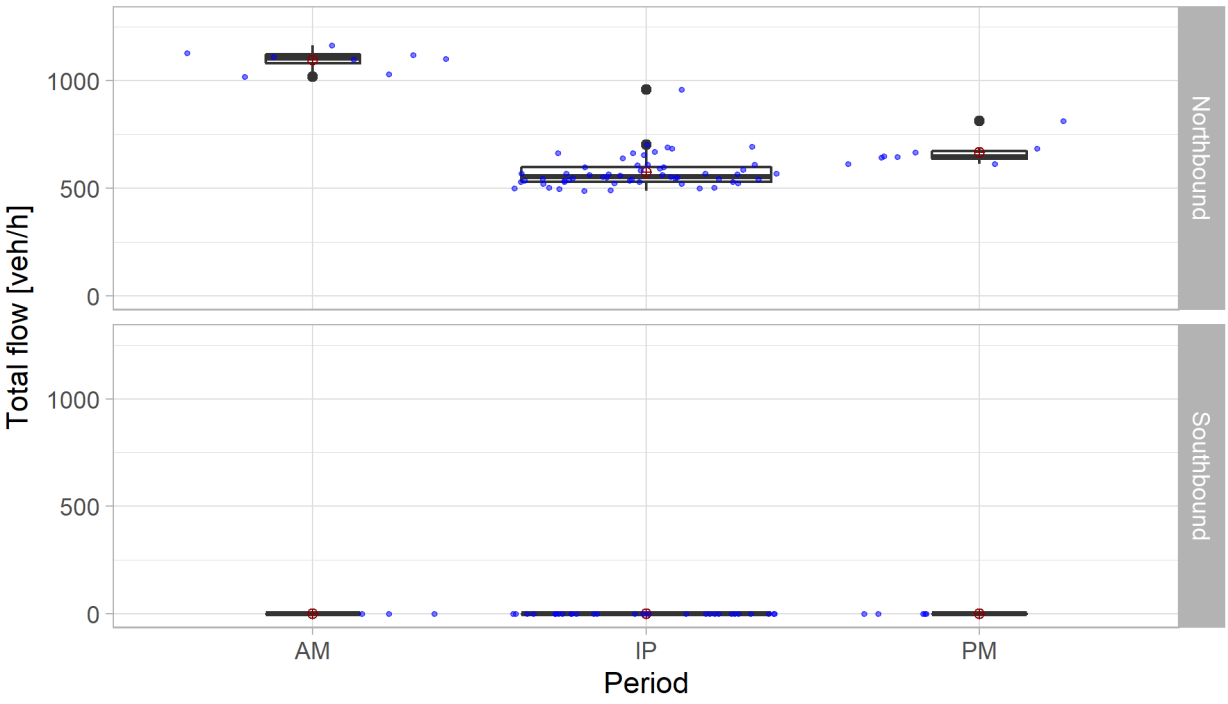
Site 113



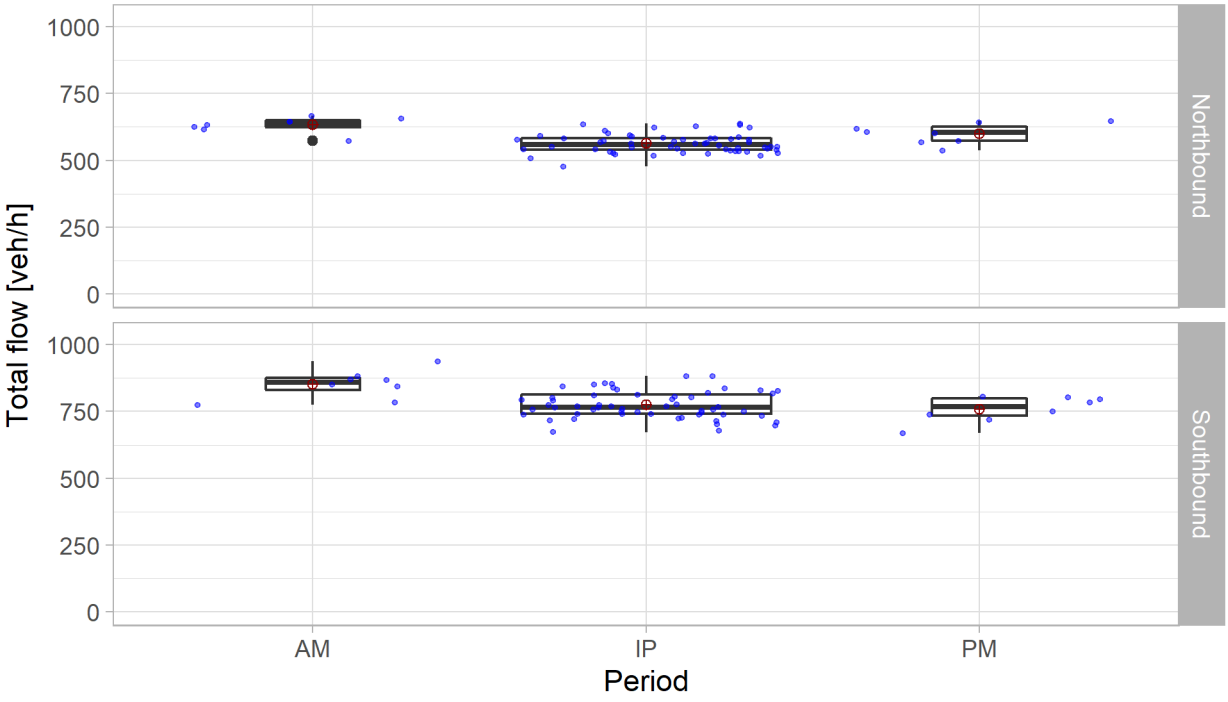
Site 114



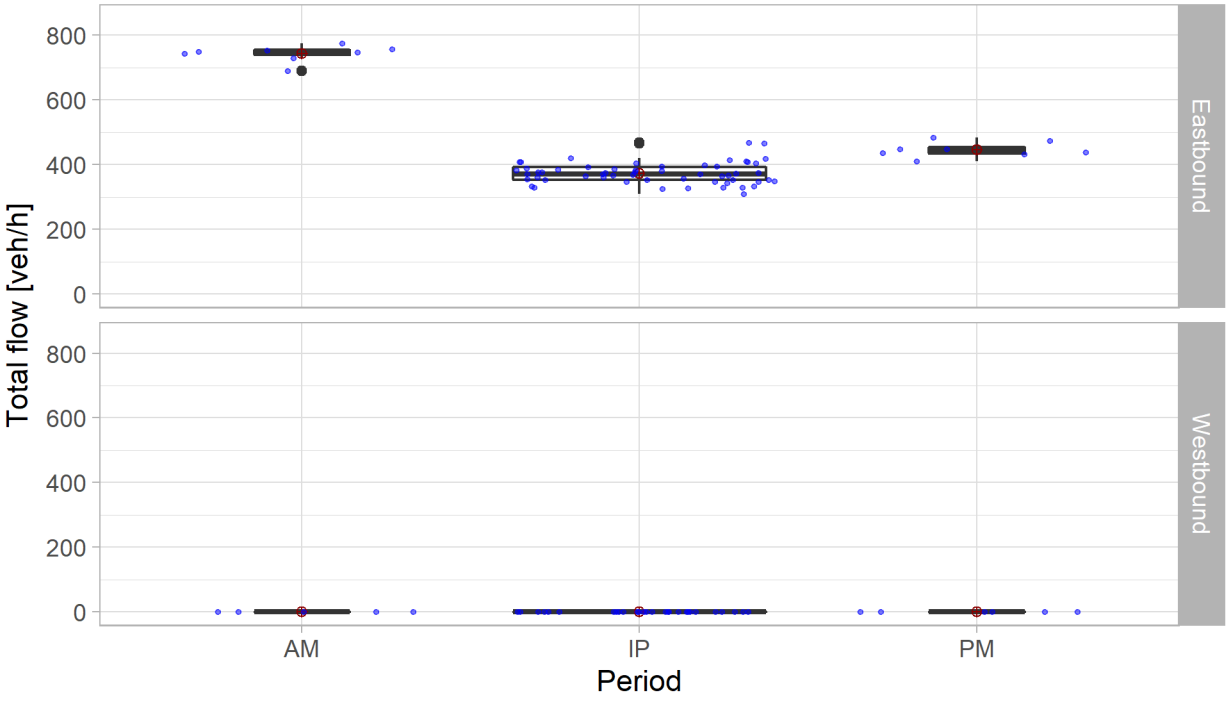
Site 115



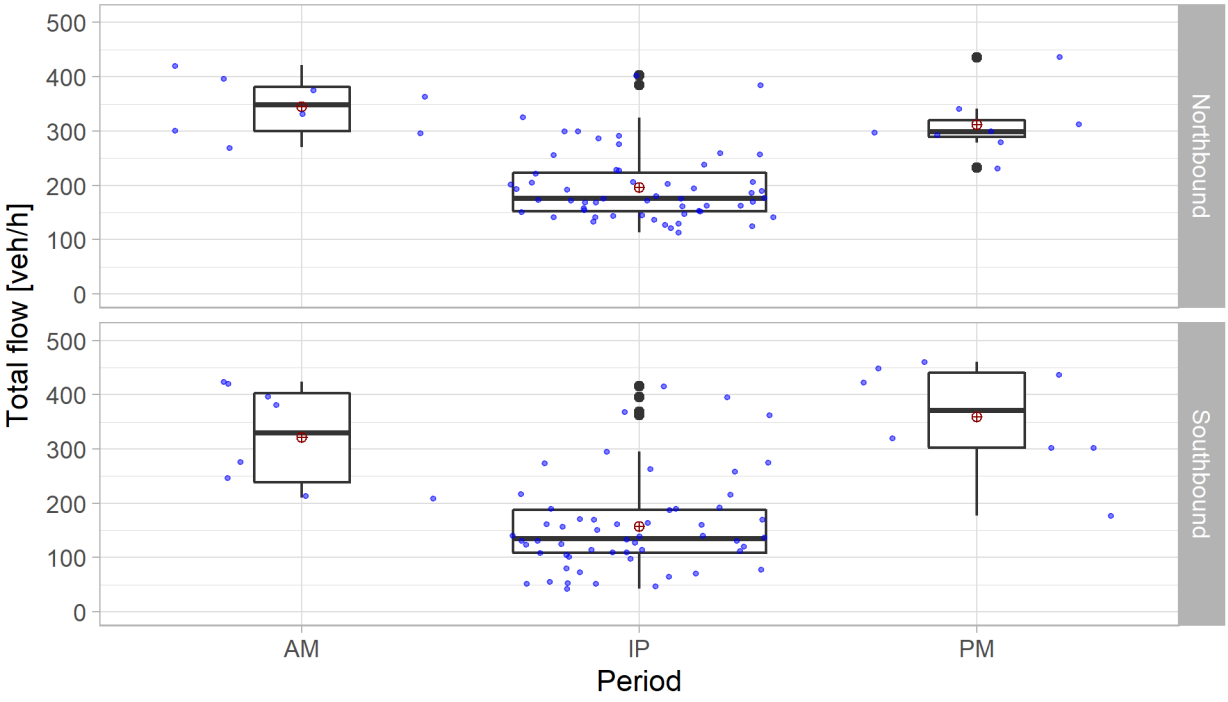
Site 116



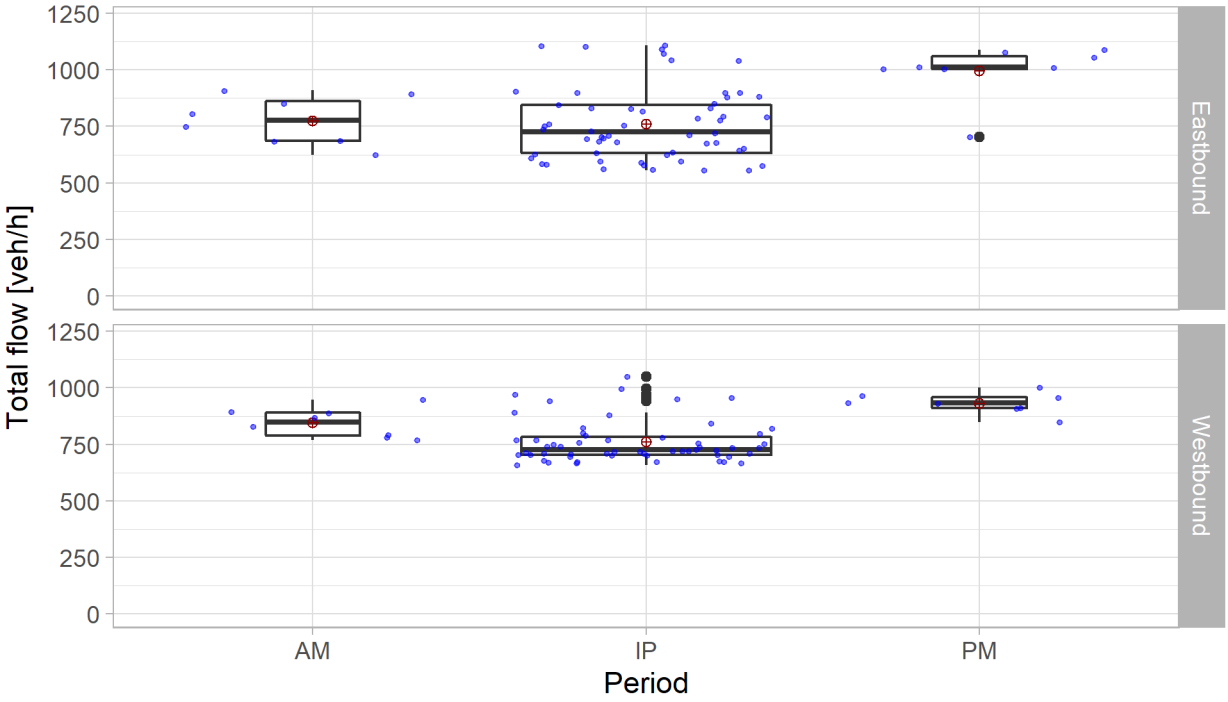
Site 121



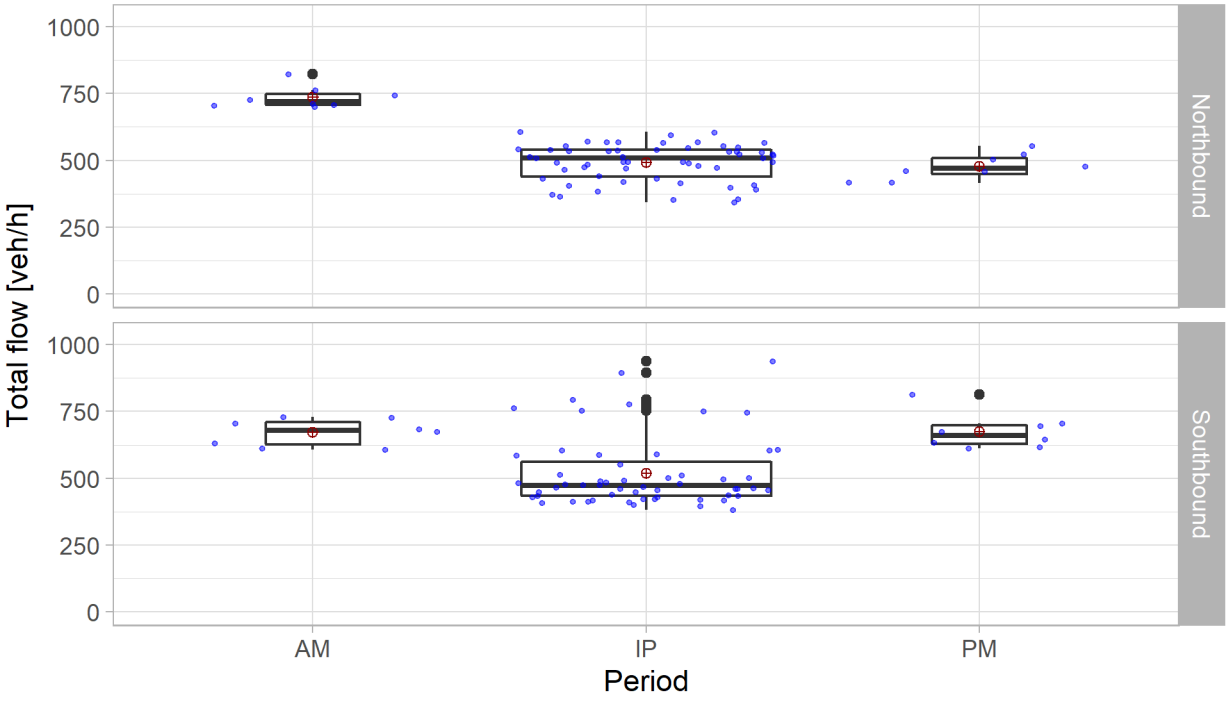
Site 122



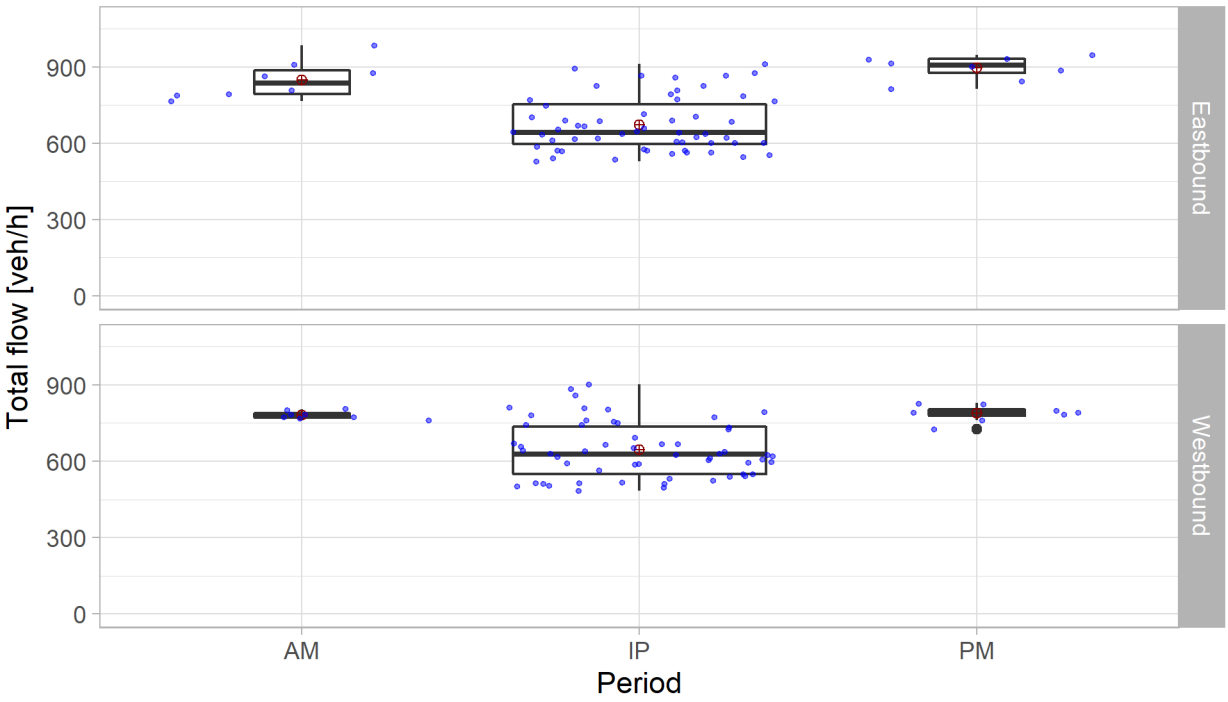
Site 123



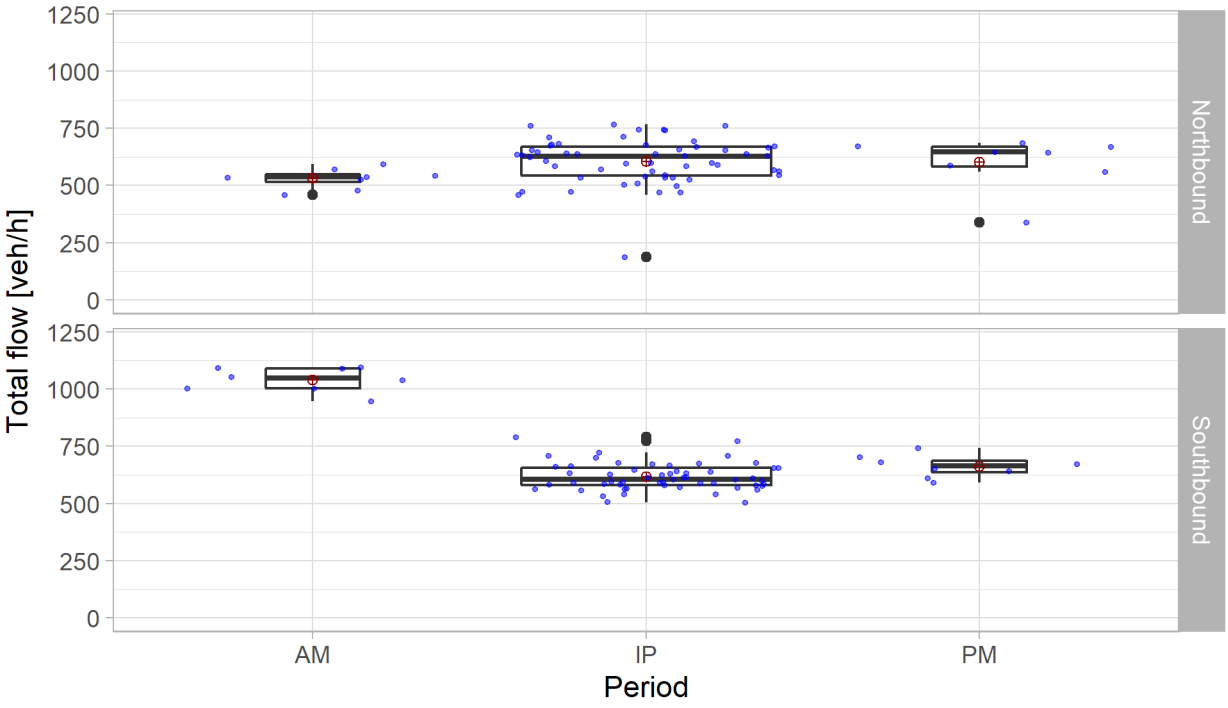
Site 124



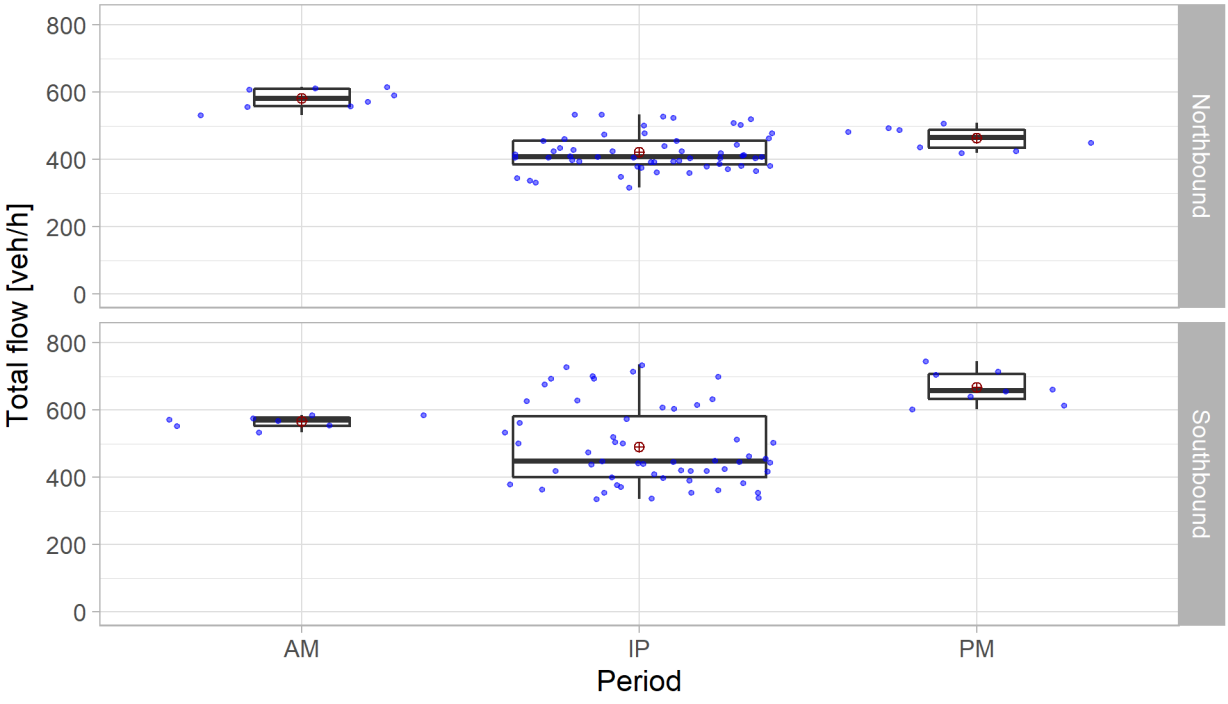
Site 125



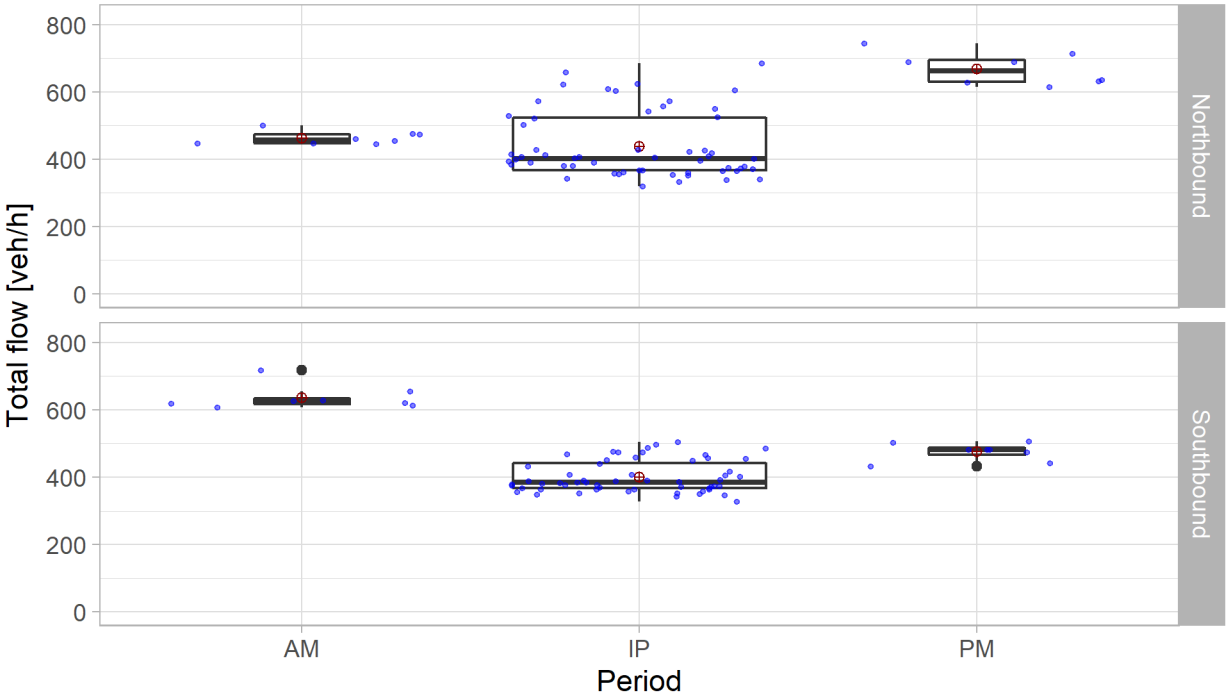
Site 126



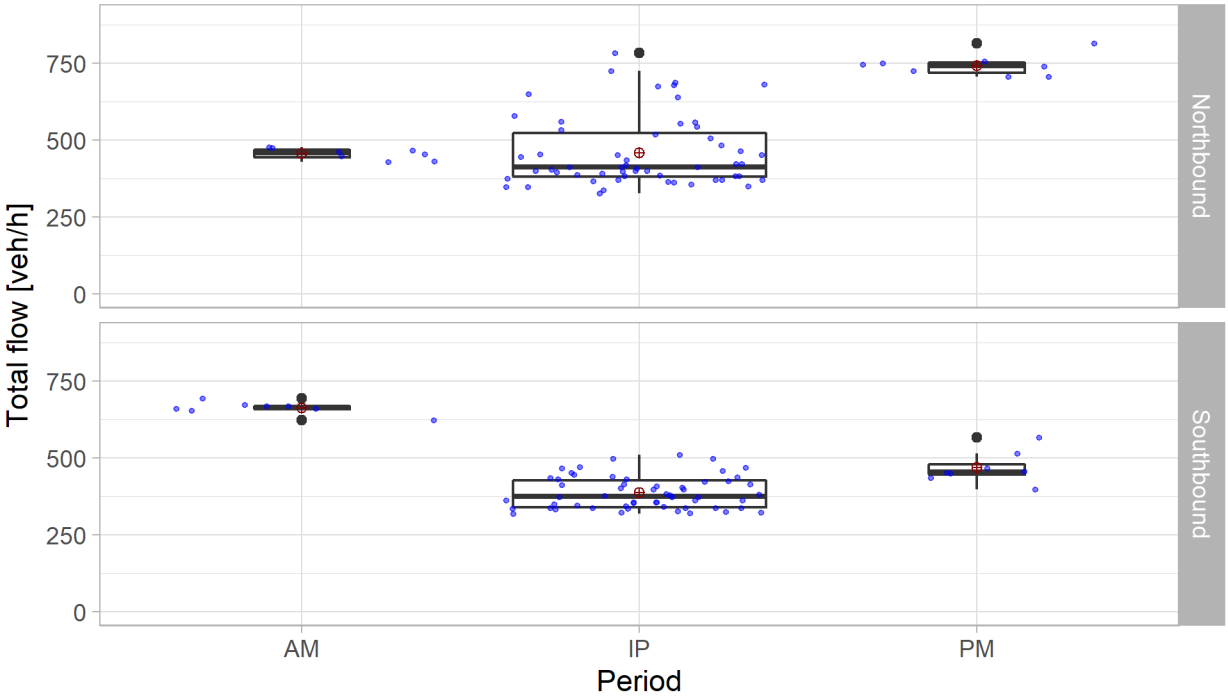
Site 127



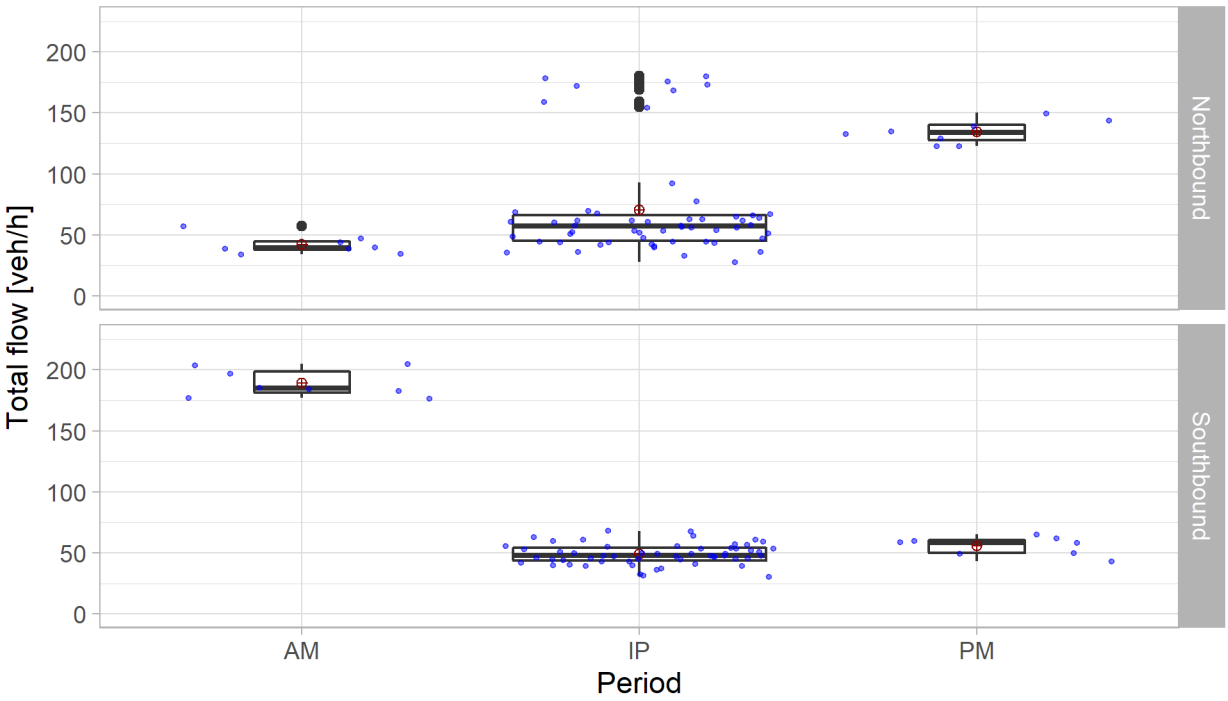
Site 128



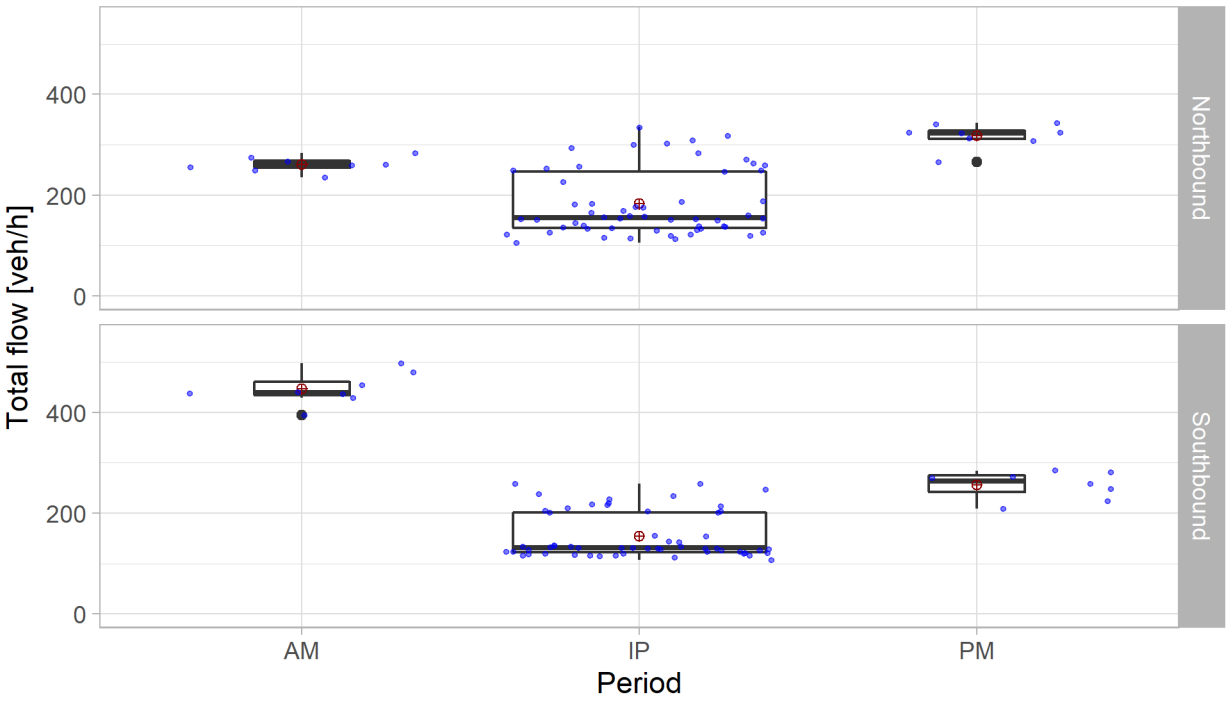
Site 129

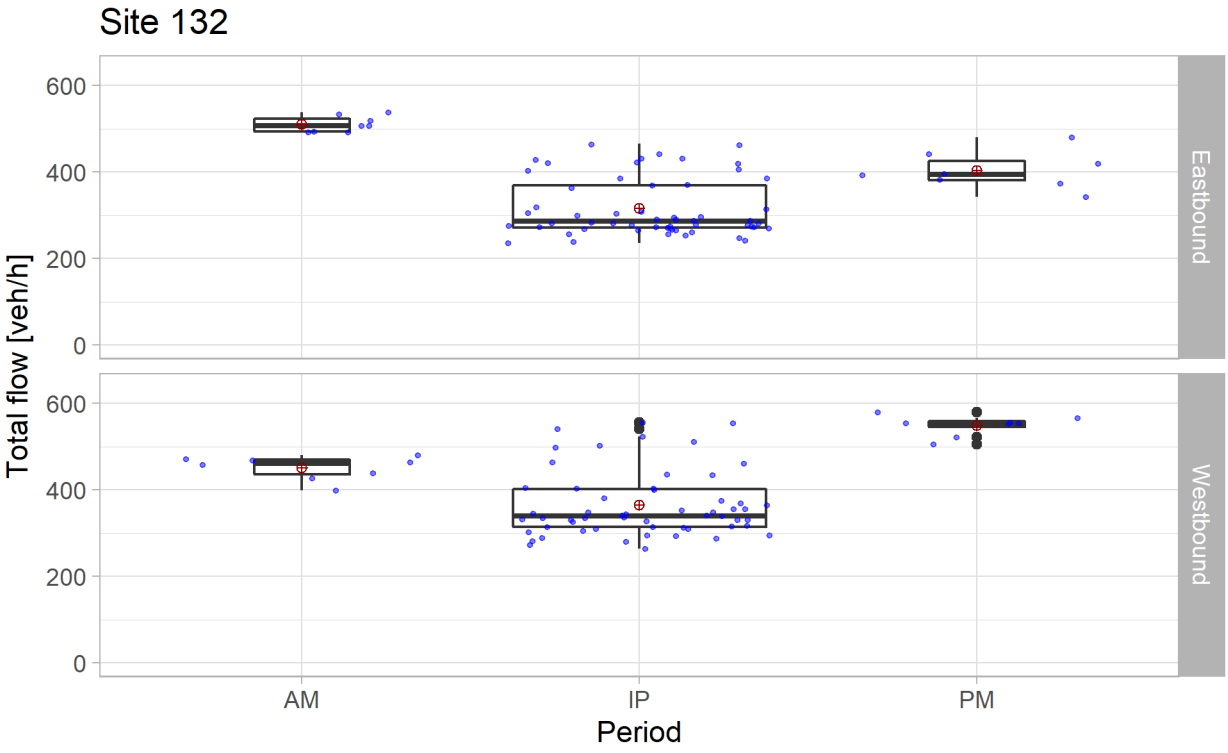


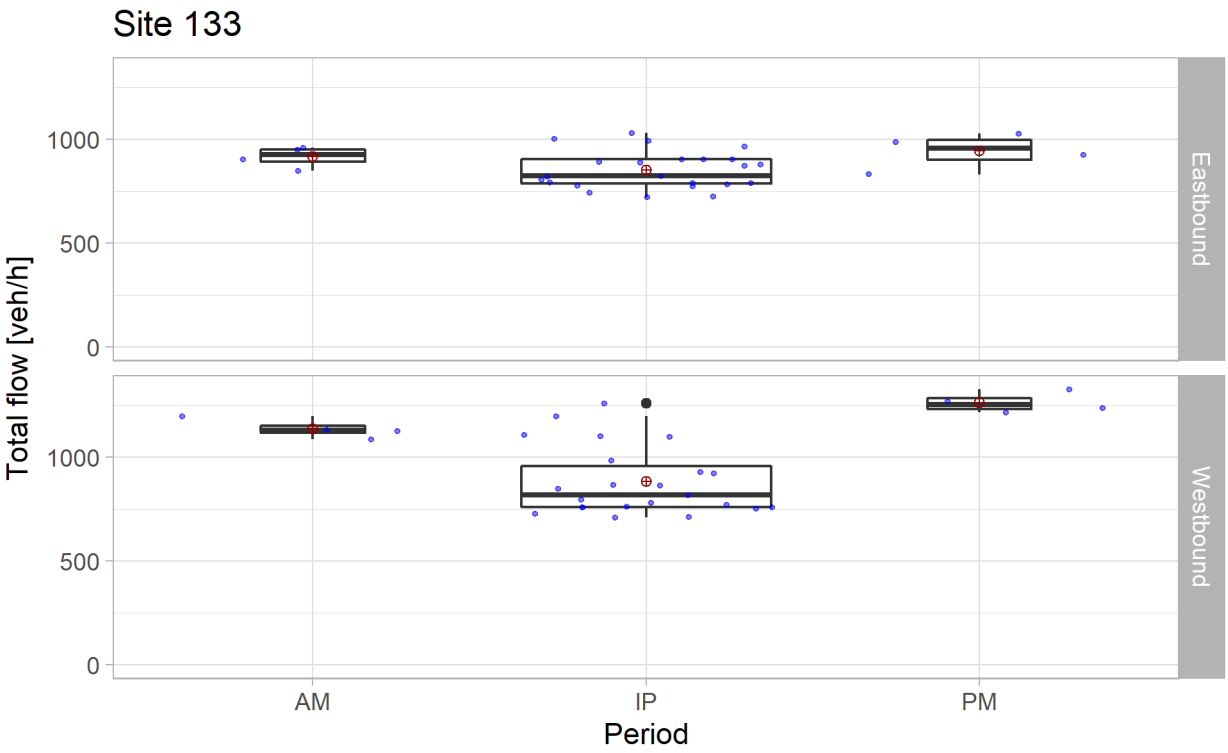
Site 13



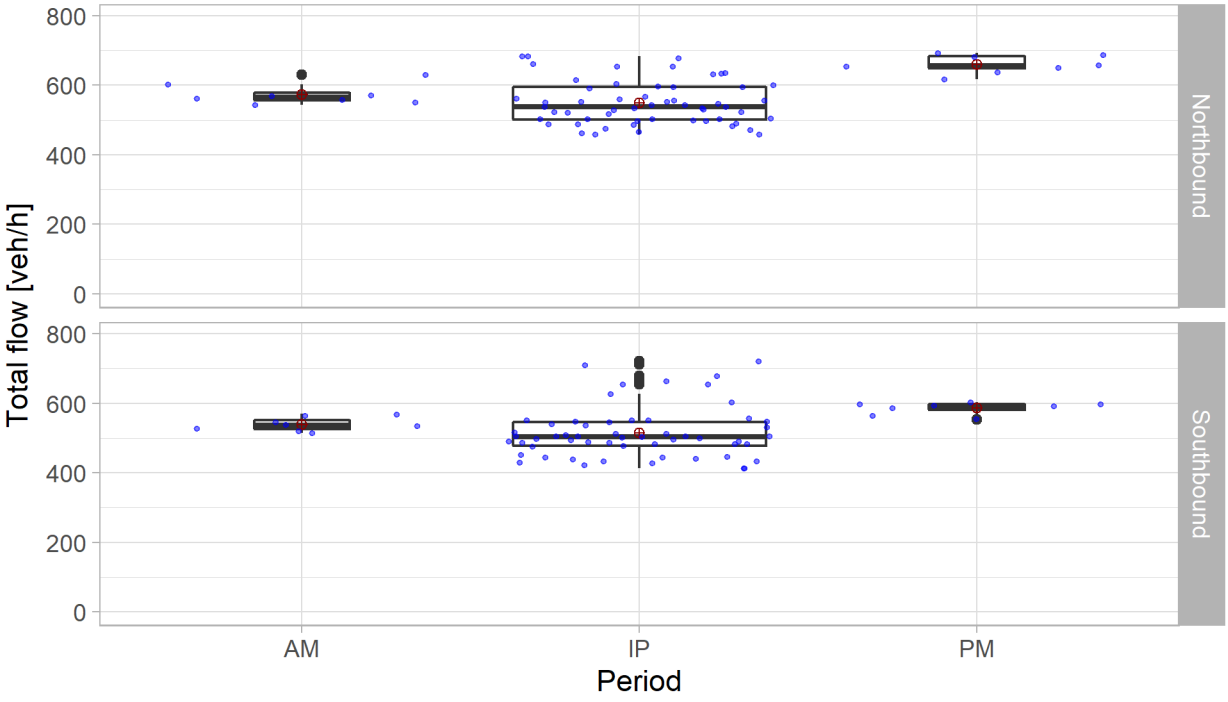
Site 131



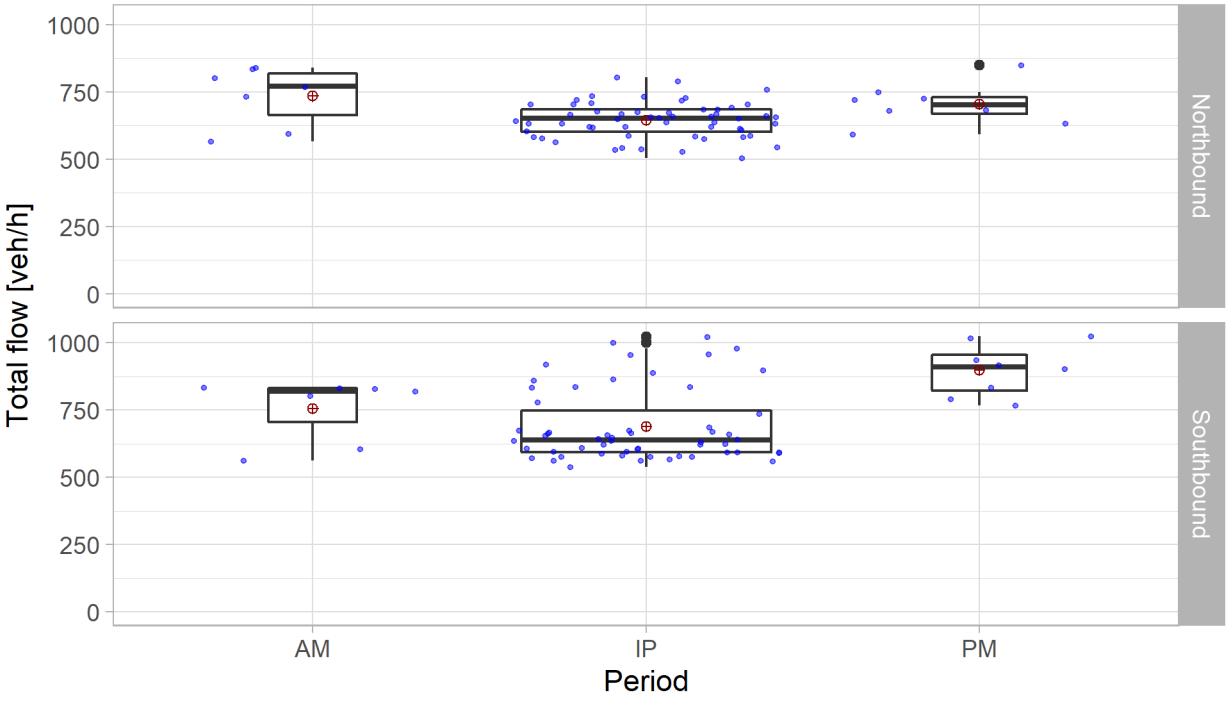

Site 132
Total flow [veh/h]
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period

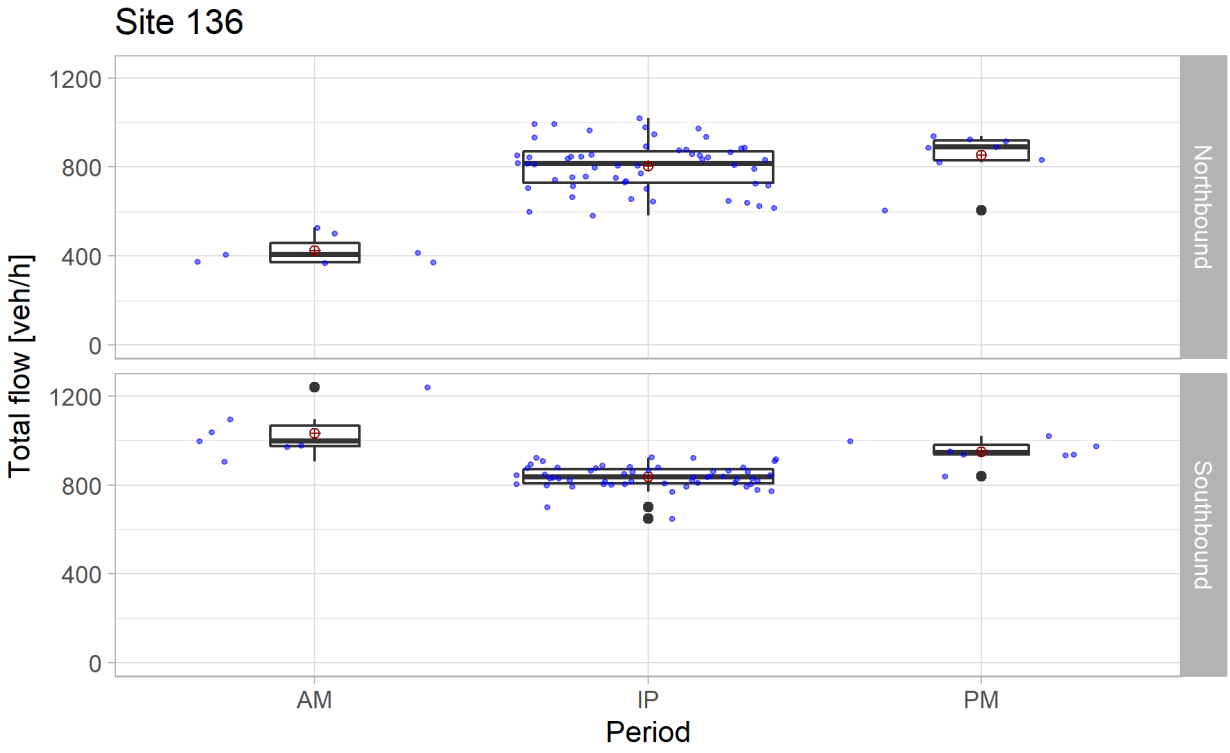

Site 133
Total flow [veh/h]
1000
500
0
Eastbound
Westbound
AM
IP
PM
Period

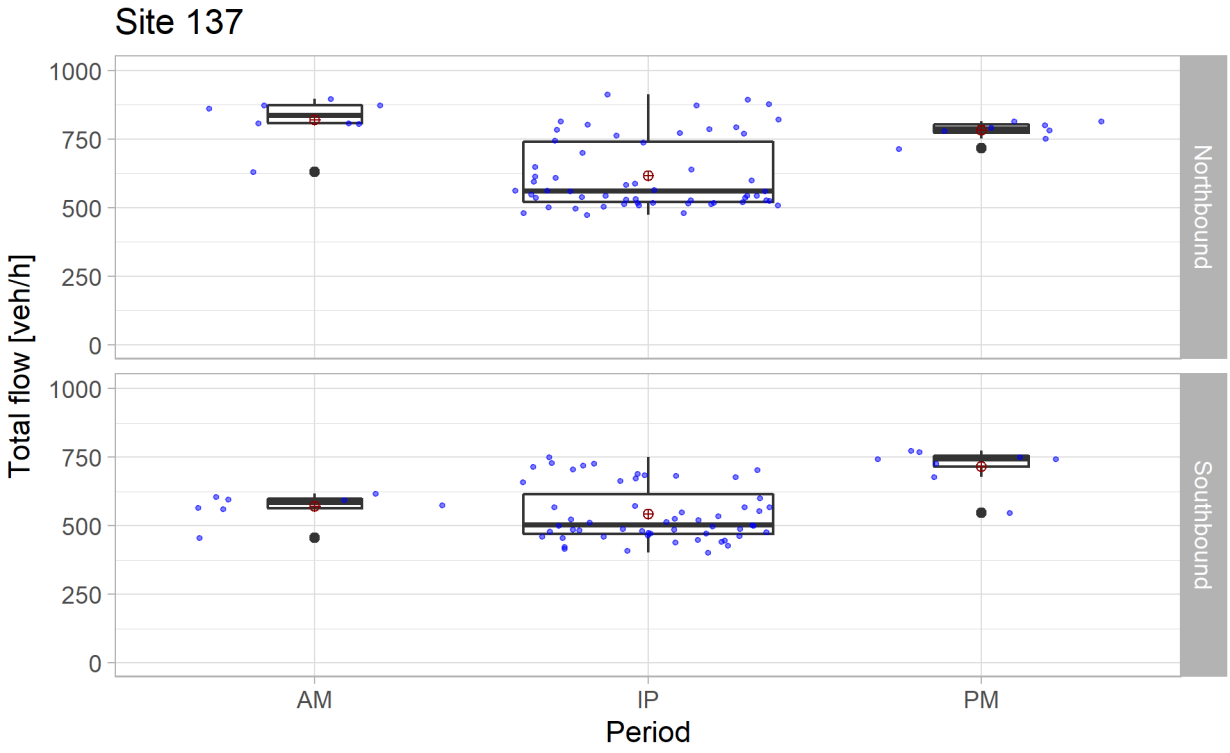
Site 134

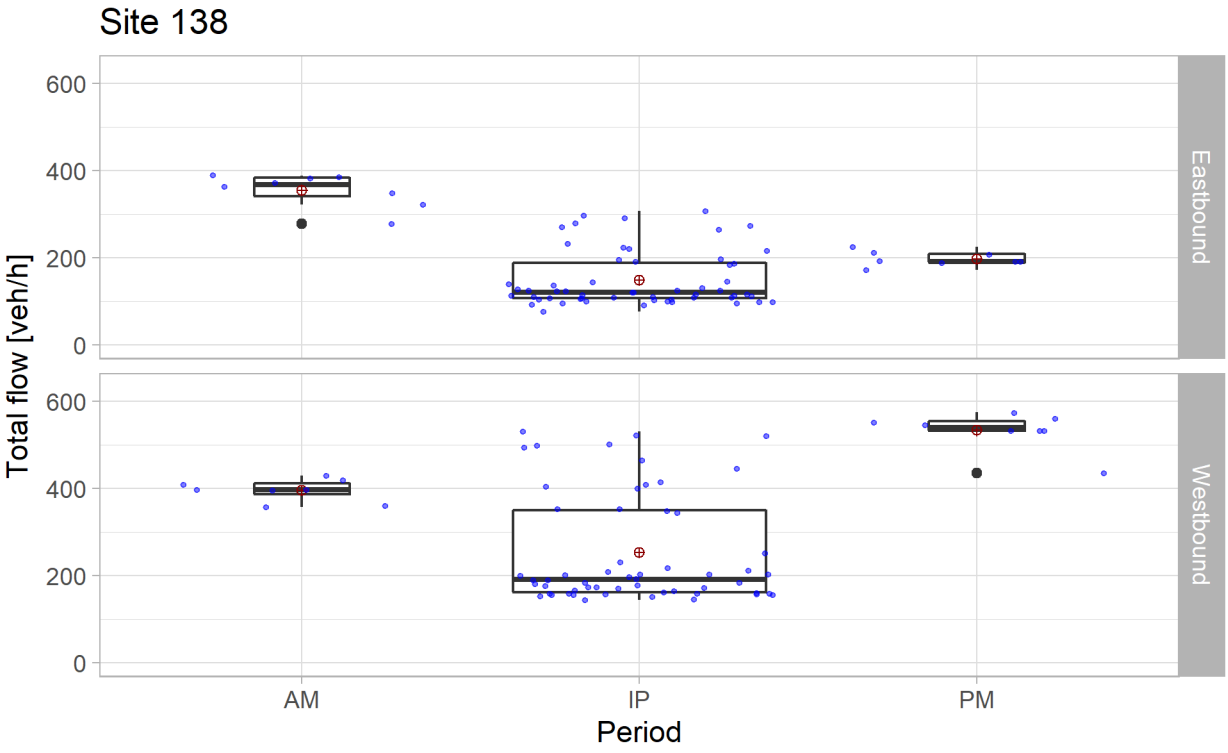


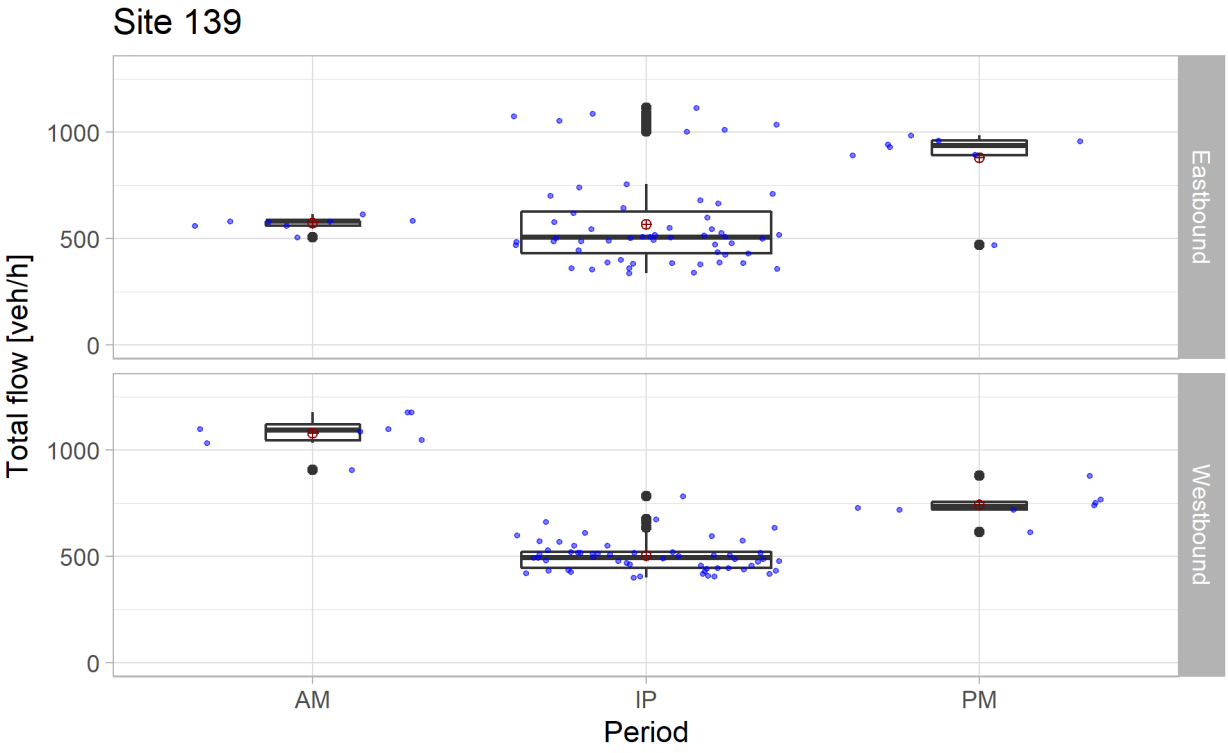
Site 135



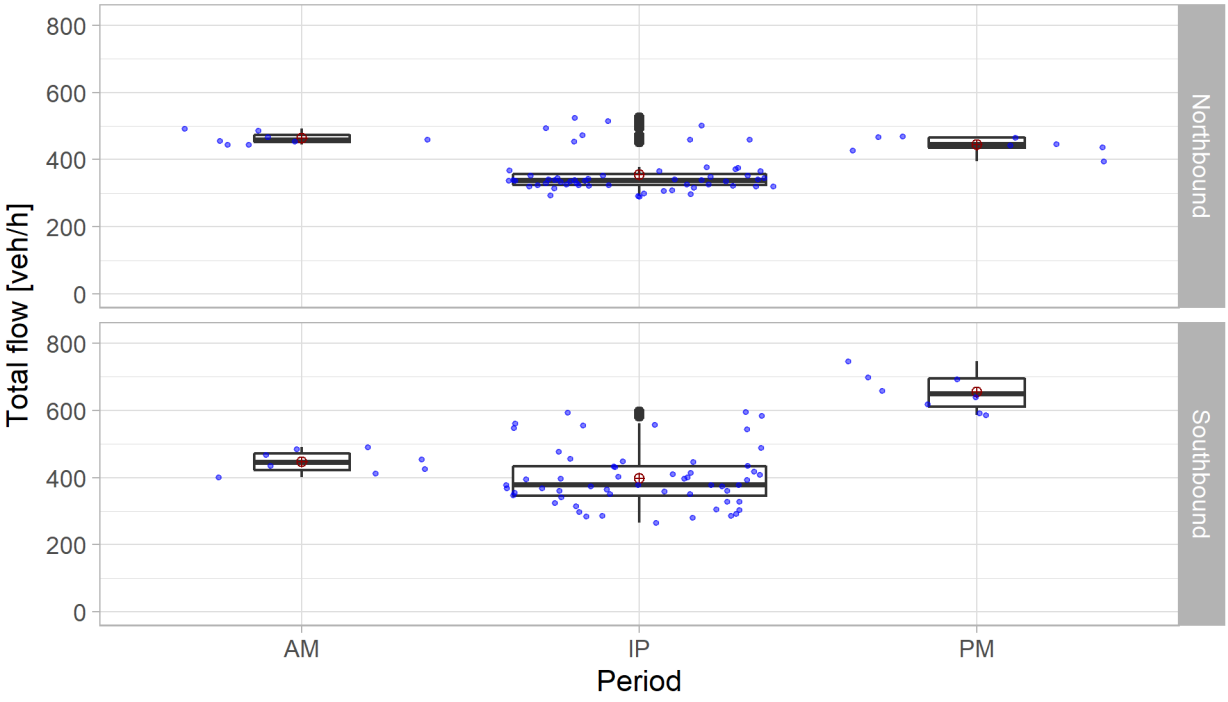

Site 136
Total flow [veh/h]
1200
800
400
0
Northbound
Southbound
AM
IP
PM
Period


Site 137
Total flow [veh/h]
1000
750
500
250
0
Northbound
Southbound
AM
IP
PM
Period

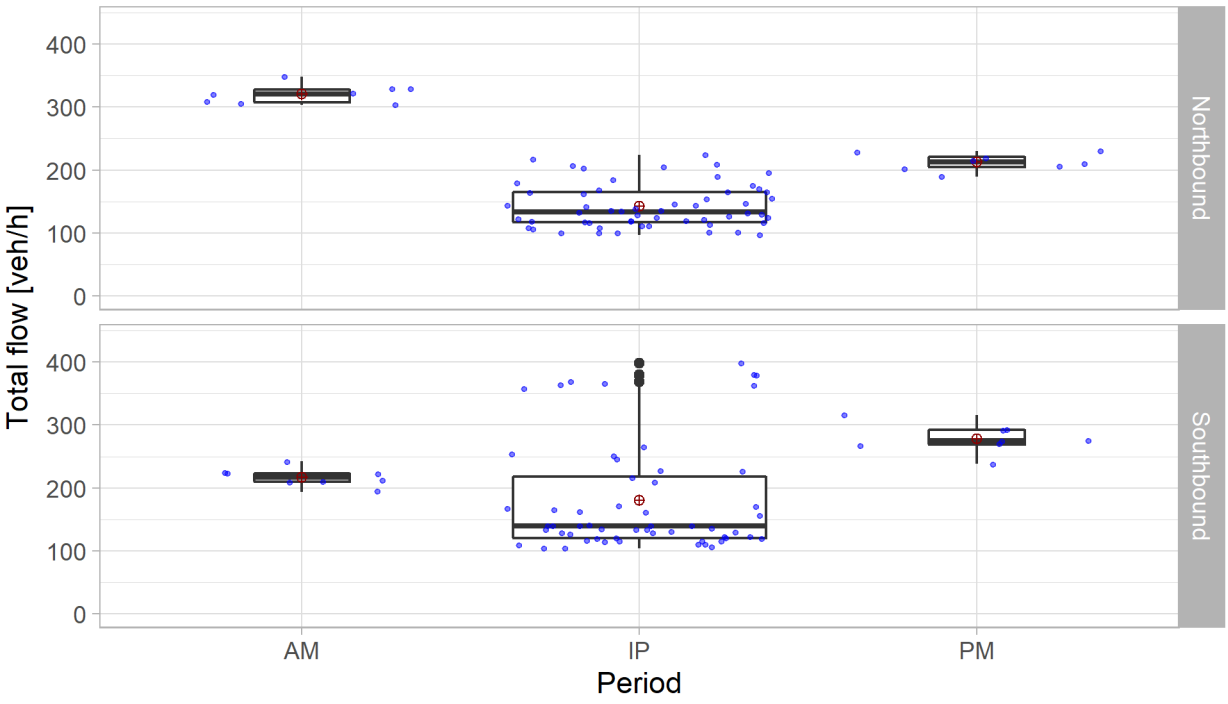

Site 138
Total flow [veh/h]
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period

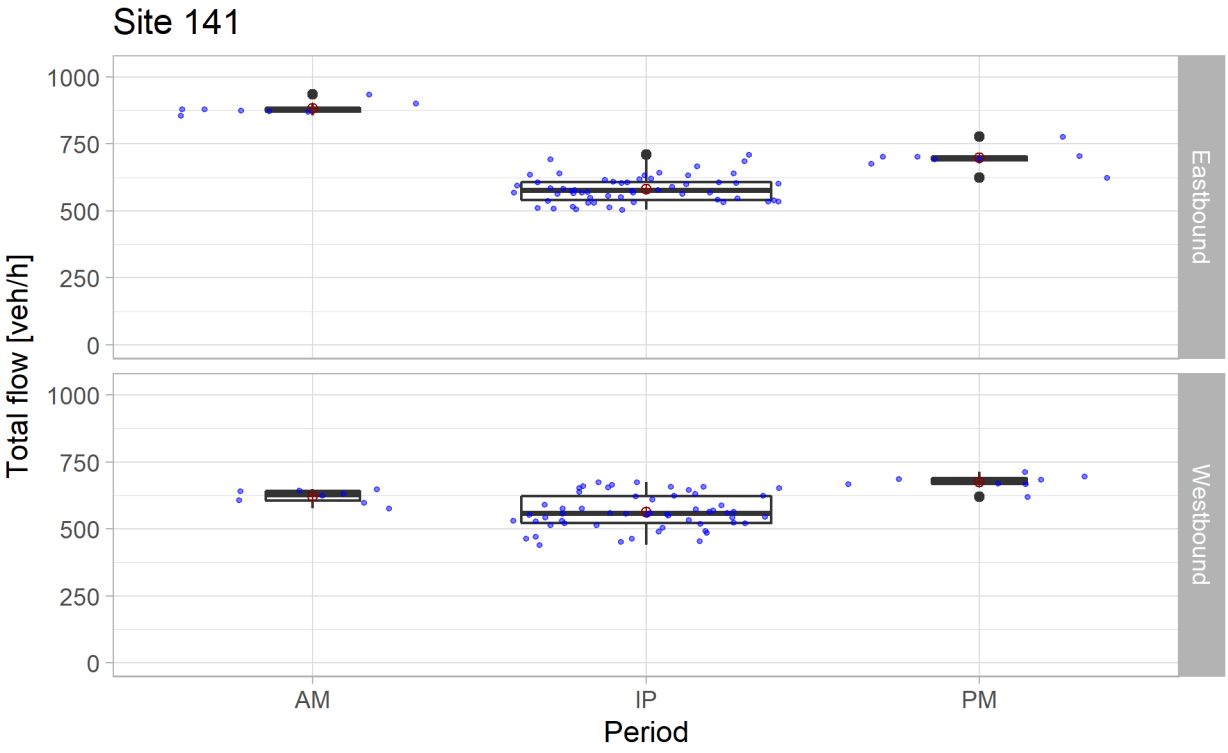

Site 139
Total flow [veh/h]
1000
500
0
Eastbound
Westbound
AM
IP
PM
Period

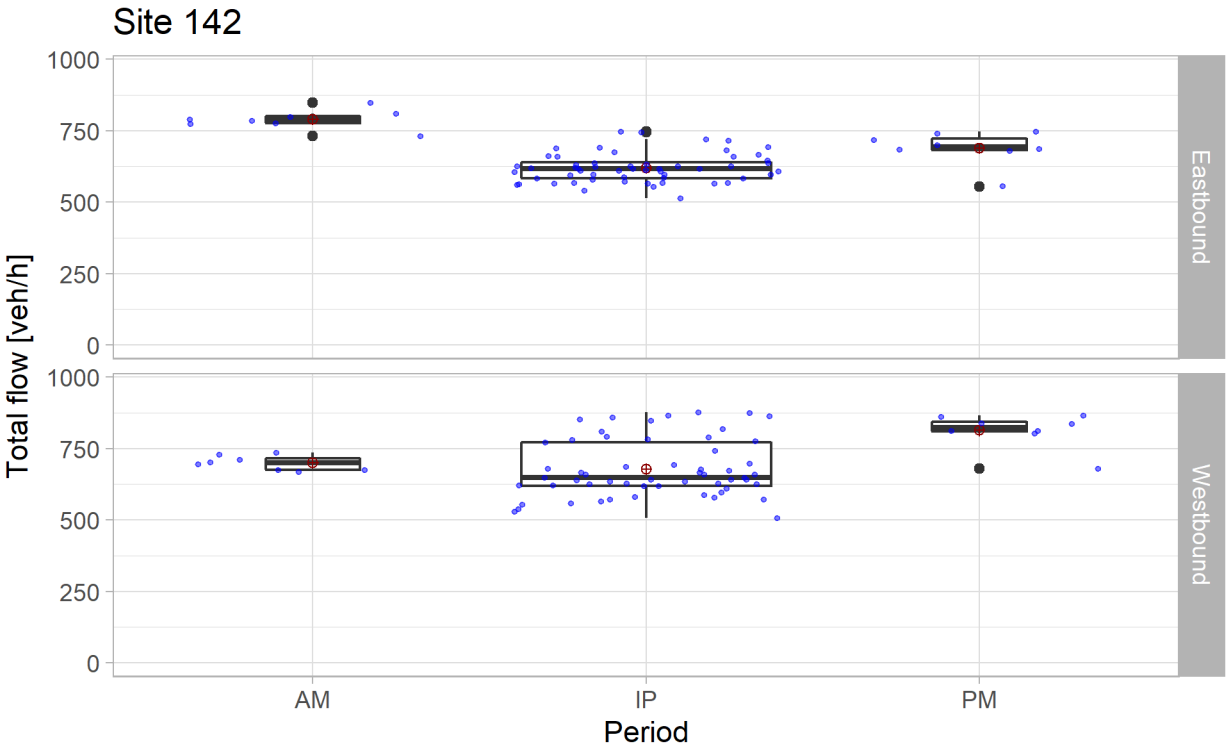
Site 14

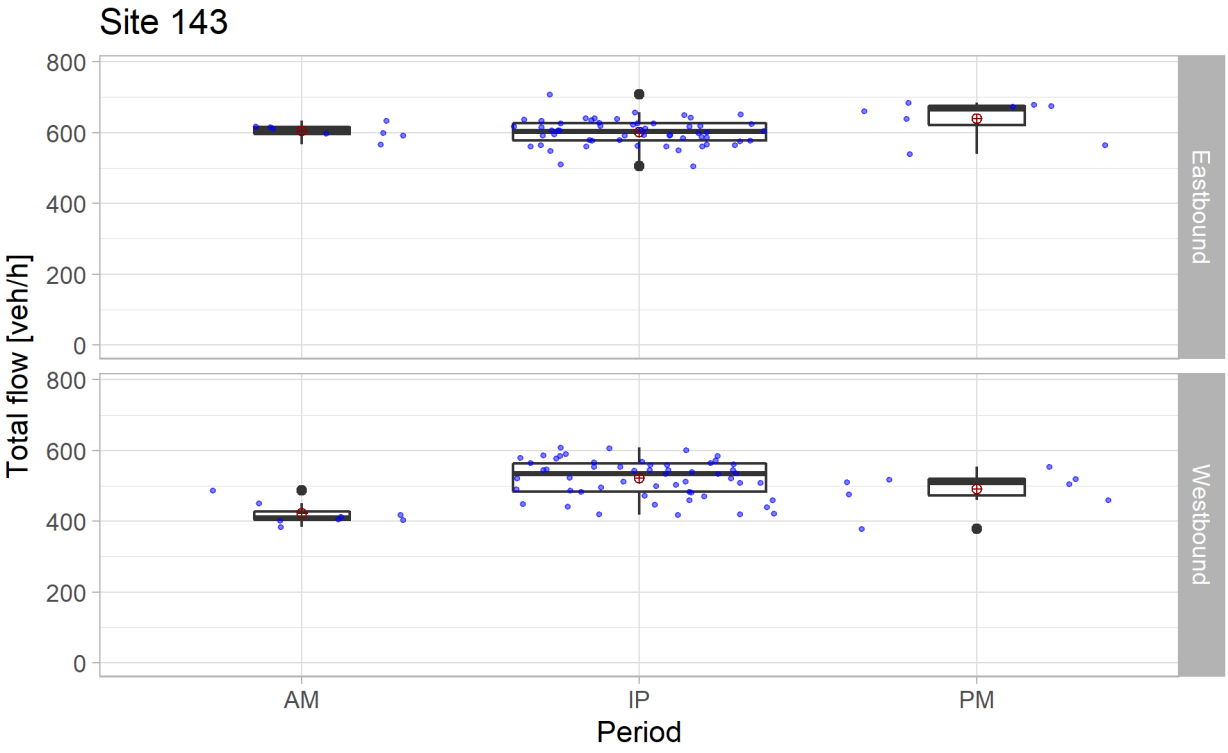


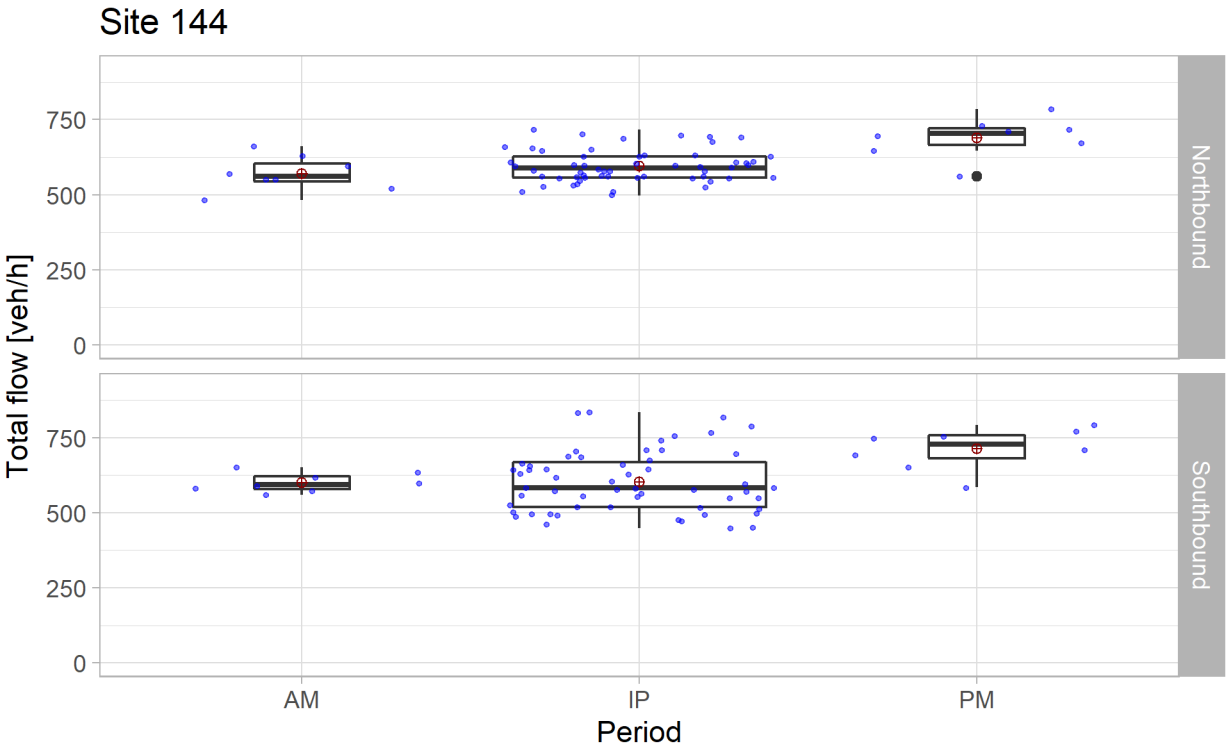
Site 140



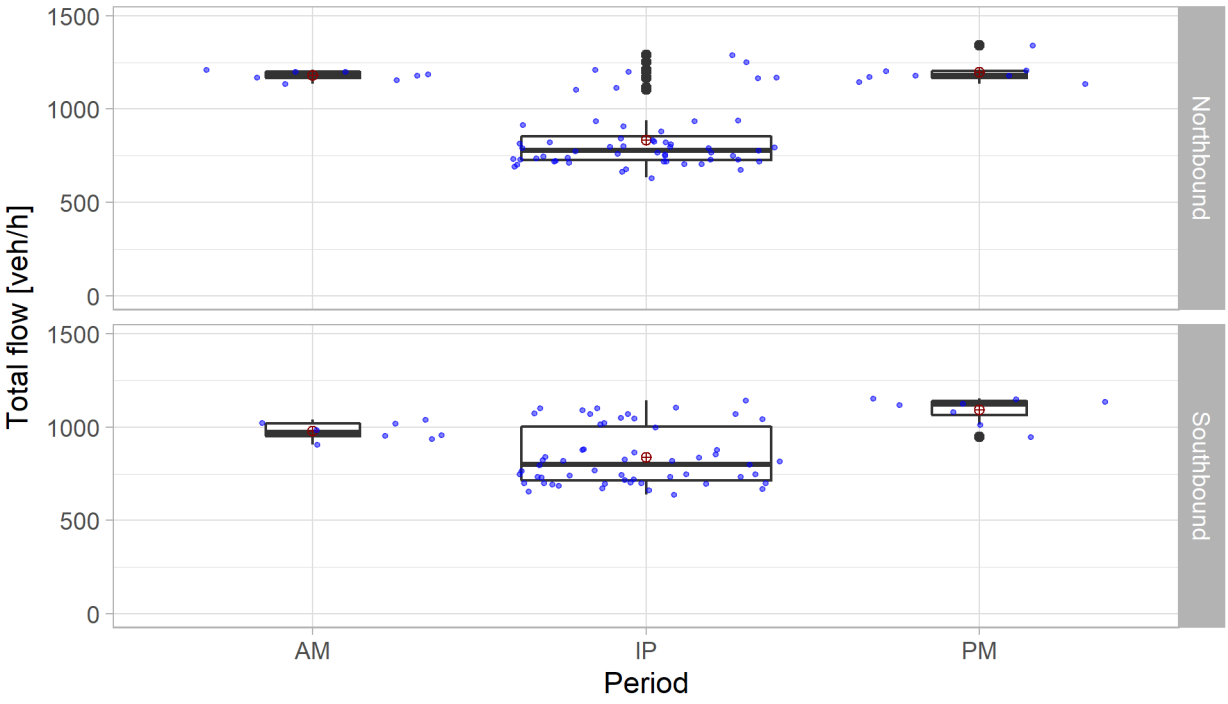

Site 141
Total flow [veh/h]
1000
750
500
250
0
Eastbound
Westbound
AM
IP
PM
Period


Site 142
Total flow [veh/h]
1000
750
500
250
0
Eastbound
Westbound
AM
IP
PM
Period

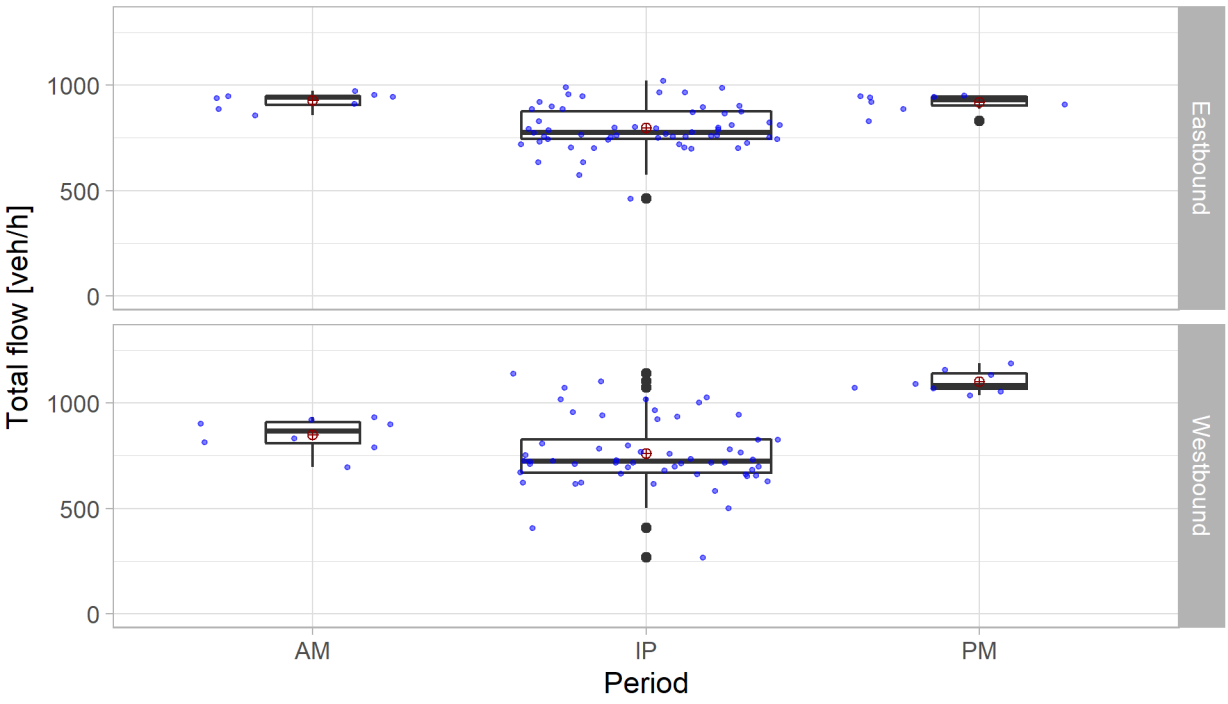

Site 143
Total flow [veh/h]
800
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period

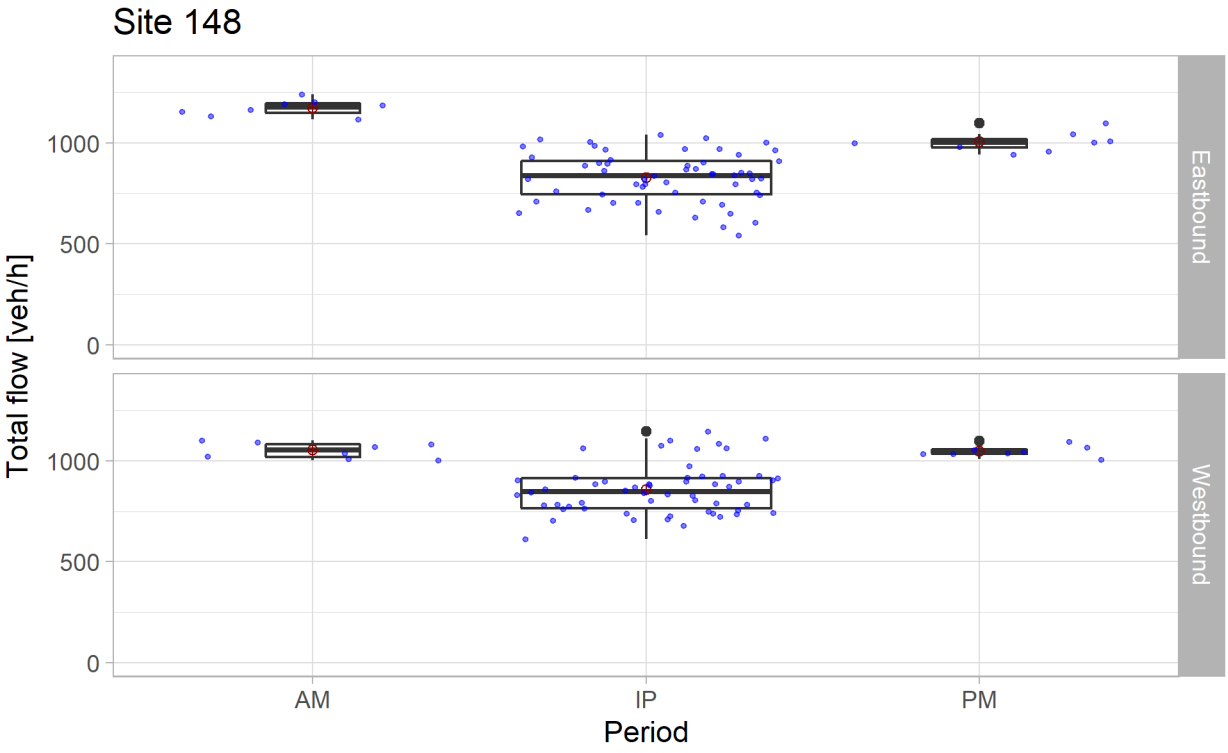

Site 144
Total flow [veh/h]
750
500
250
0
Northbound
Southbound
AM
IP
PM
Period

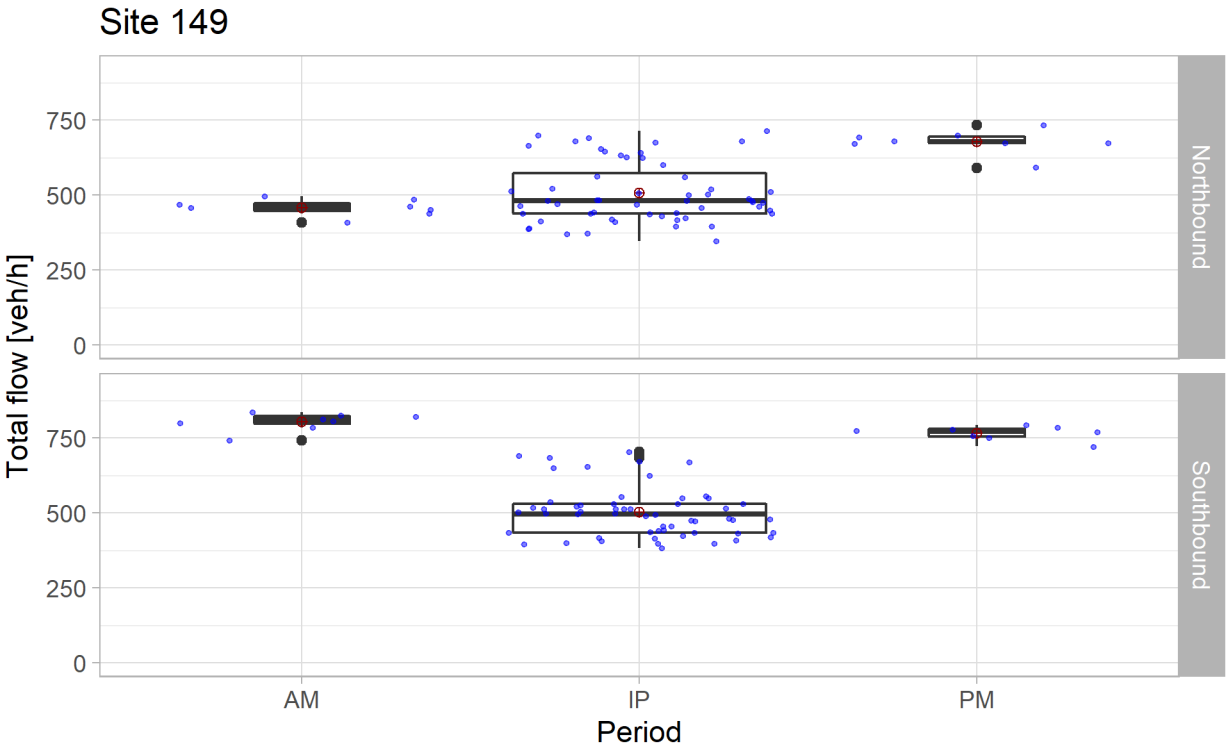
Site 145



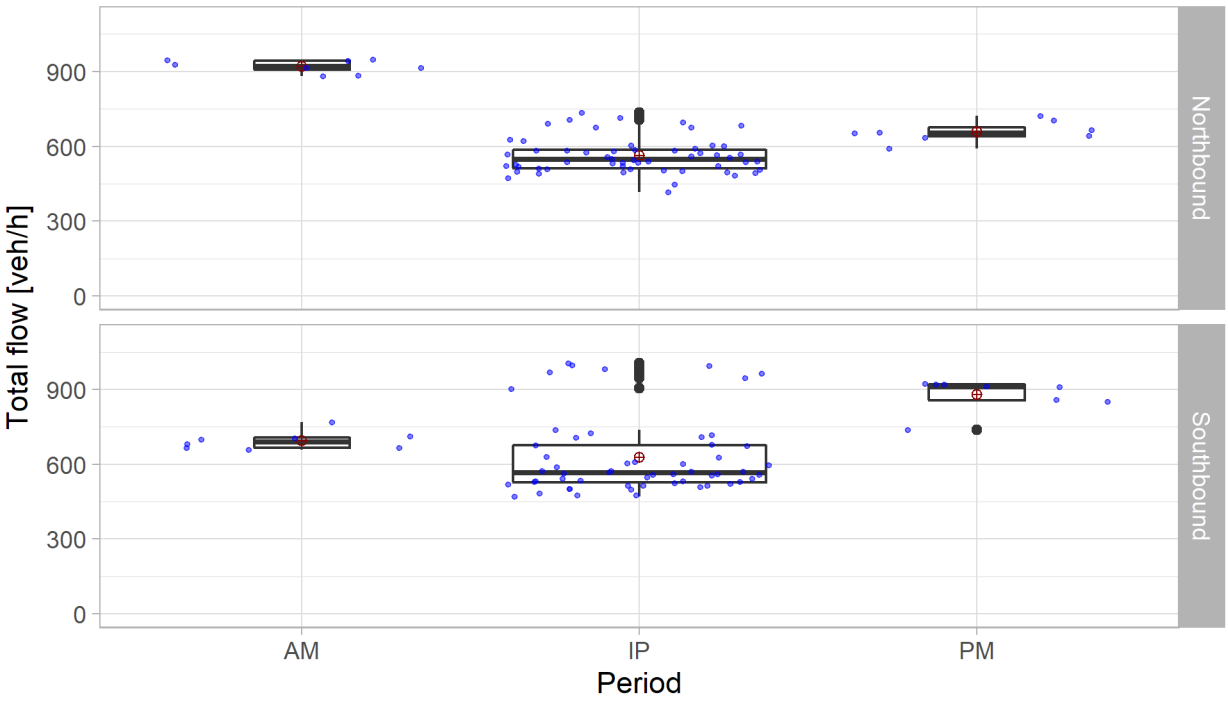
Site 146



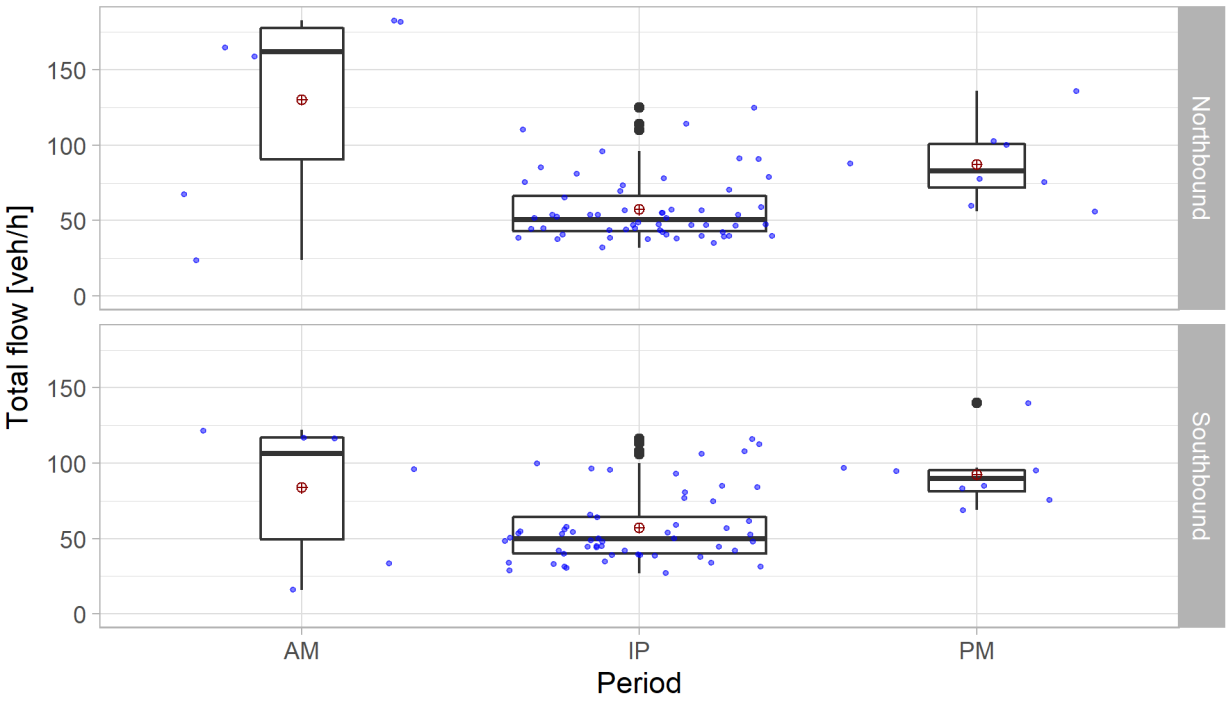

Site 148
Total flow [veh/h]
1000
500
0
Eastbound
Westbound
AM
IP
PM
Period


Site 149
Total flow [veh/h]
750
500
250
0
Northbound
Southbound
AM
IP
PM
Period

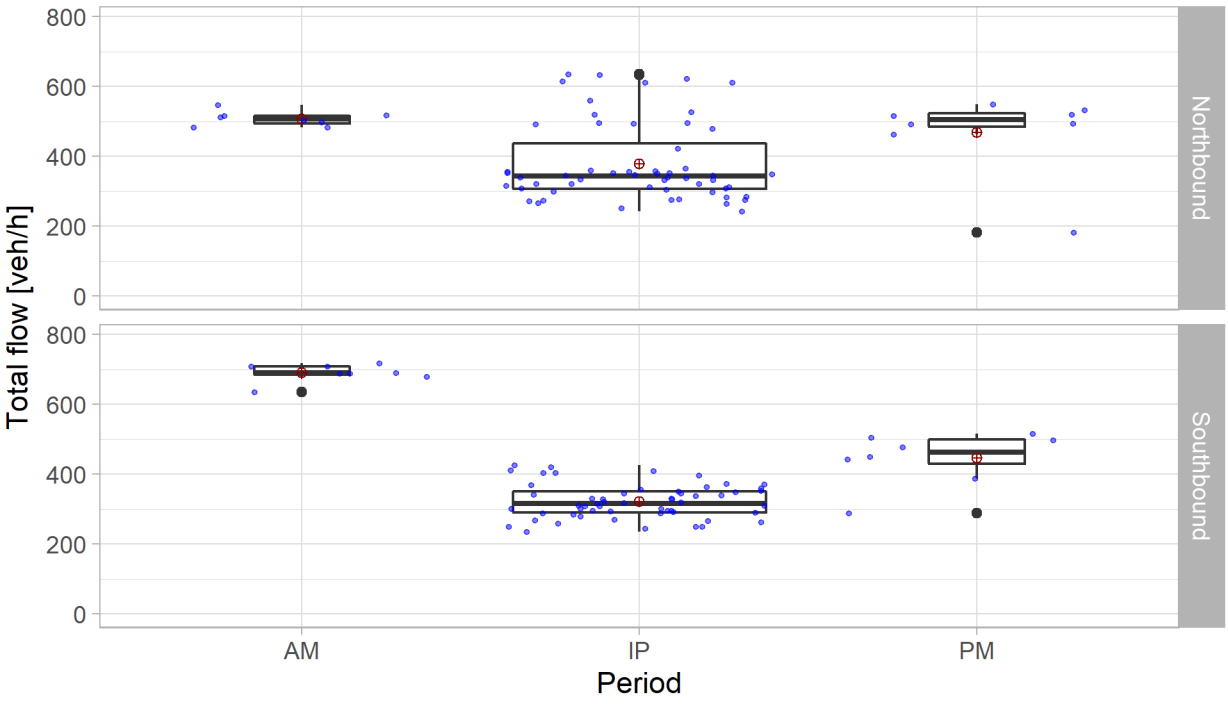
Site 15



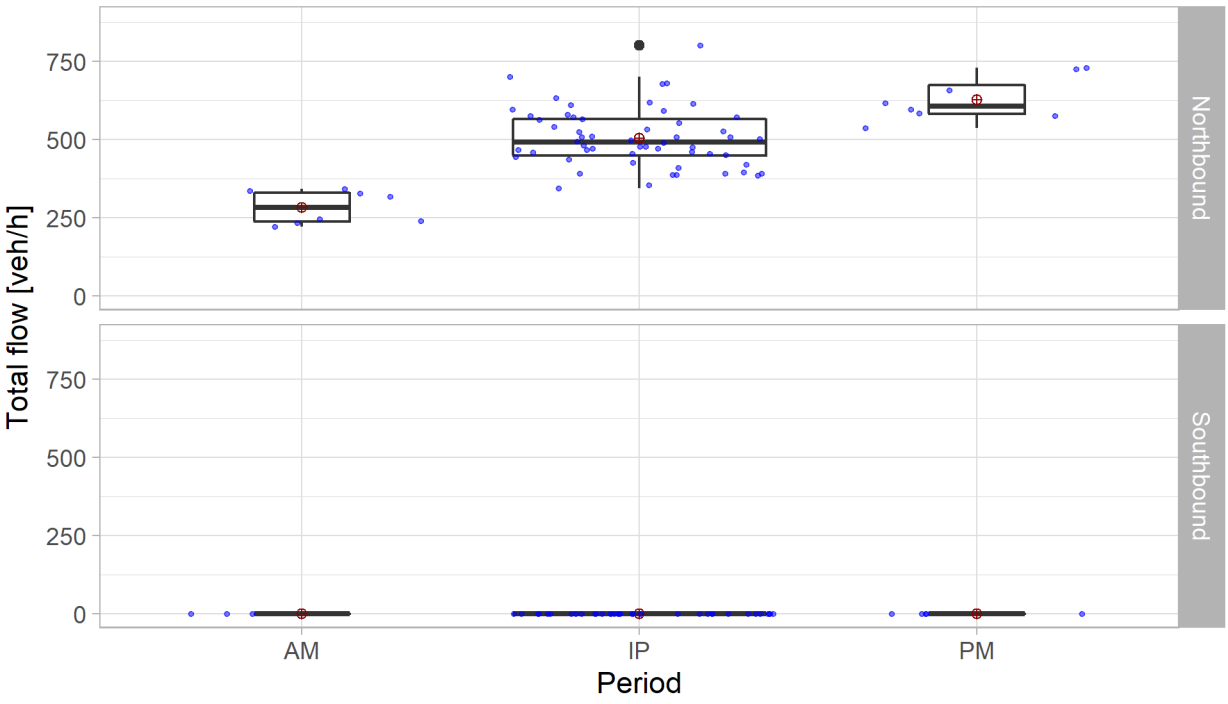
Site 150



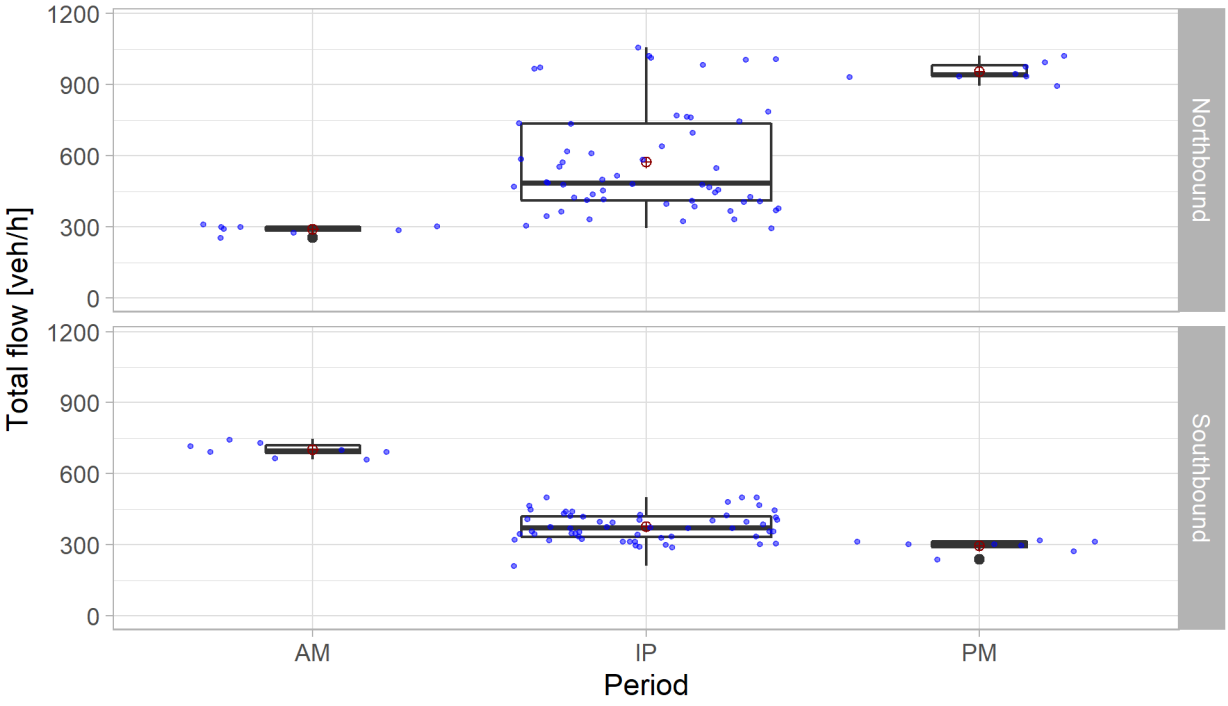
Site 151



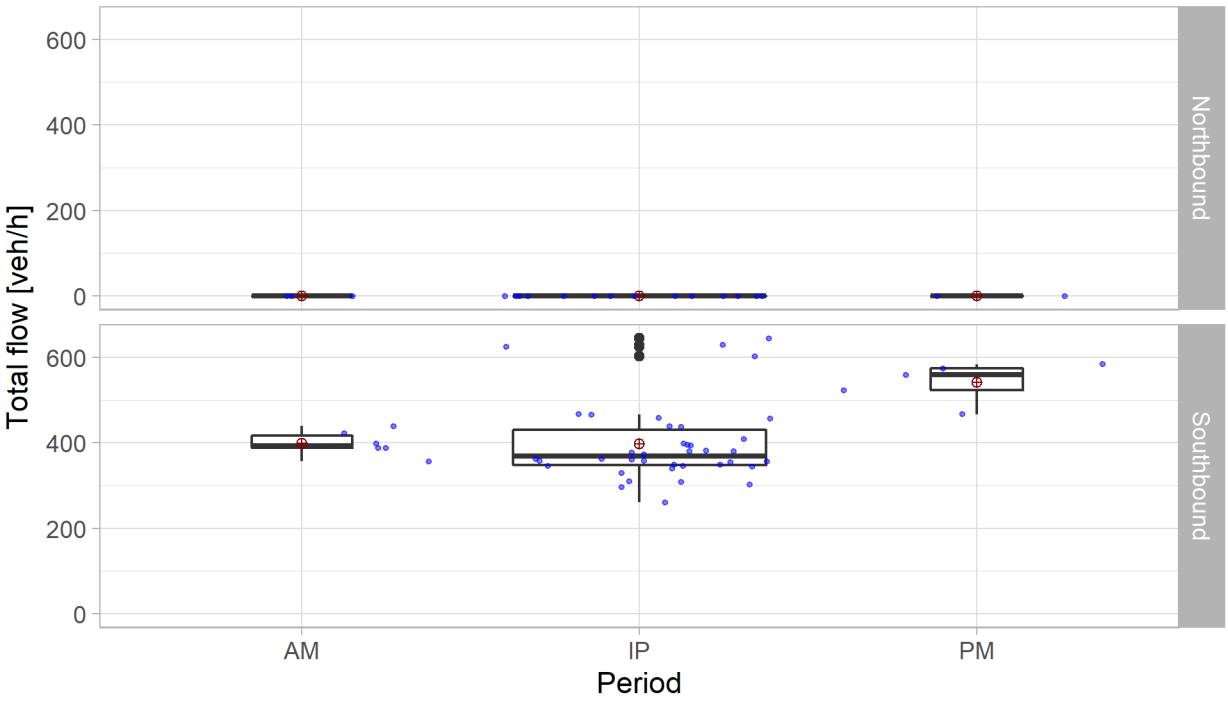
Site 152



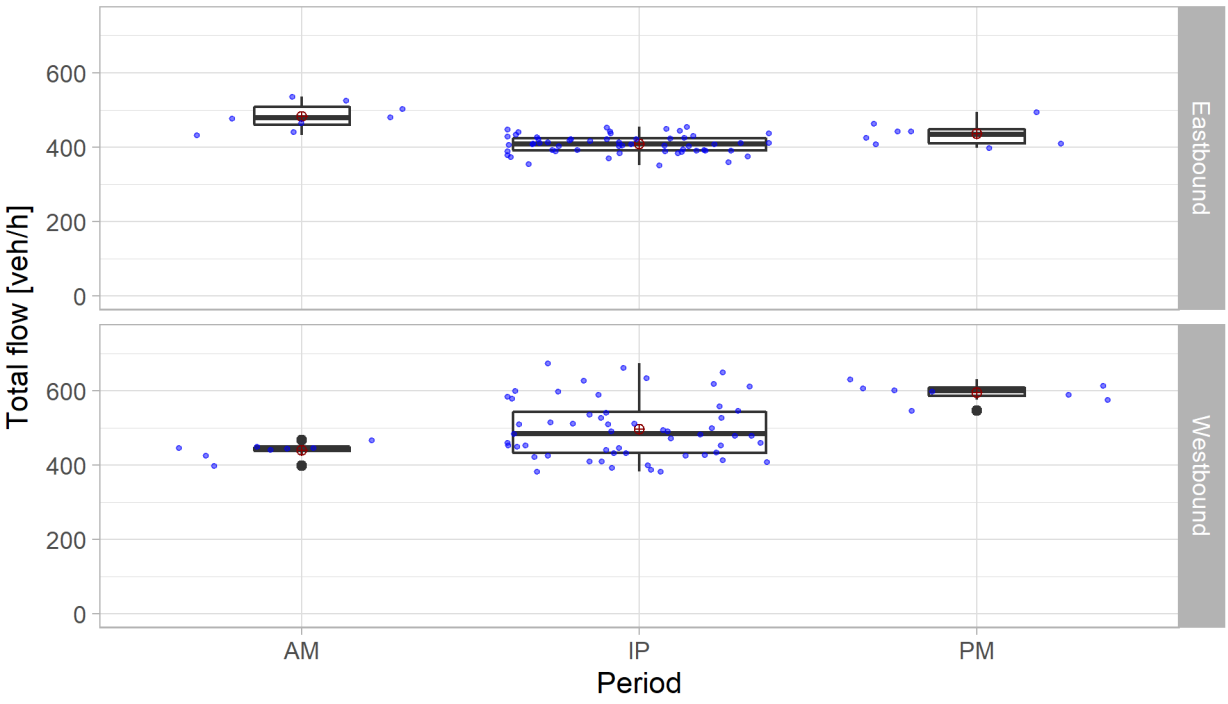
Site 153



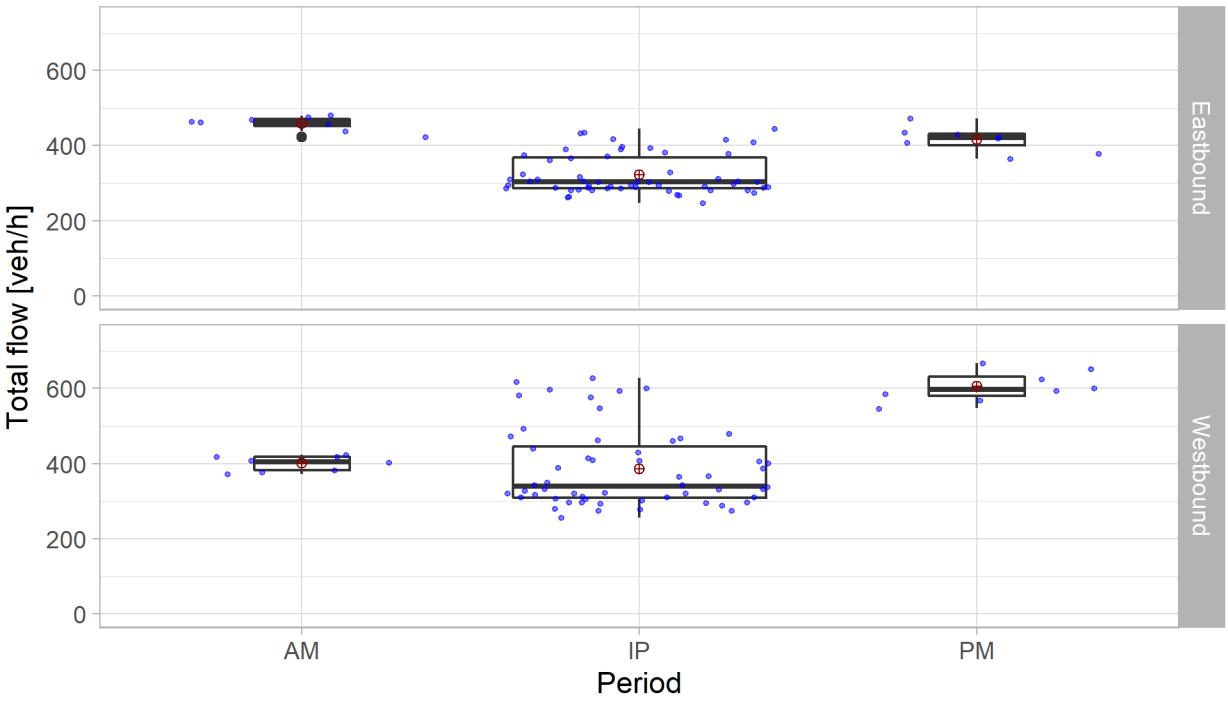
Site 154



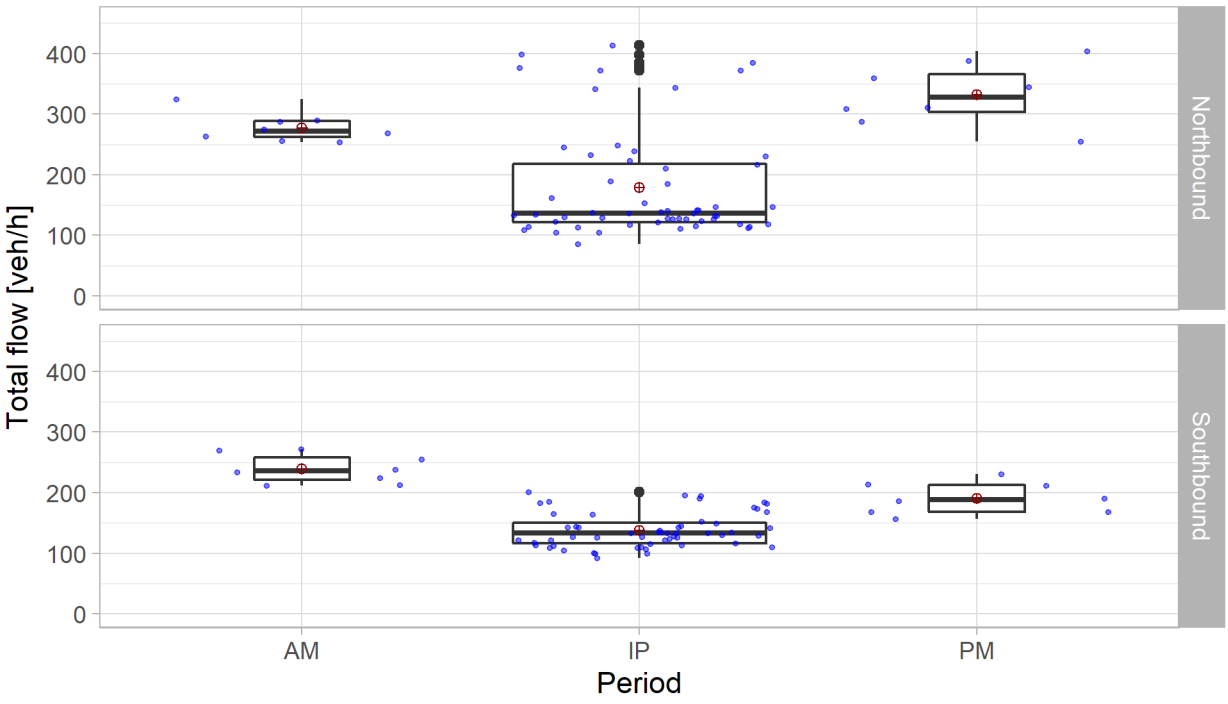
Site 155



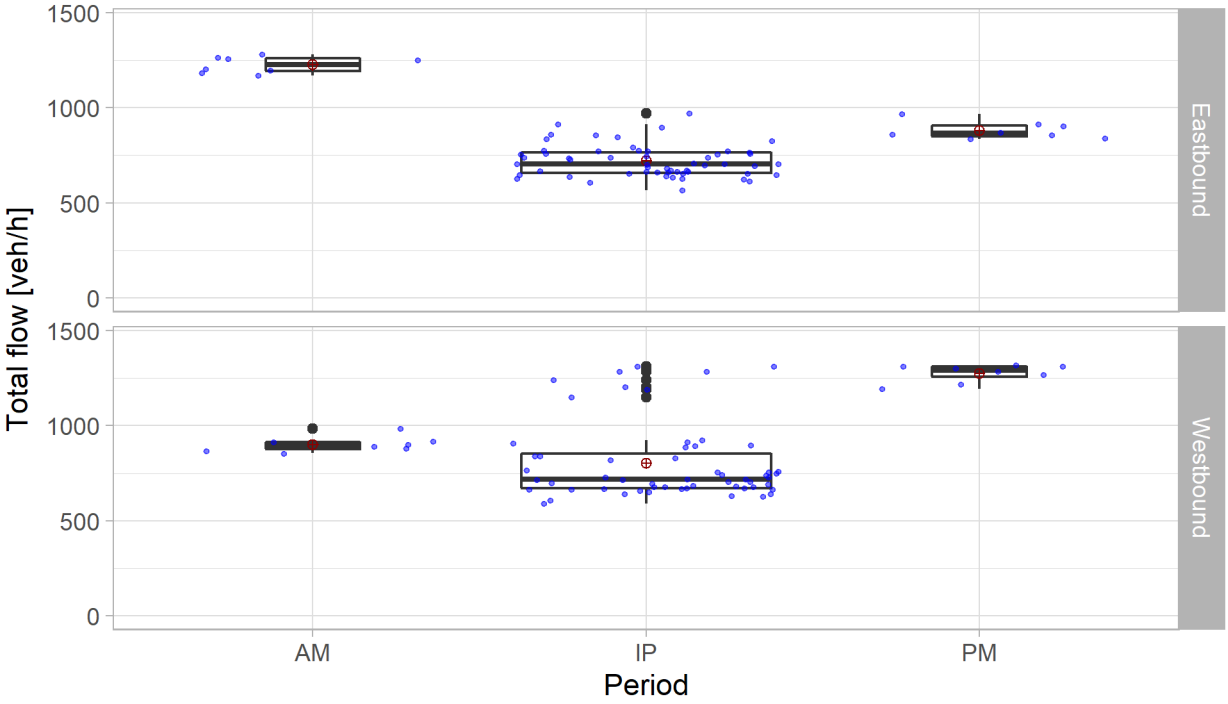
Site 156



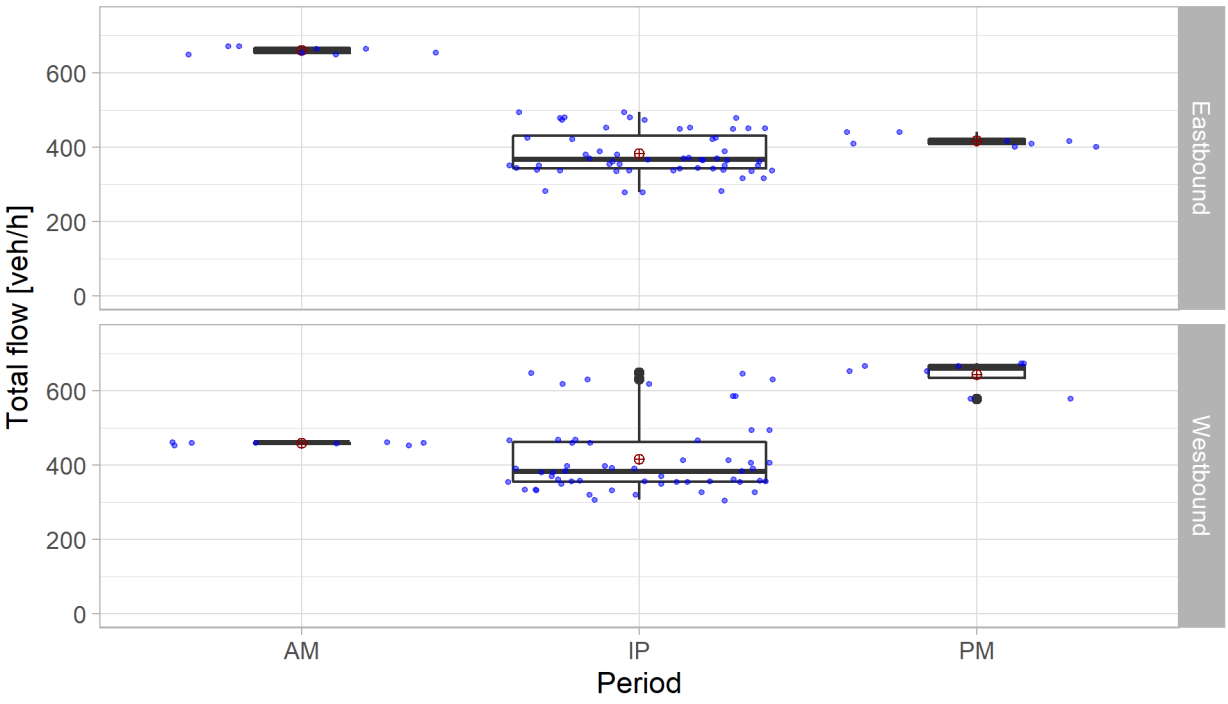
Site 157



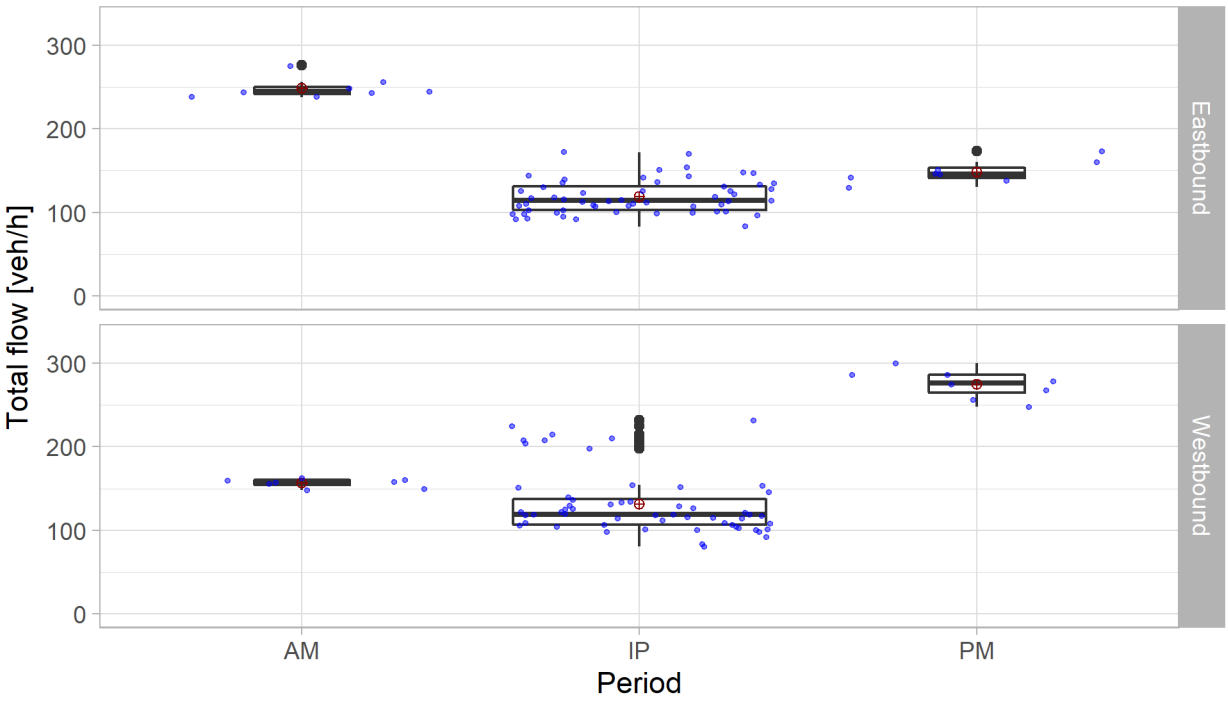
Site 158

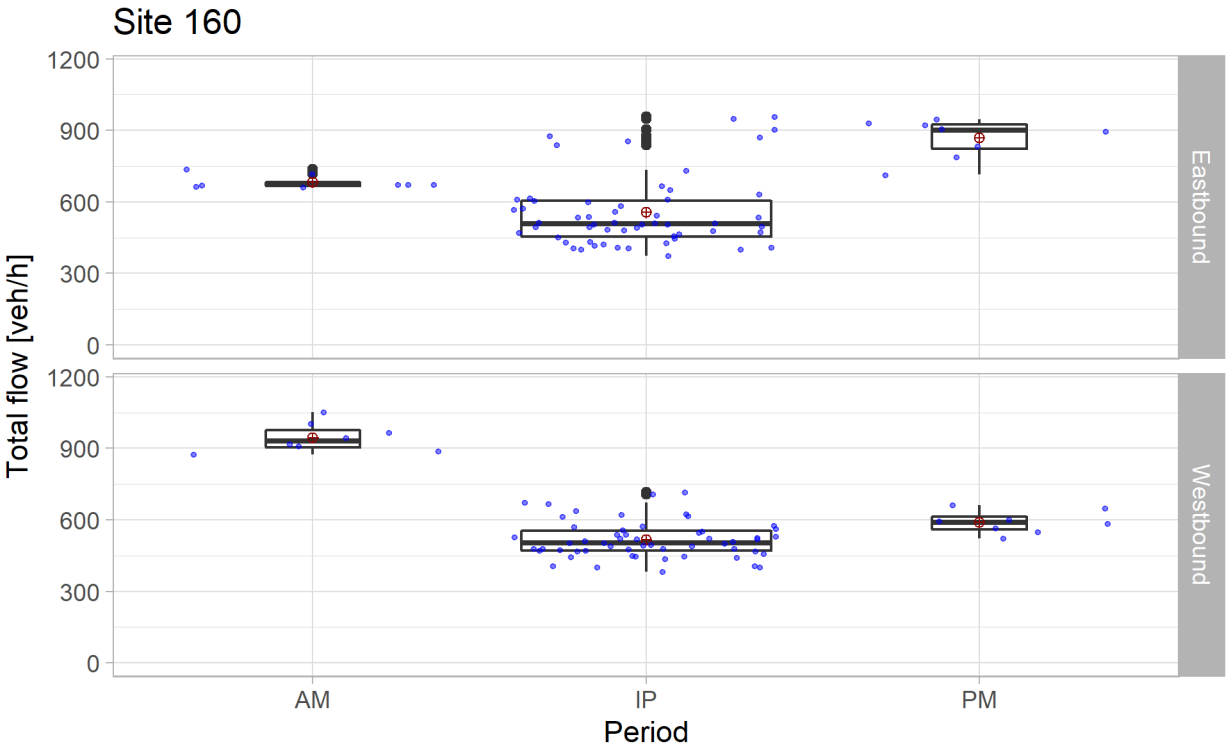


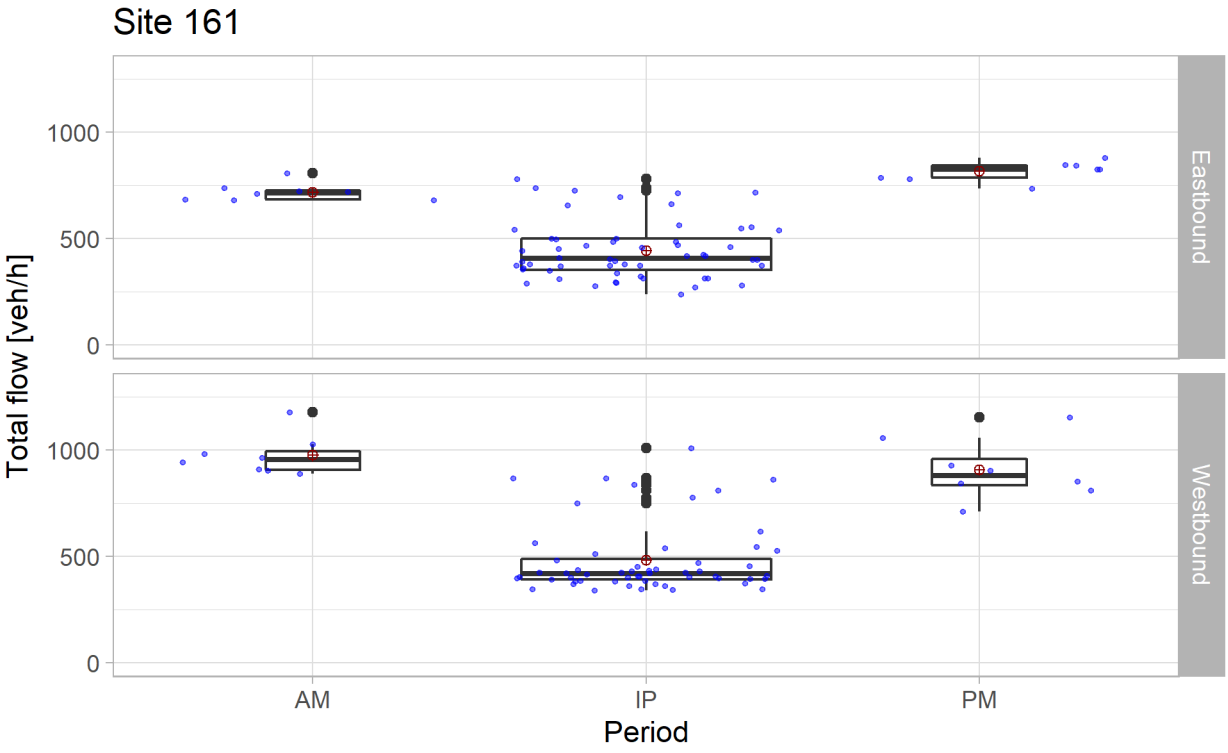
Site 159



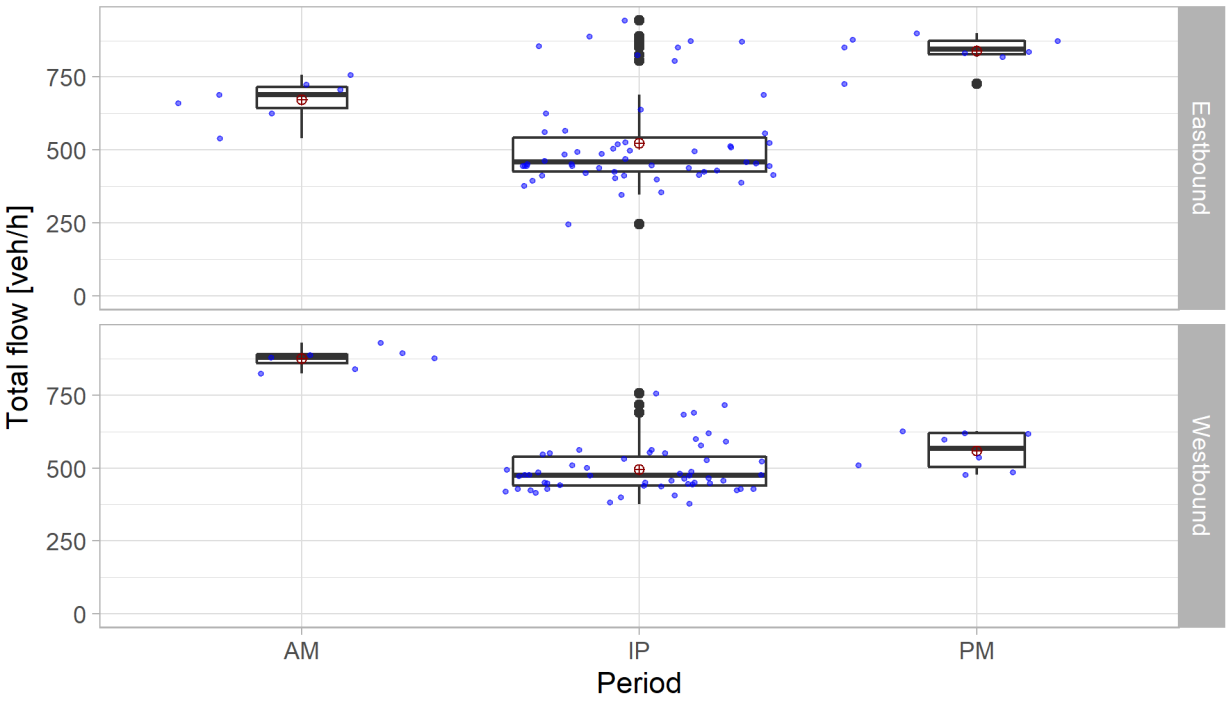
Site 16



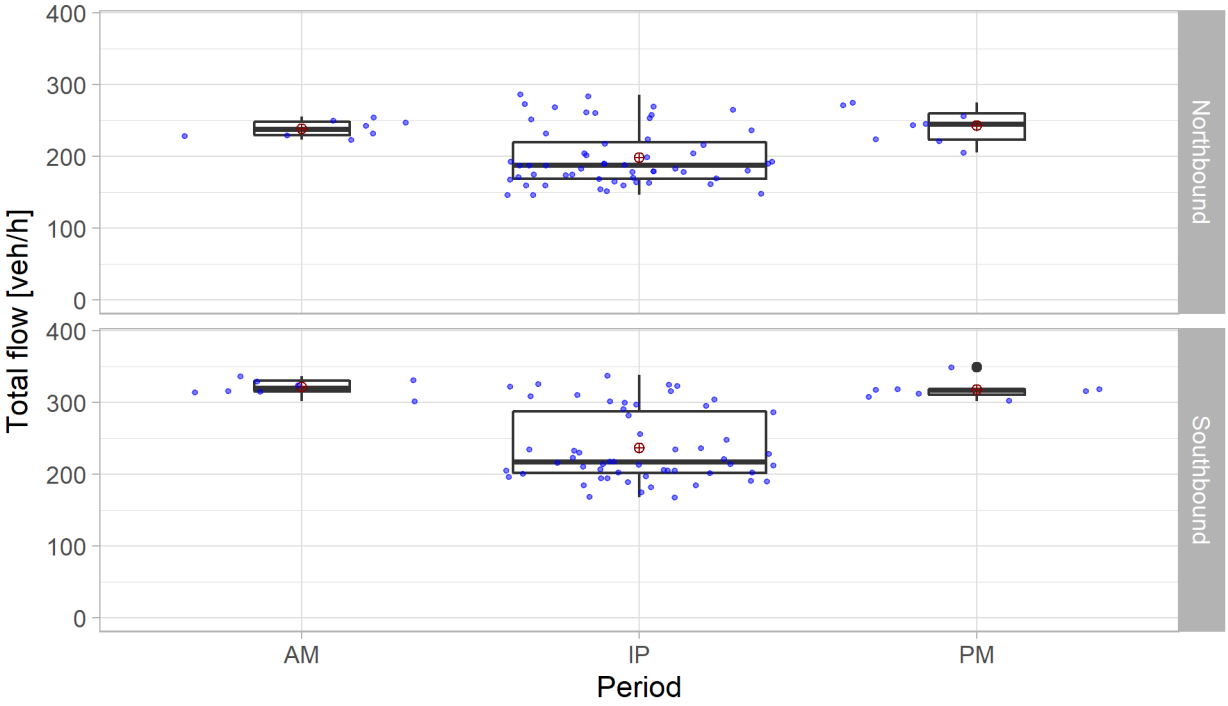

Site 160
Total flow [veh/h]
1200
900
600
300
0
Eastbound
Westbound
AM
IP
PM
Period

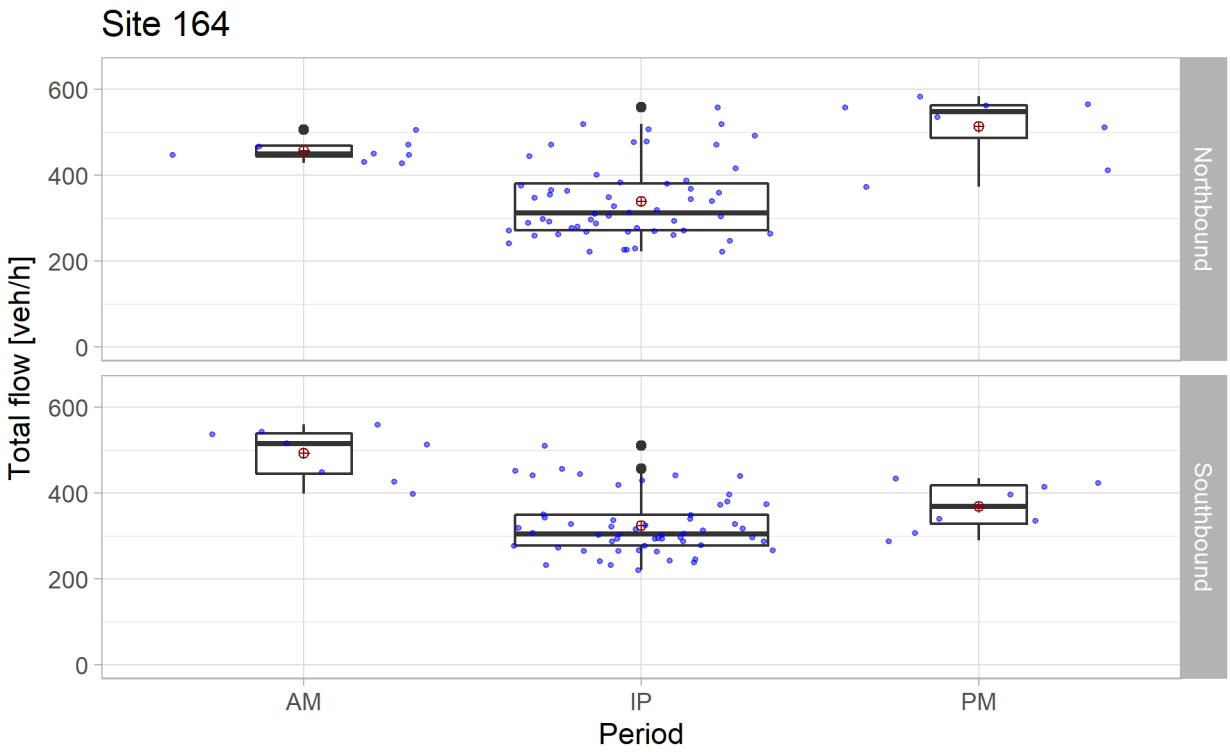

Site 161
Total flow [veh/h]
1000
500
0
Eastbound
Westbound
AM
IP
PM
Period

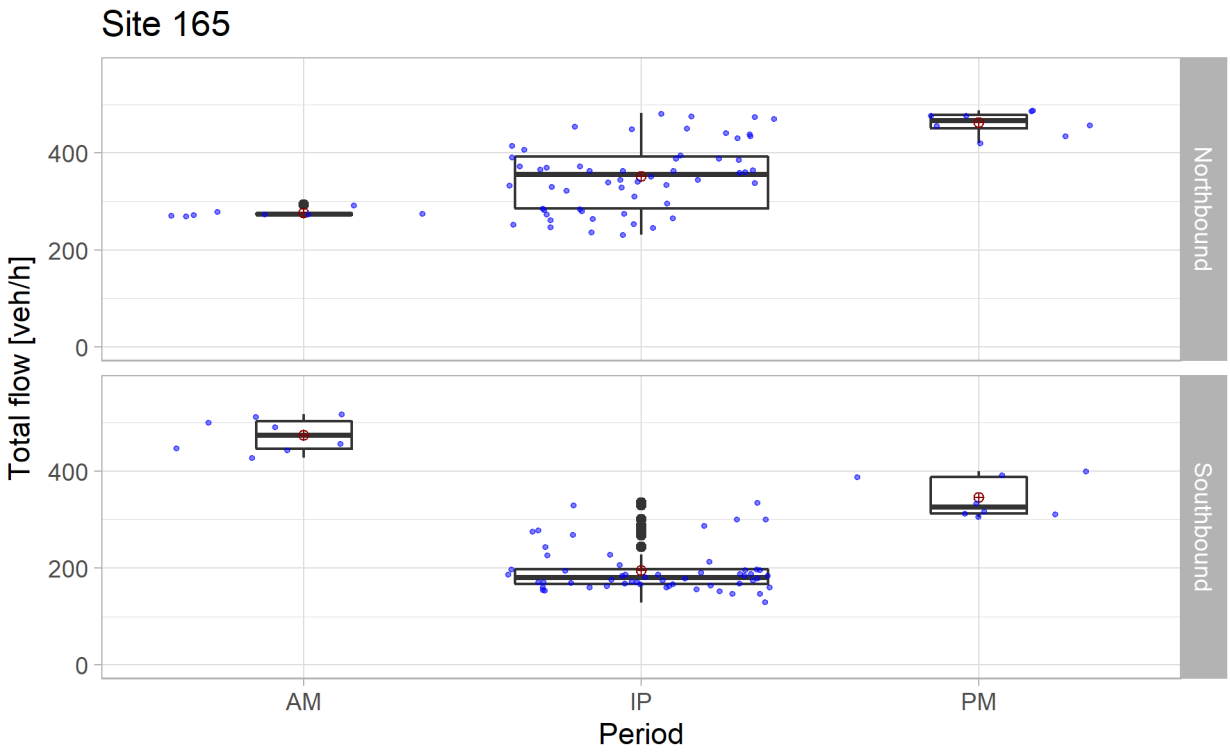
Site 162

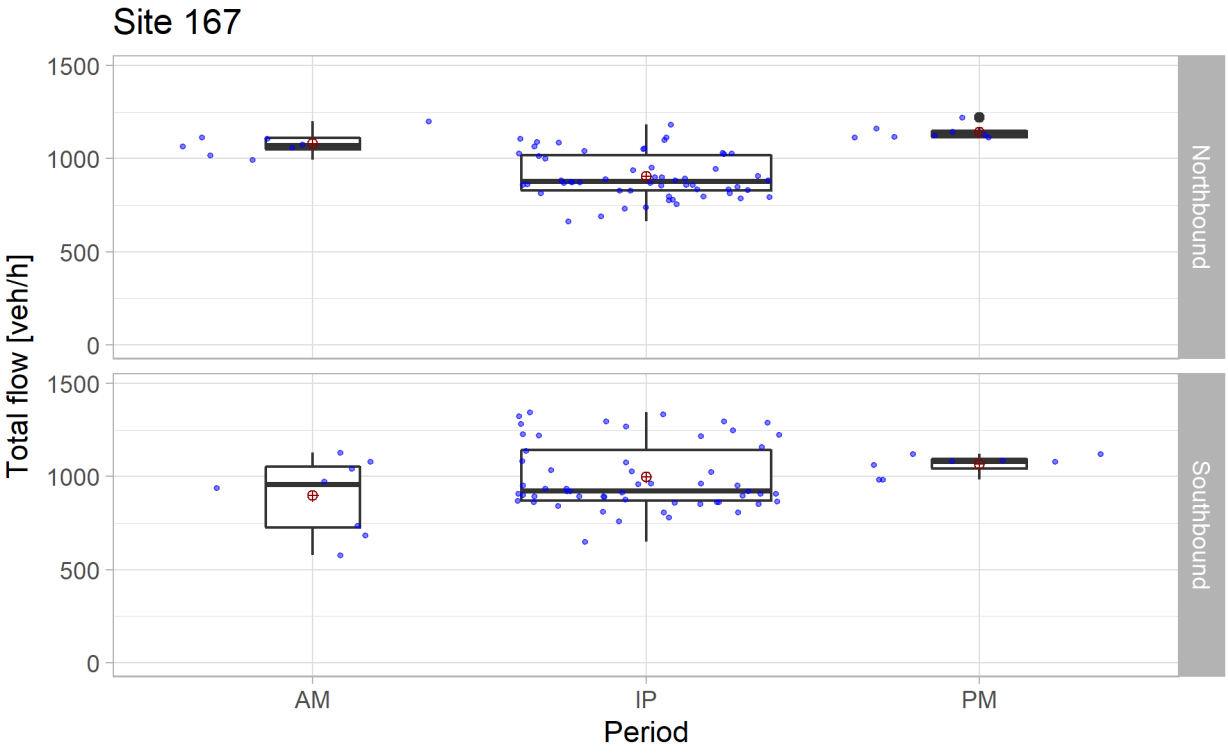


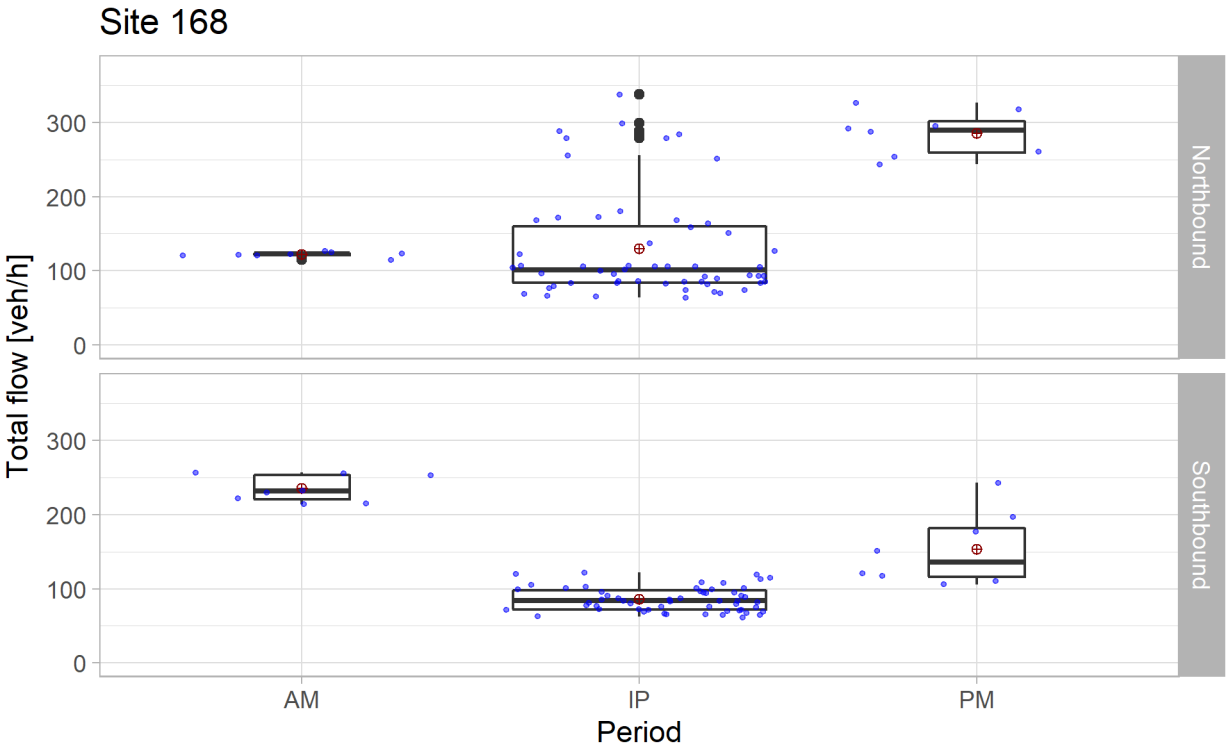
Site 163



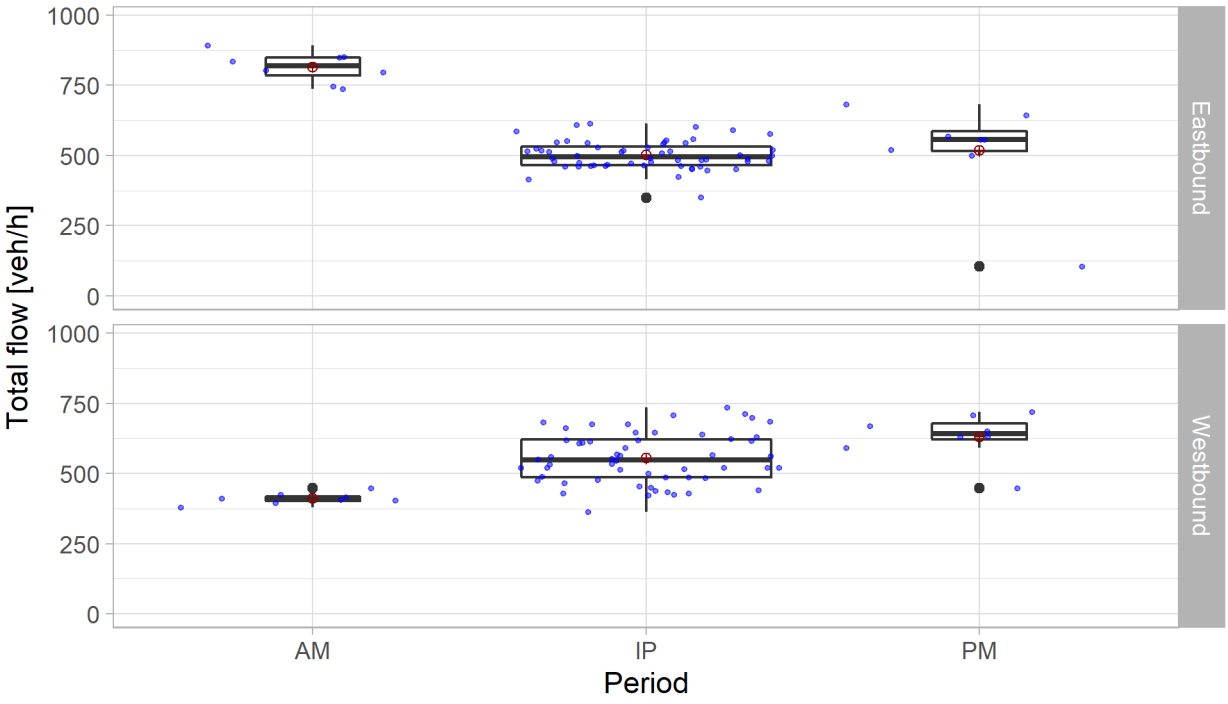

Site 164
Total flow [veh/h]
600
400
200
0
Northbound
Southbound
AM
IP
PM
Period


Site 165
Total flow [veh/h]
400
200
0
Northbound
Southbound
AM
IP
PM
Period

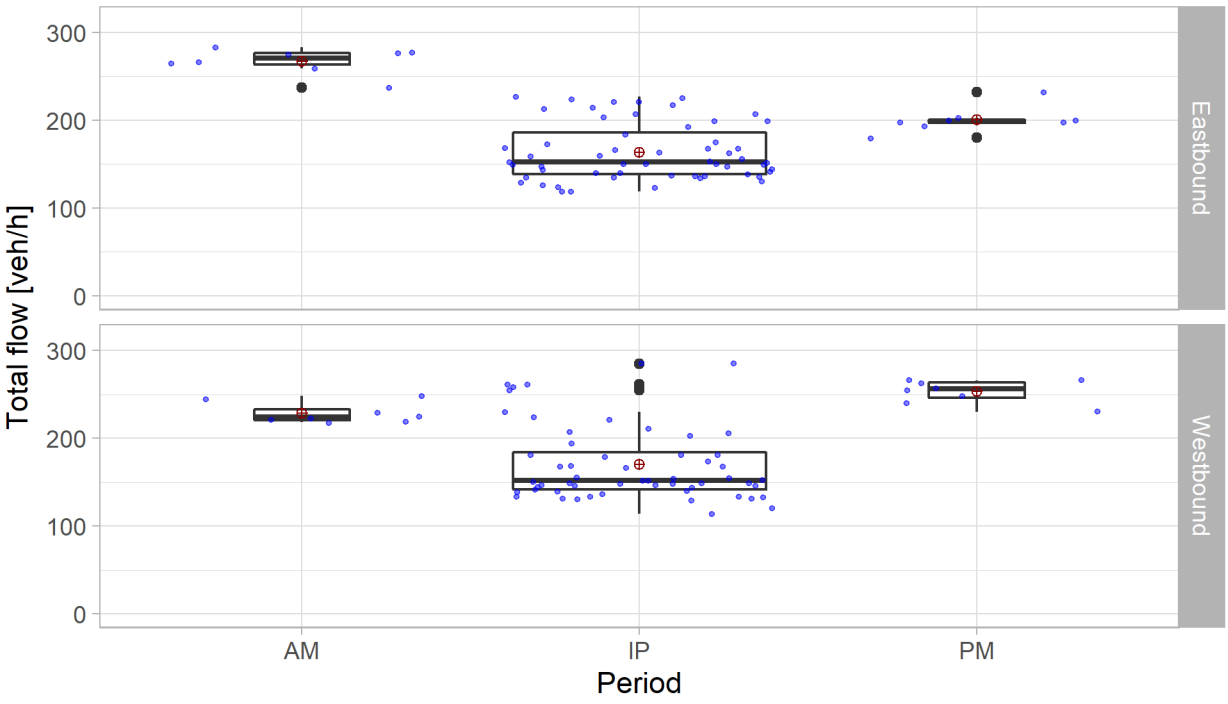

Site 167
1500
1000
500
0
Total flow [veh/h]
Northbound
Southbound
AM
IP
PM
Period


Site 168
300
200
100
0
Total flow [veh/h]
Northbound
Southbound
AM
IP
PM
Period

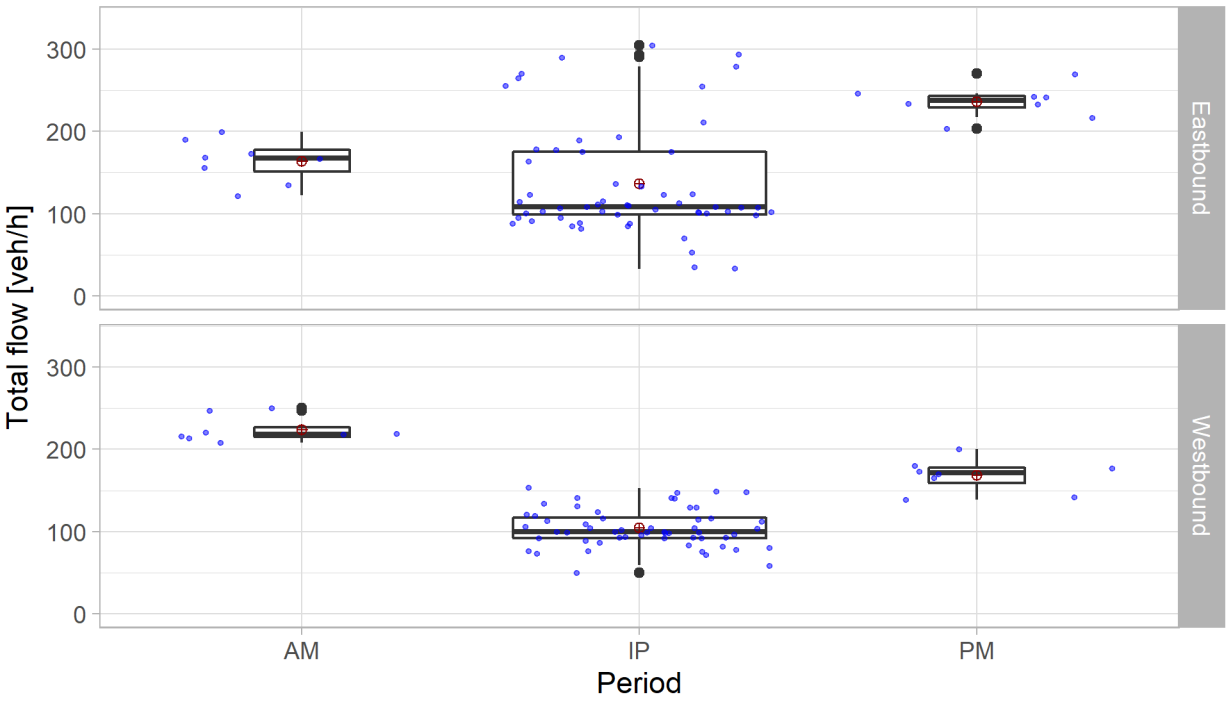
Site 169



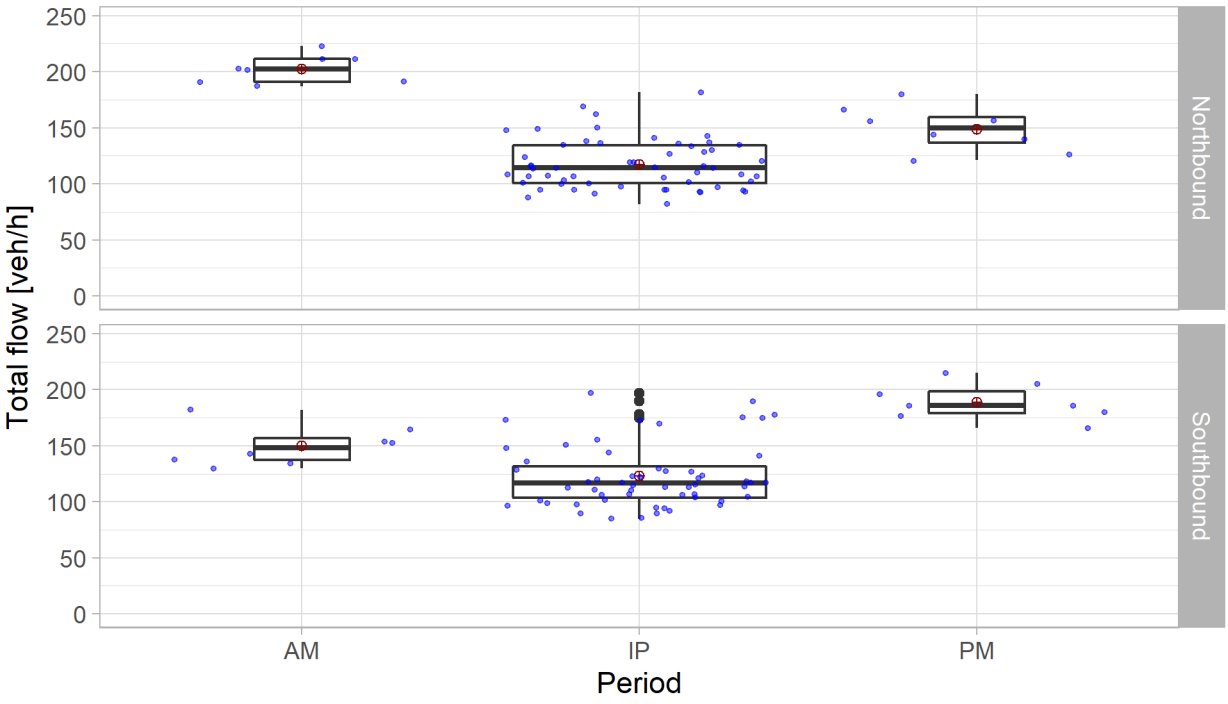
Site 17



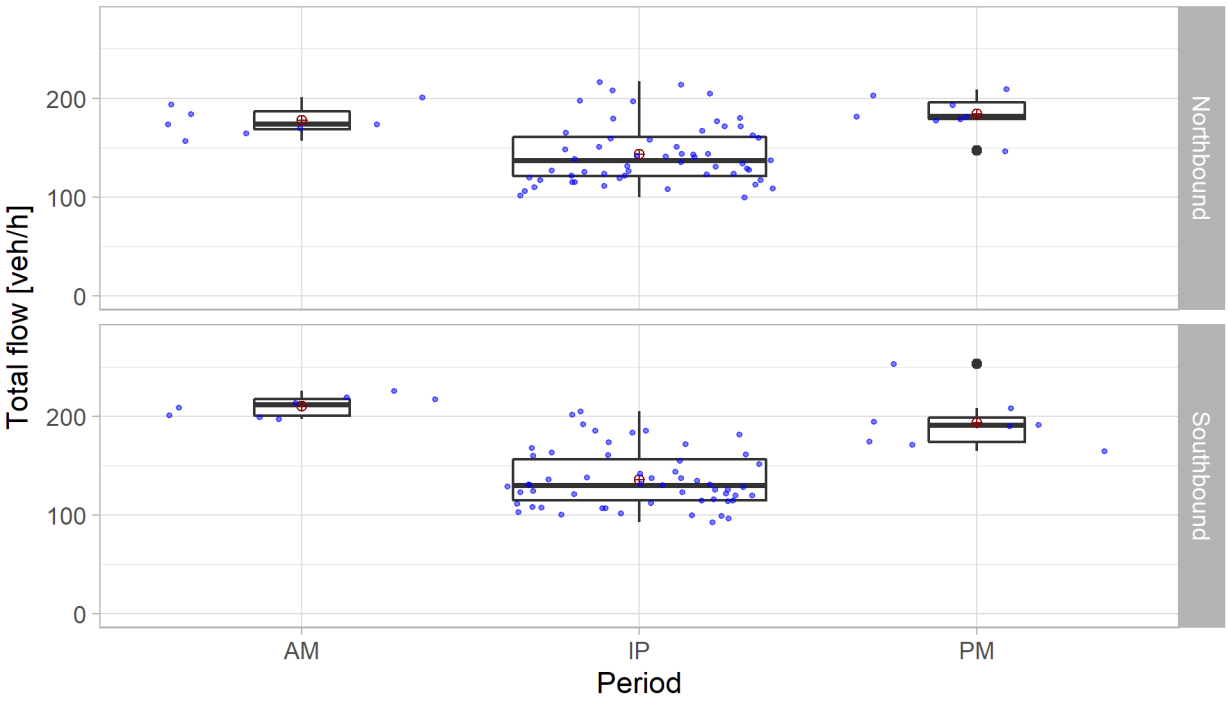
Site 170



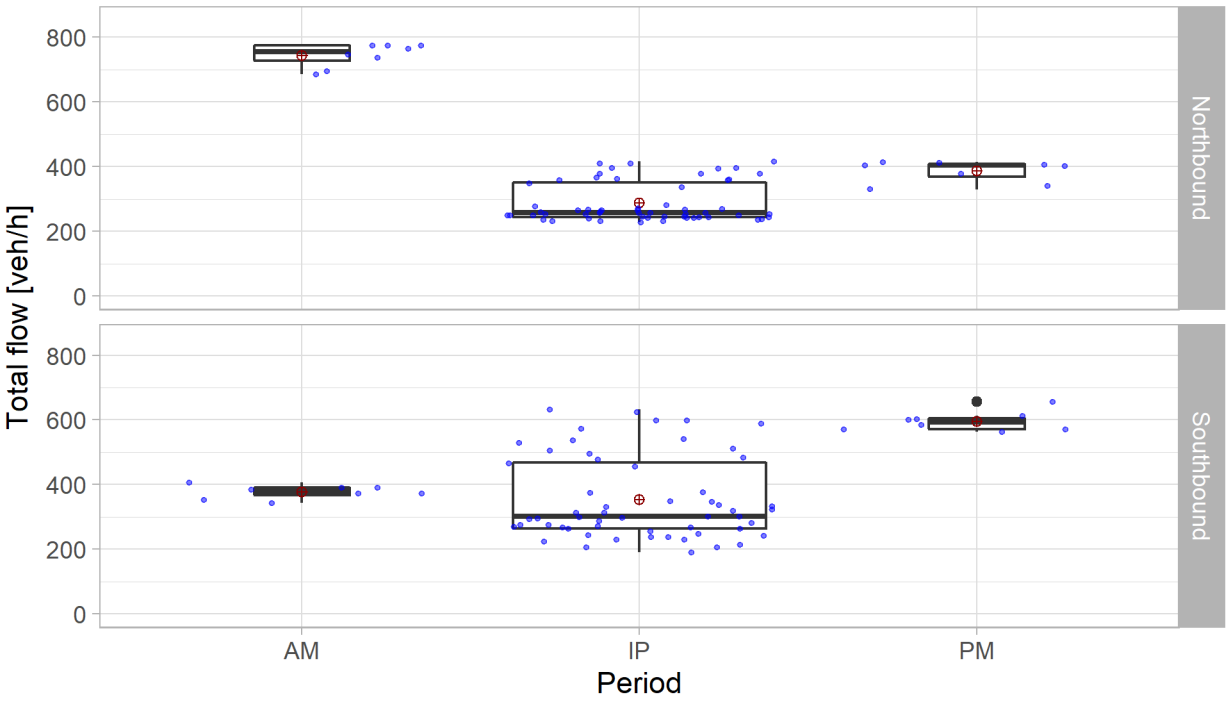
Site 18



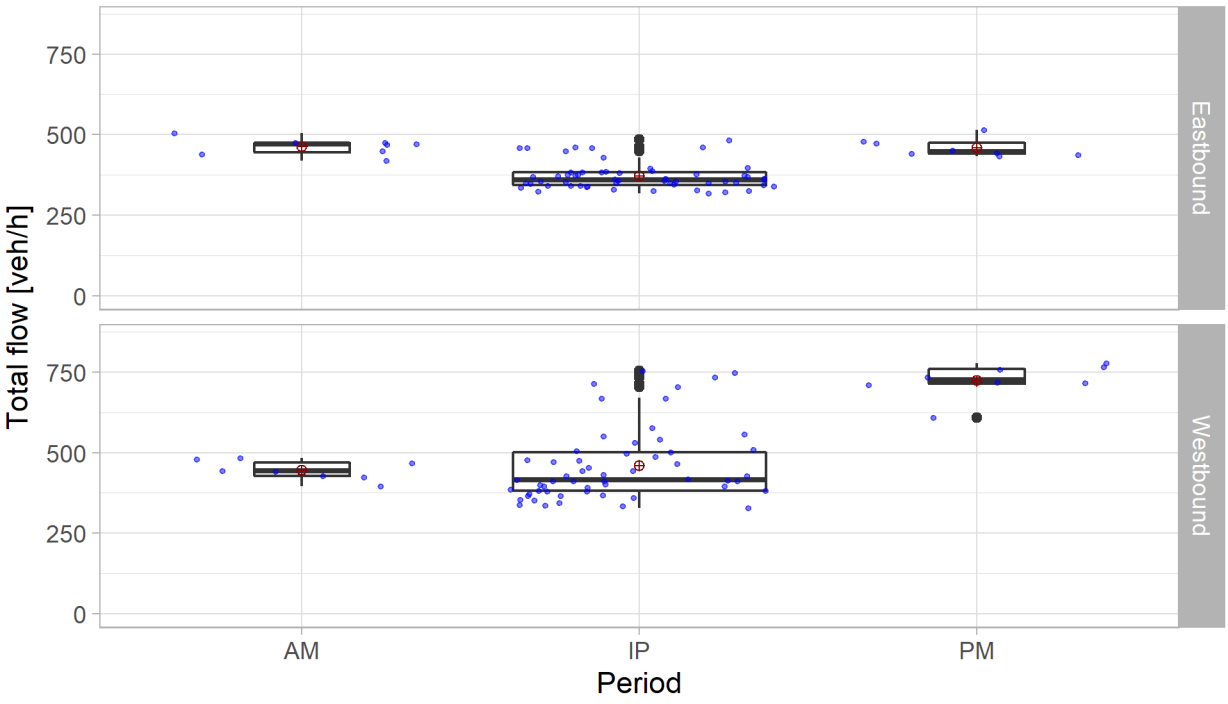
Site 19



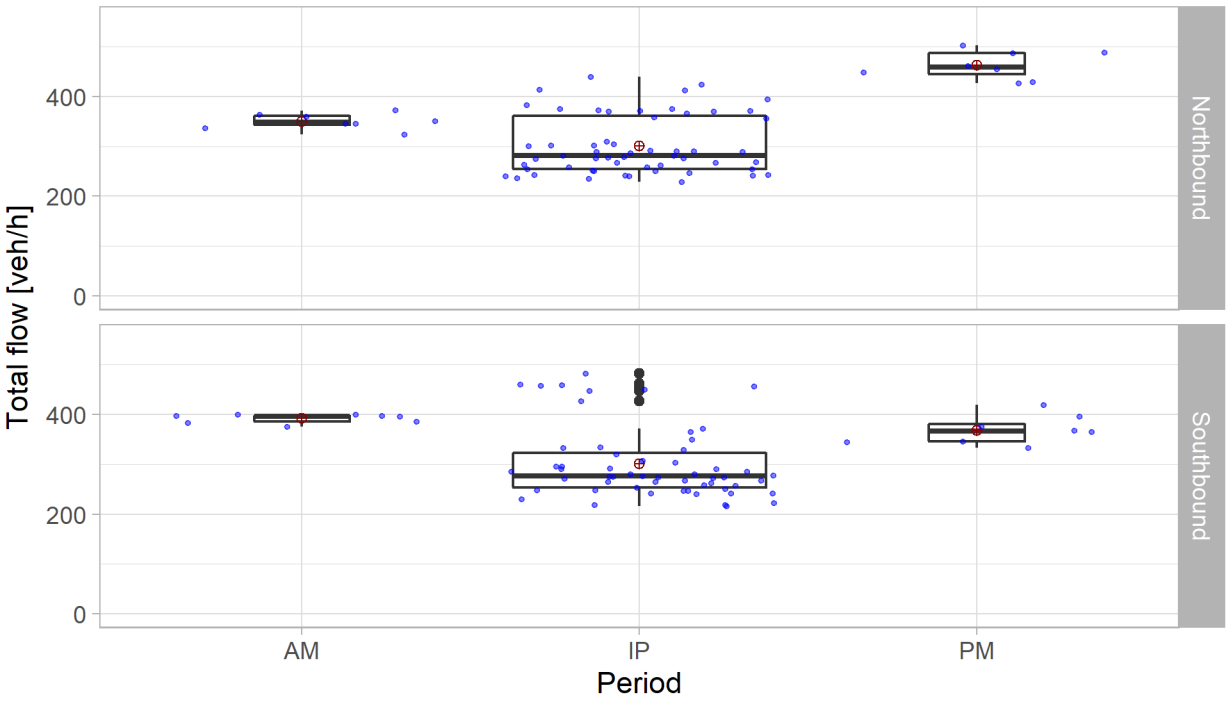
Site 2



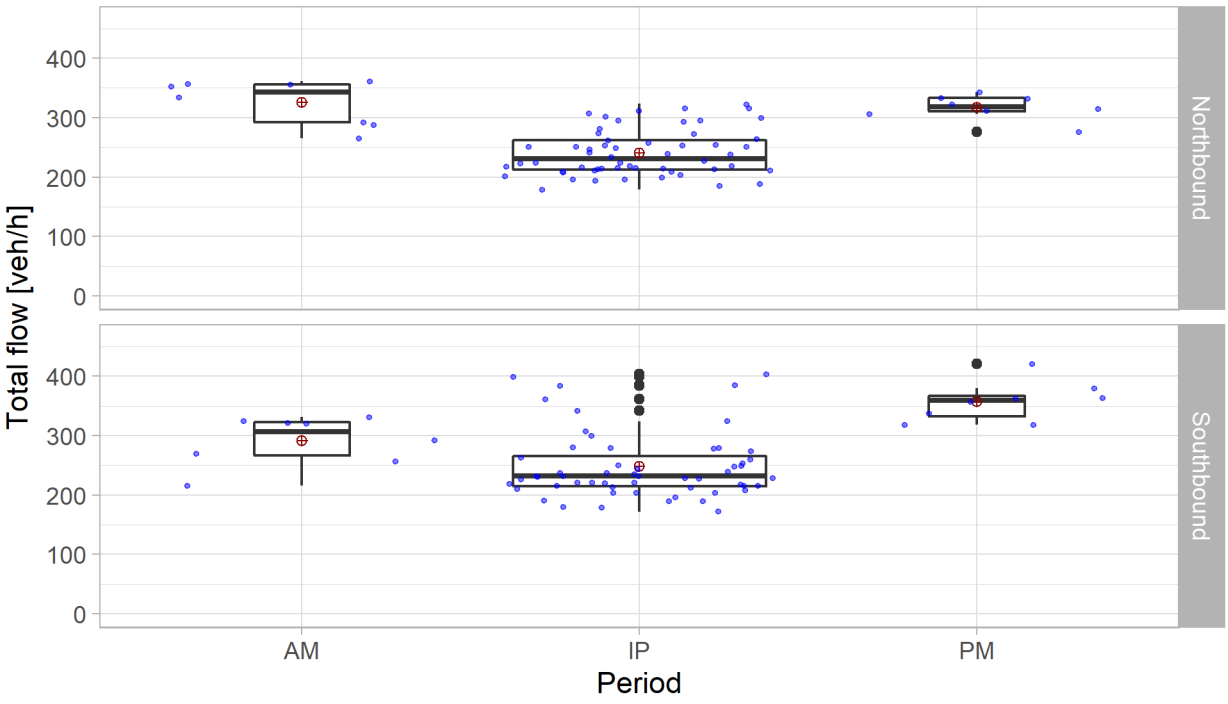
Site 20



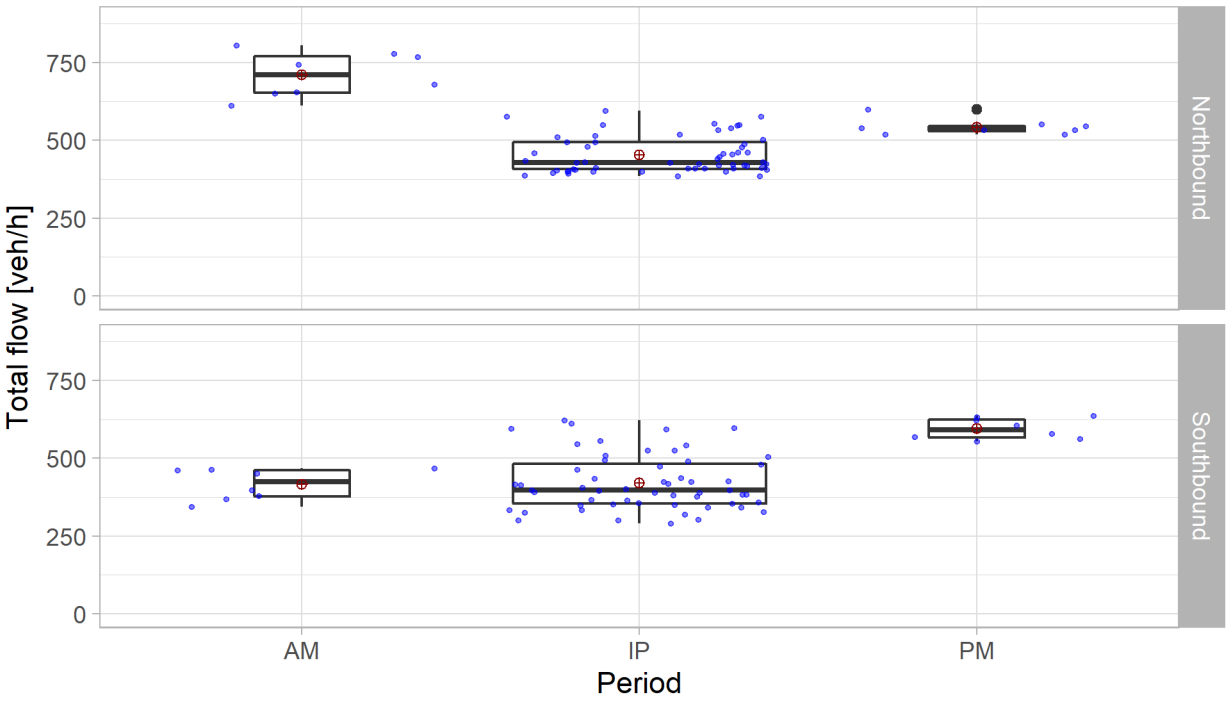
Site 21



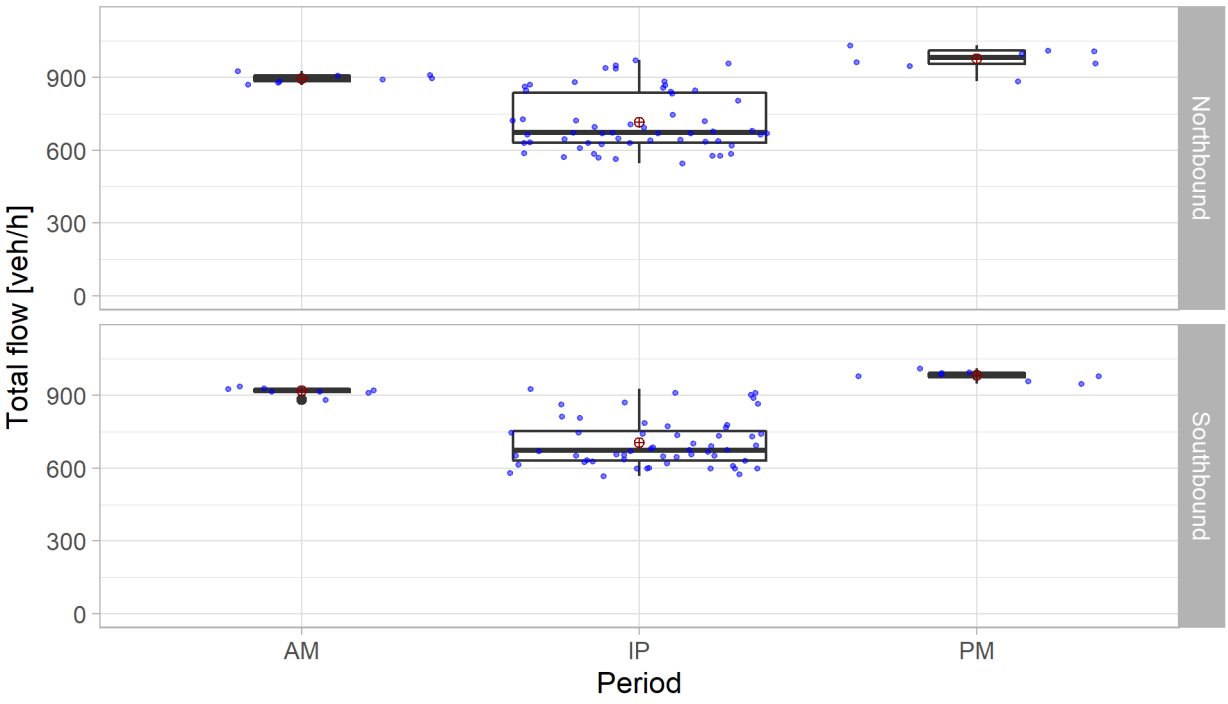
Site 22



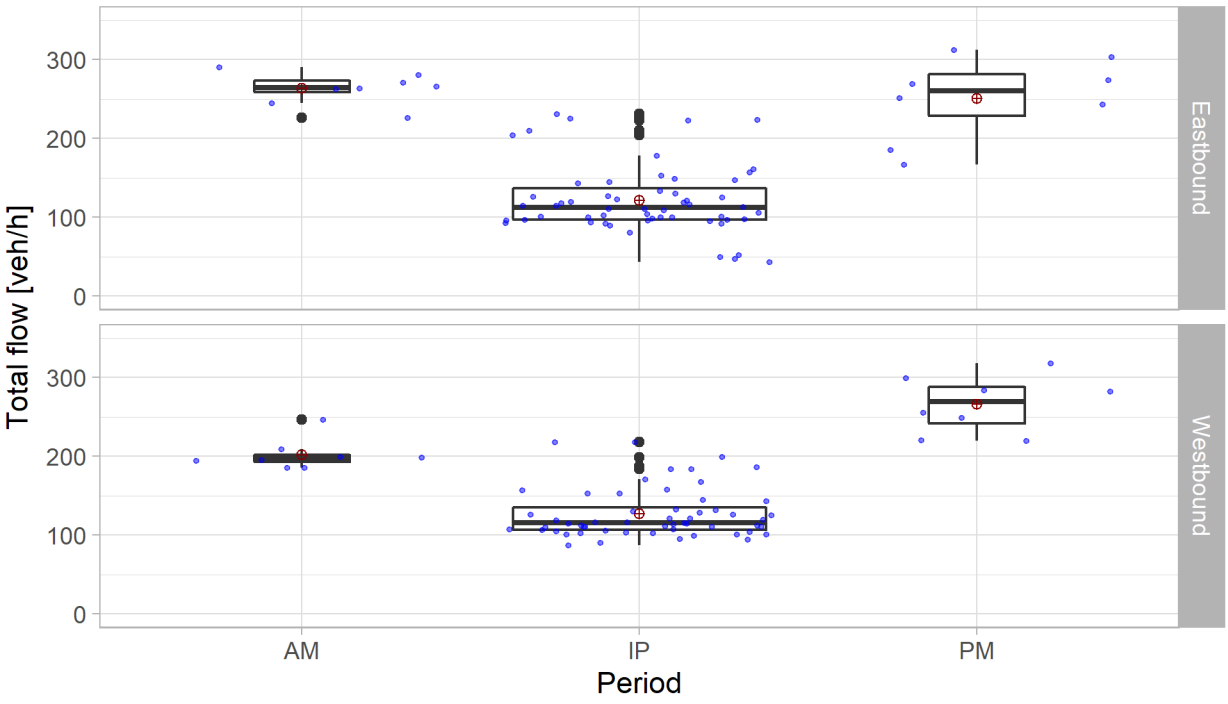
Site 23

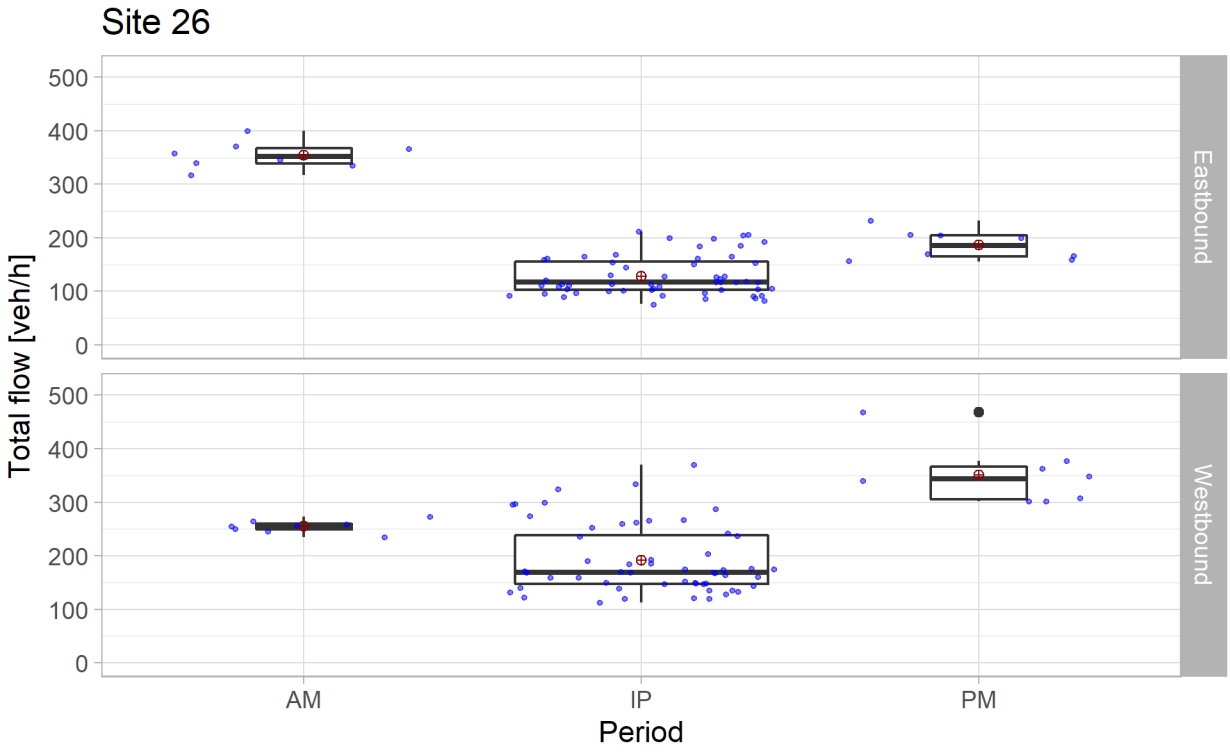


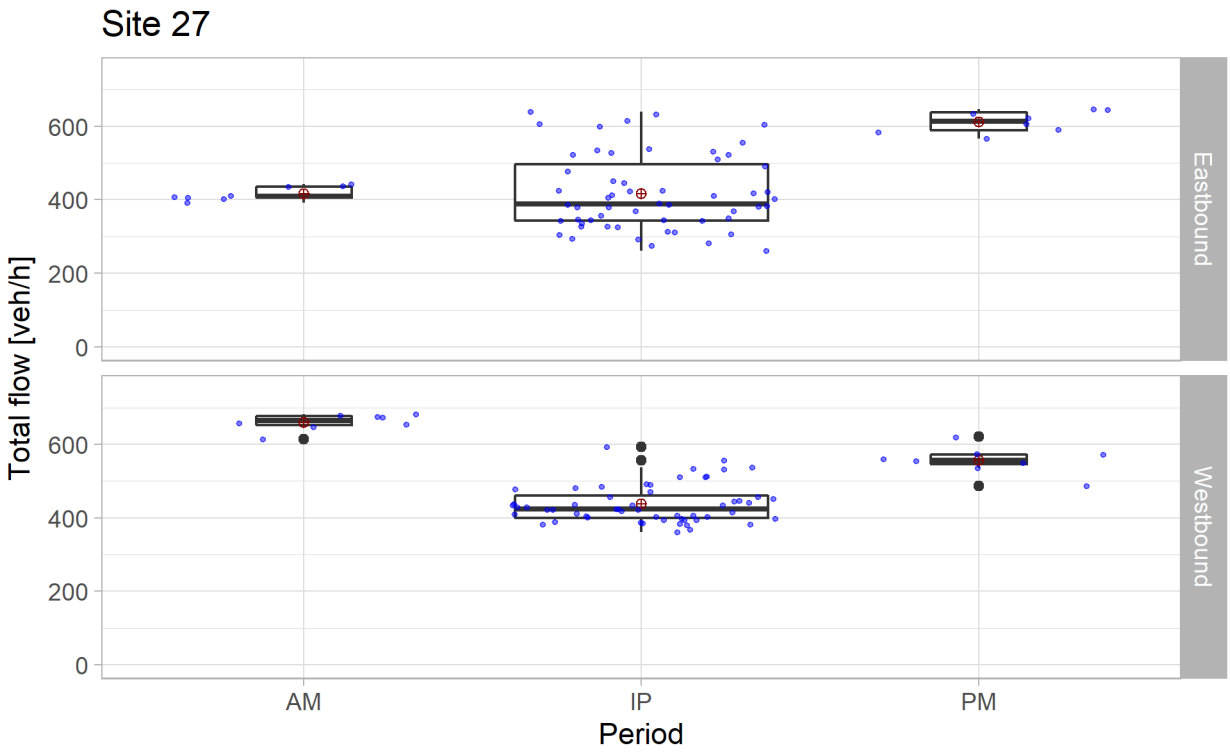
Site 24



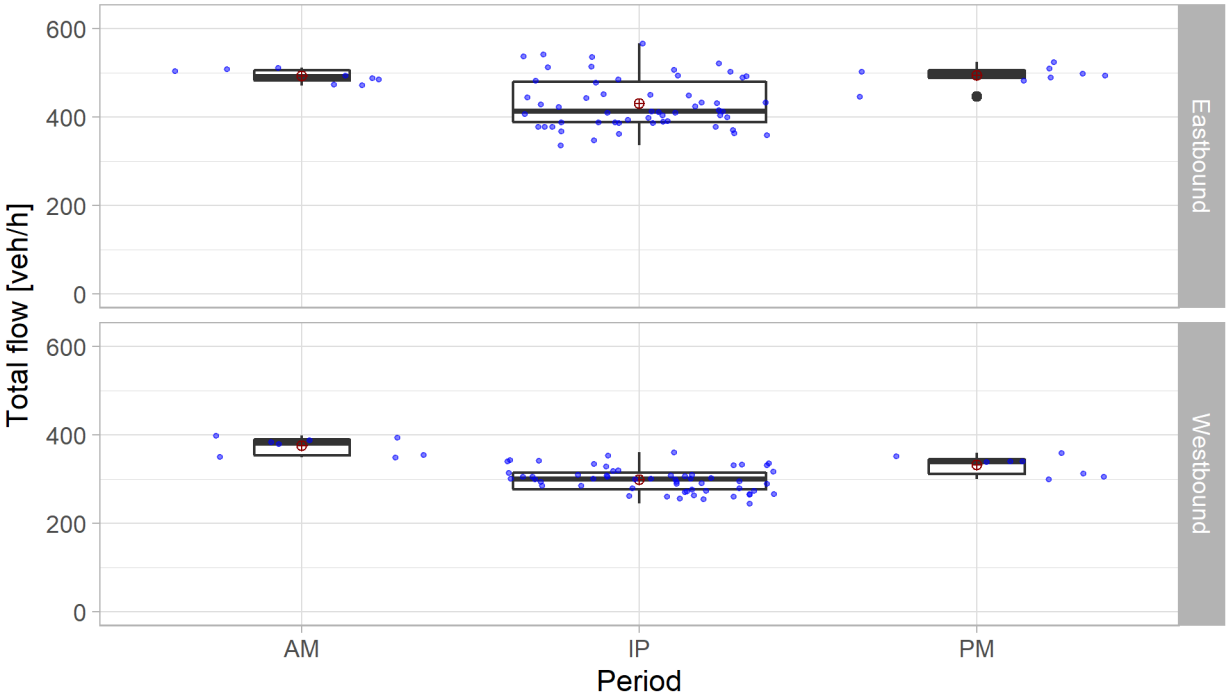
Site 25



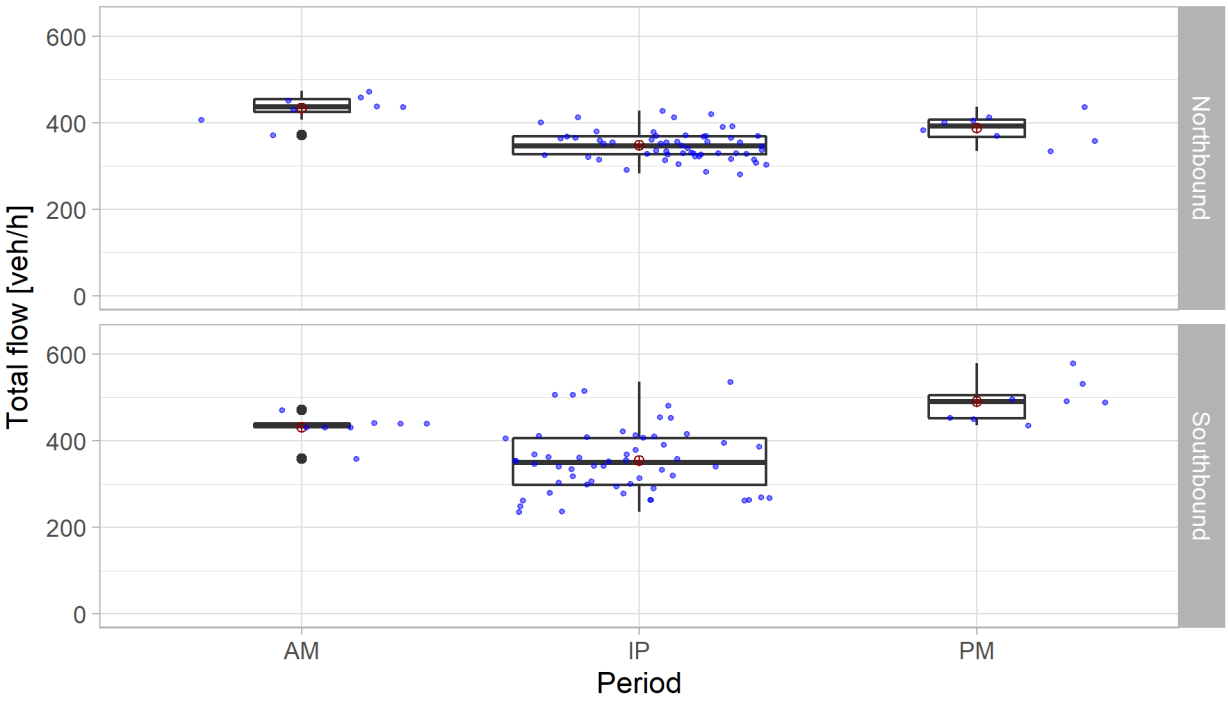

Site 26
Total flow [veh/h]
500
400
300
200
100
0
Eastbound
Westbound
AM
IP
PM
Period

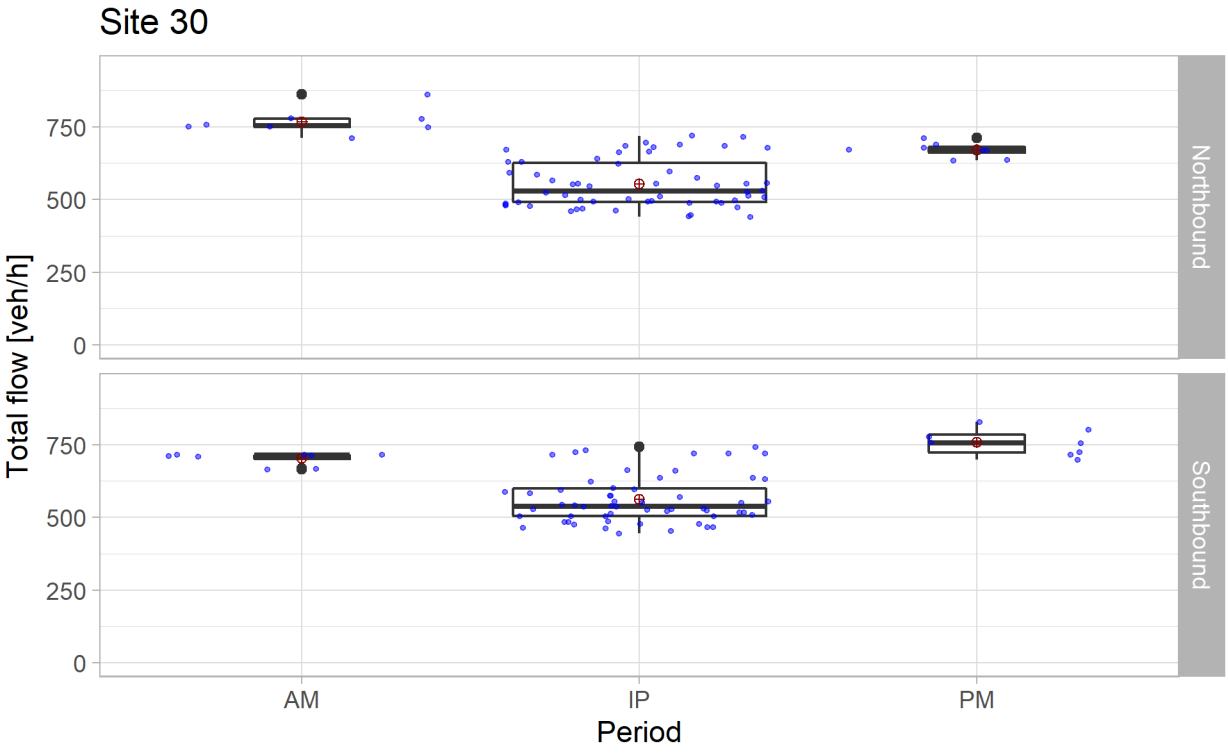

Site 27
Total flow [veh/h]
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period

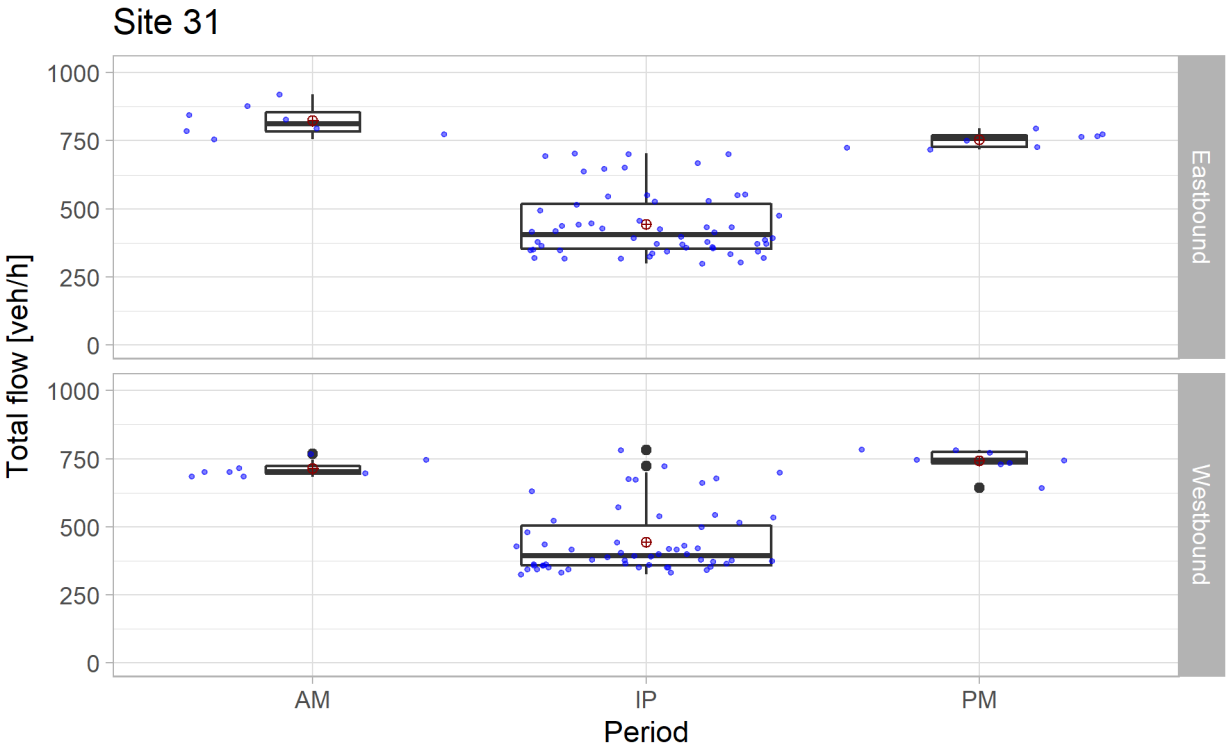
Site 28



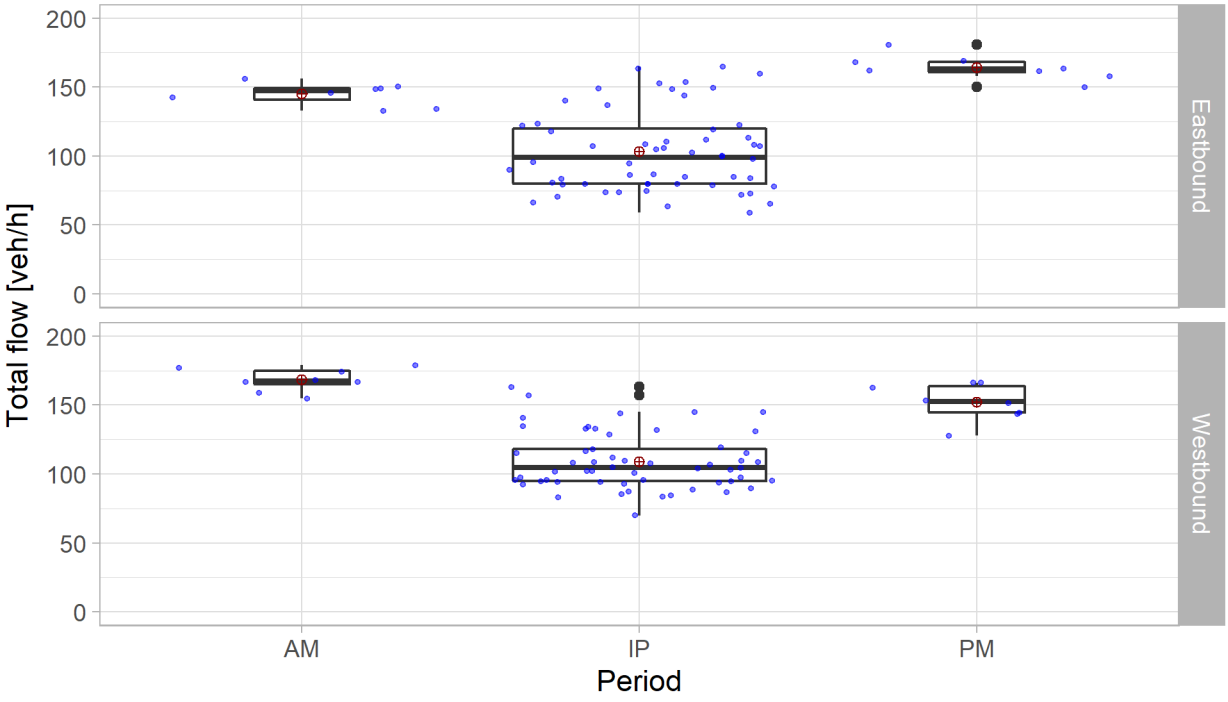
Site 29



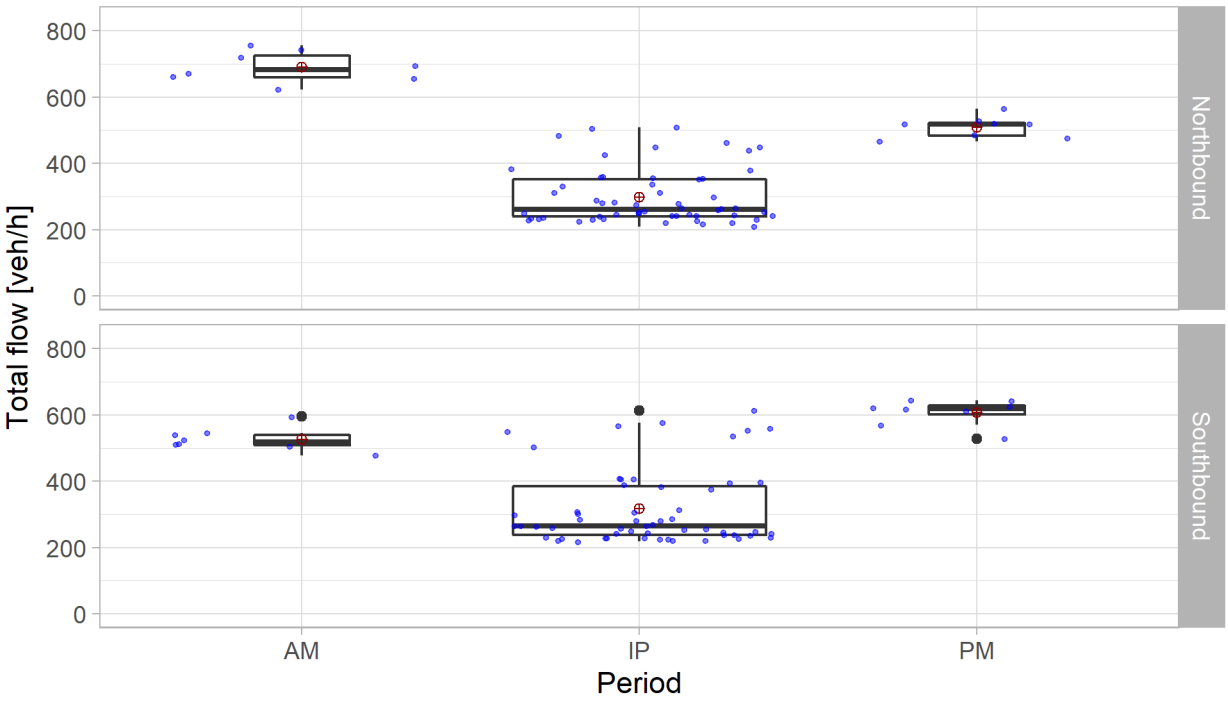

Site 30
Total flow [veh/h]
750
500
250
0
Northbound
Southbound
AM
IP
PM
Period

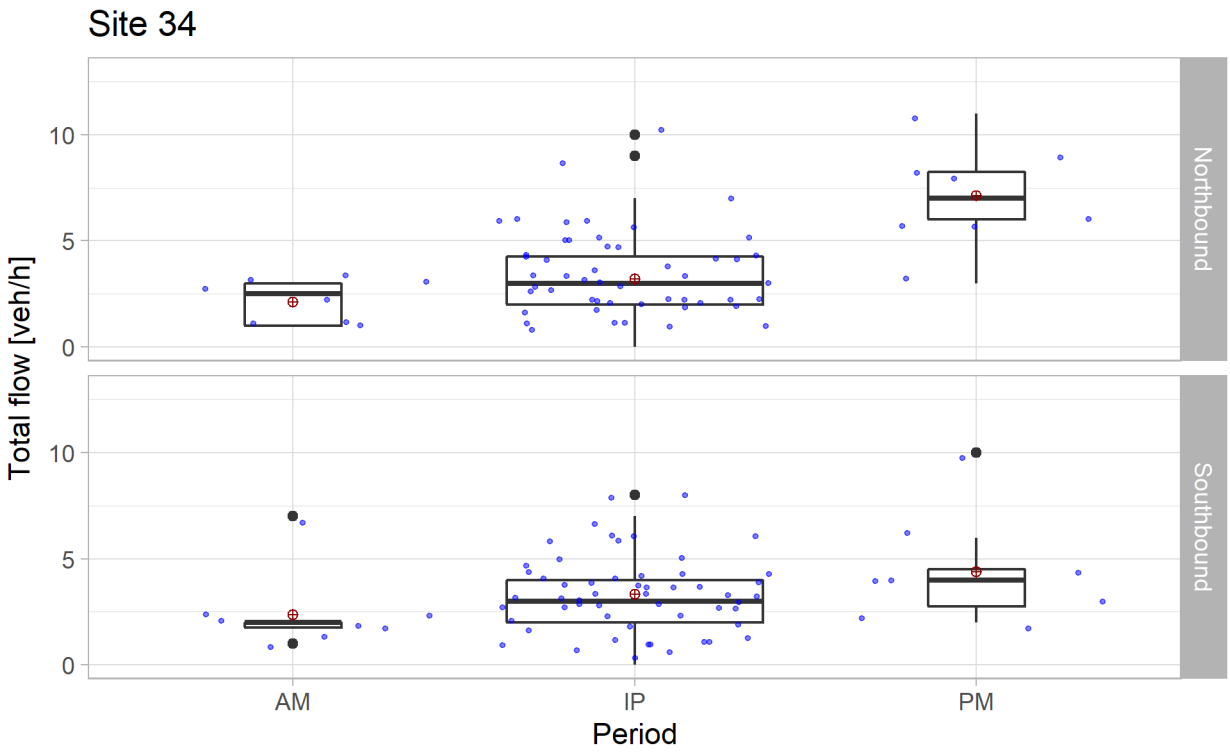

Site 31
Total flow [veh/h]
1000
750
500
250
0
Eastbound
Westbound
AM
IP
PM
Period

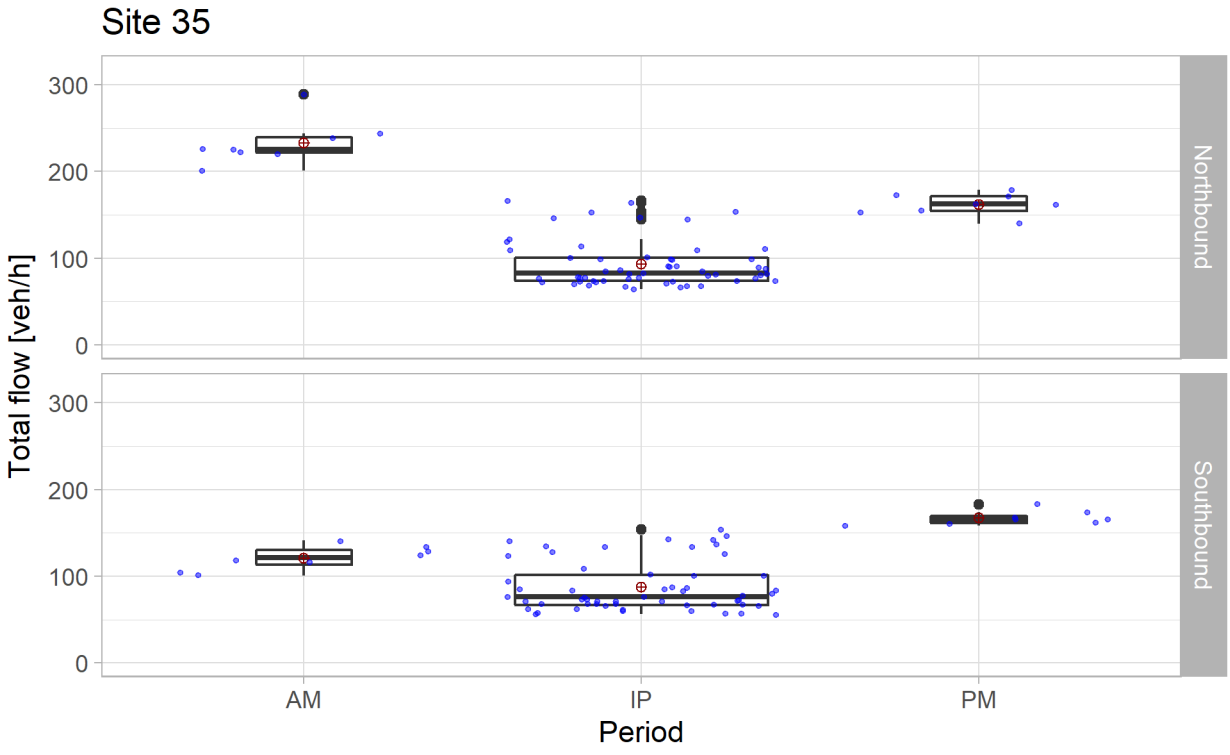
Site 32



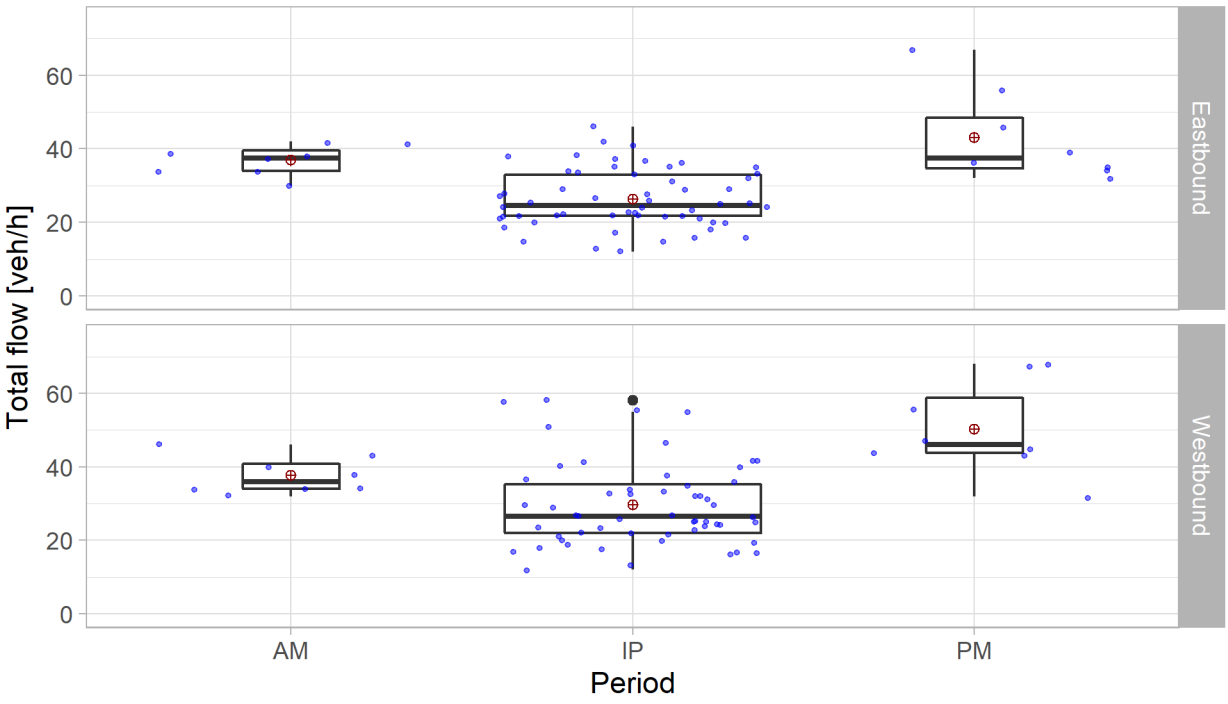
Site 33



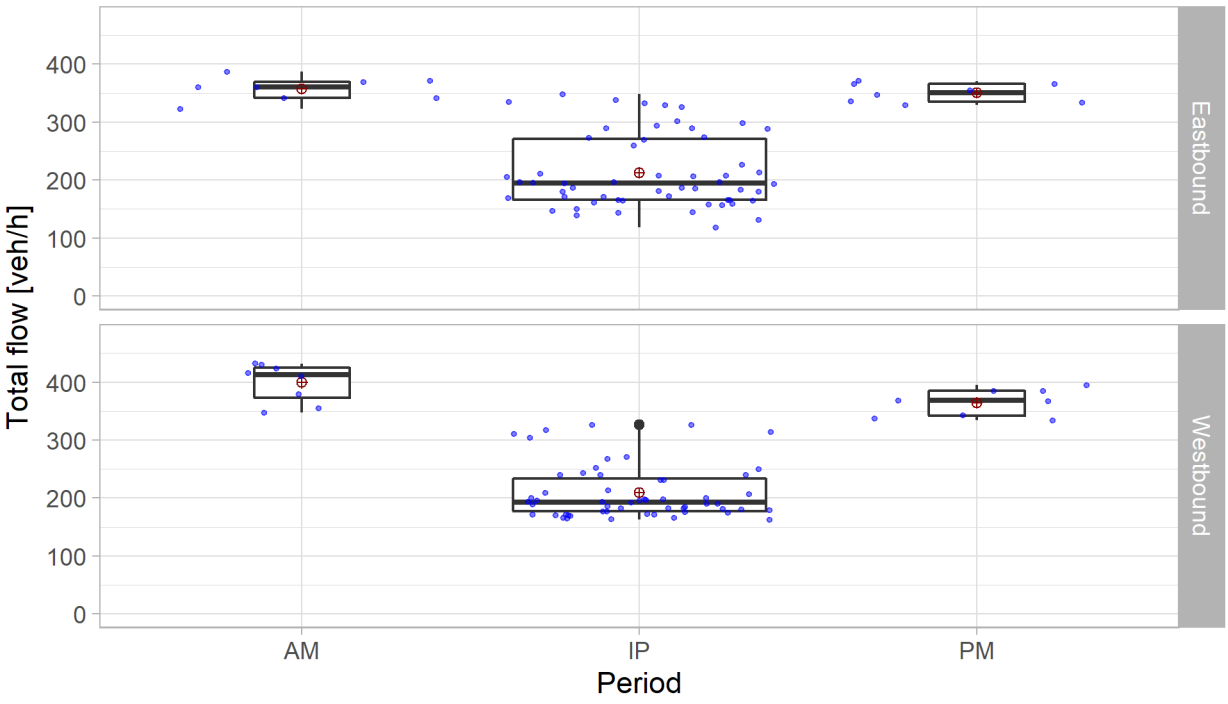

Site 34
Total flow [veh/h]
10
5
0
Northbound
Southbound
AM
IP
PM
Period


Site 35
Total flow [veh/h]
300
200
100
0
Northbound
Southbound
AM
IP
PM
Period

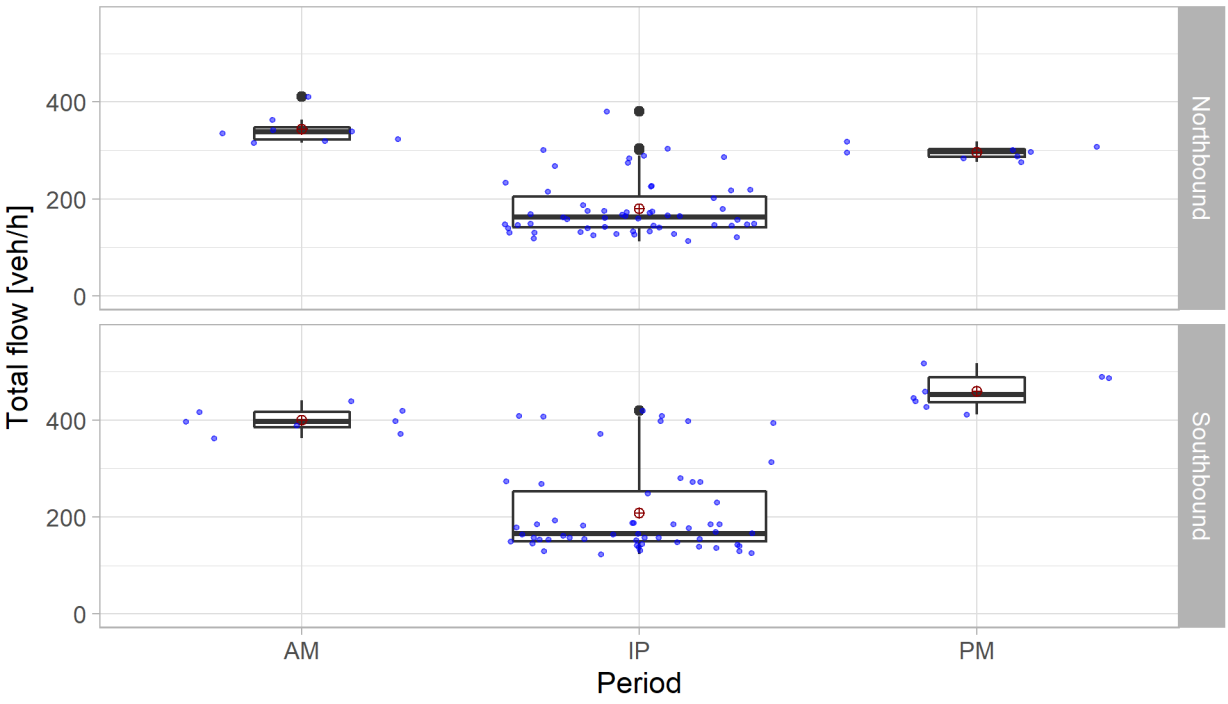
Site 36



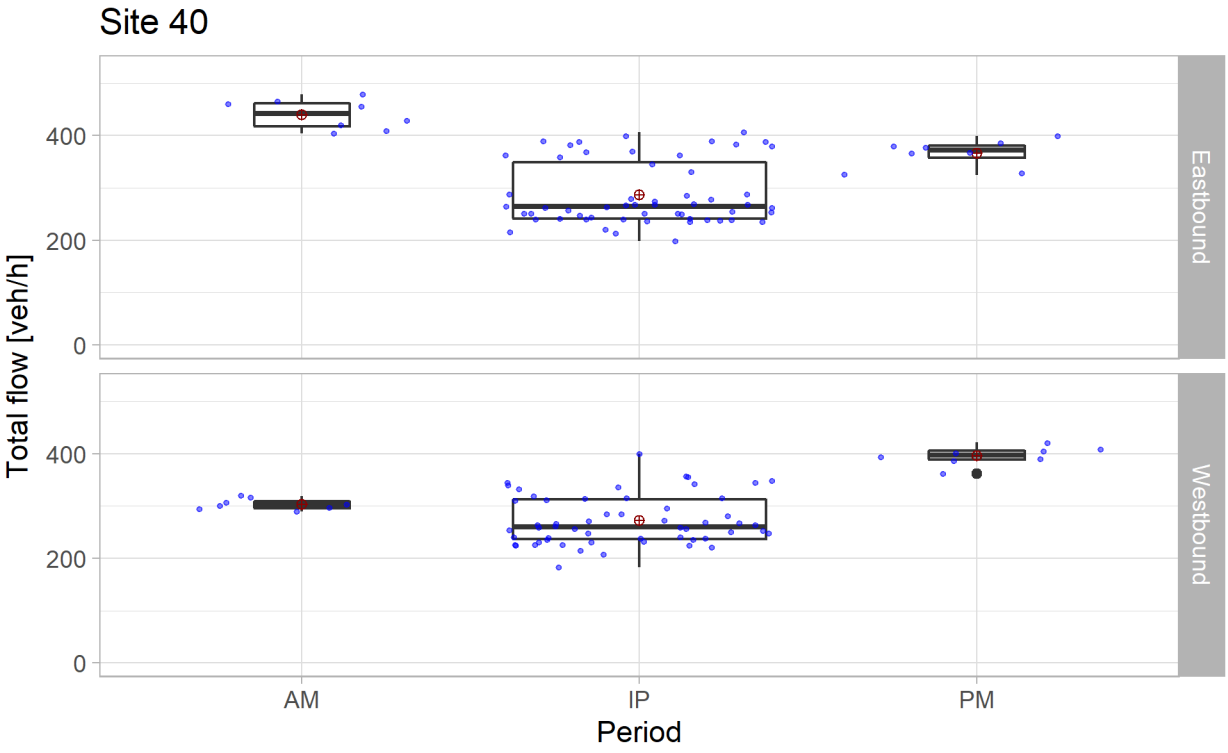
Site 37

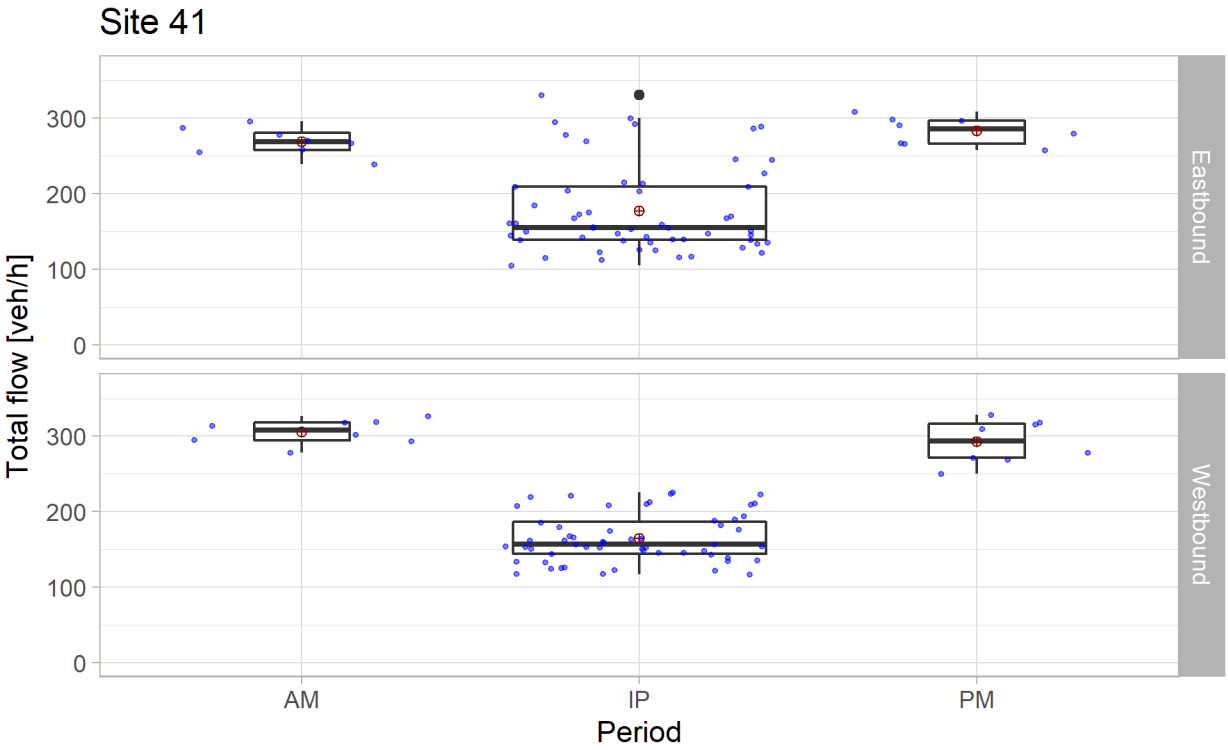


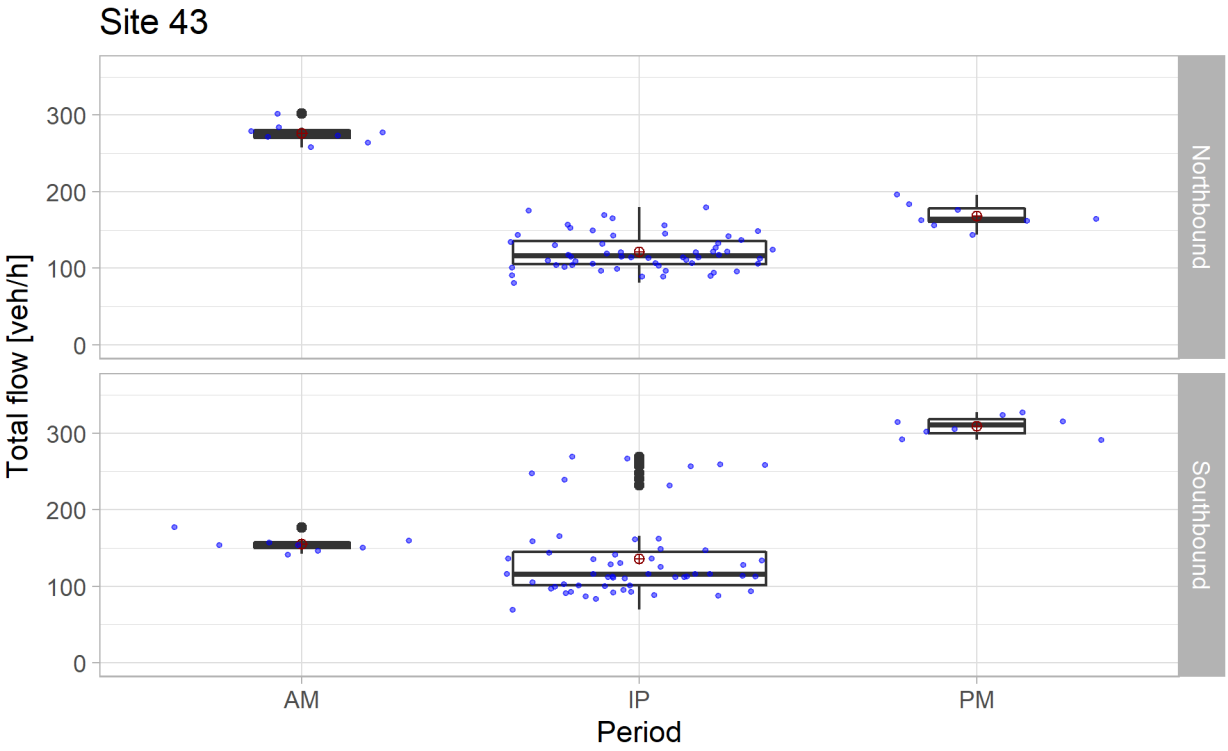
Site 38



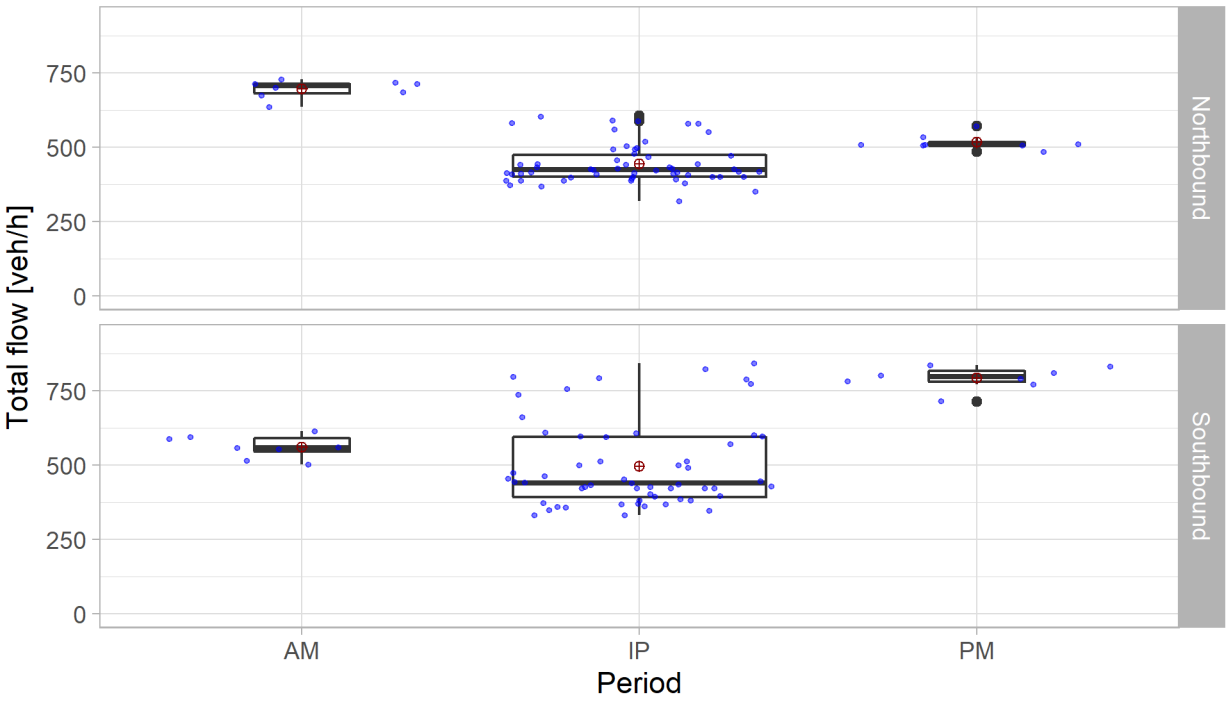
Site 40



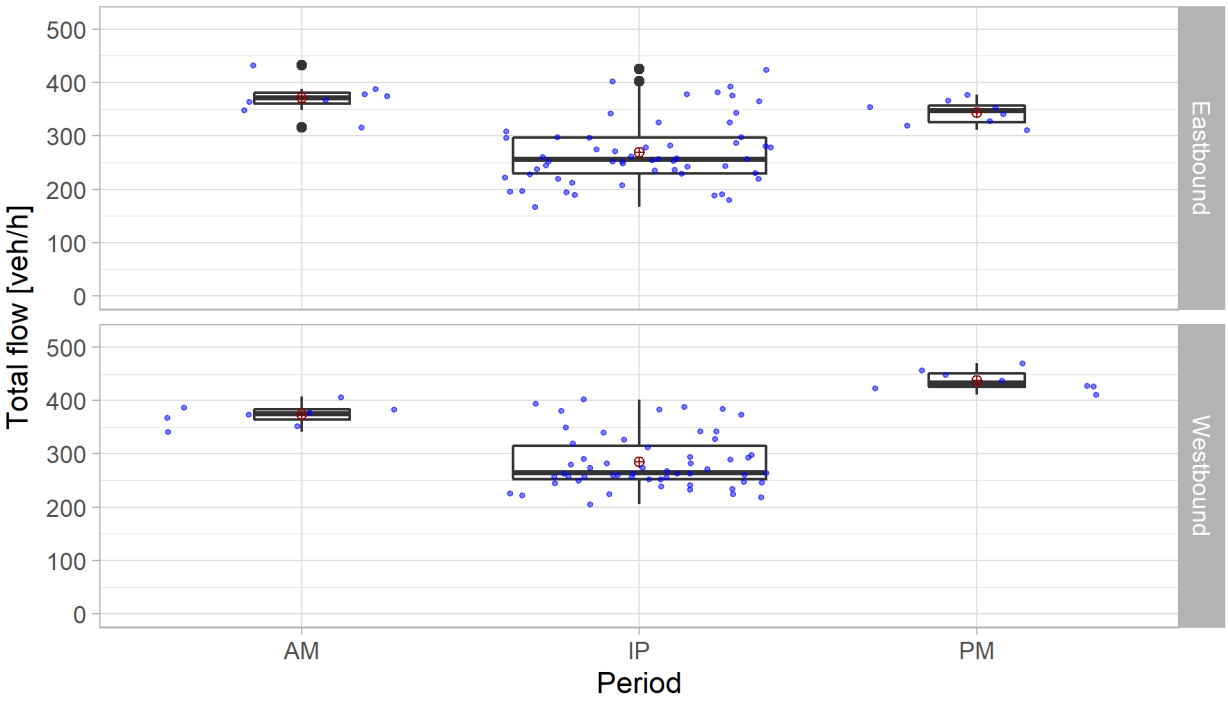

Site 41
Total flow [veh/h]
300
200
100
0
Eastbound
Westbound
AM
IP
PM
Period


Site 43
Total flow [veh/h]
300
200
100
0
Northbound
Southbound
AM
IP
PM
Period

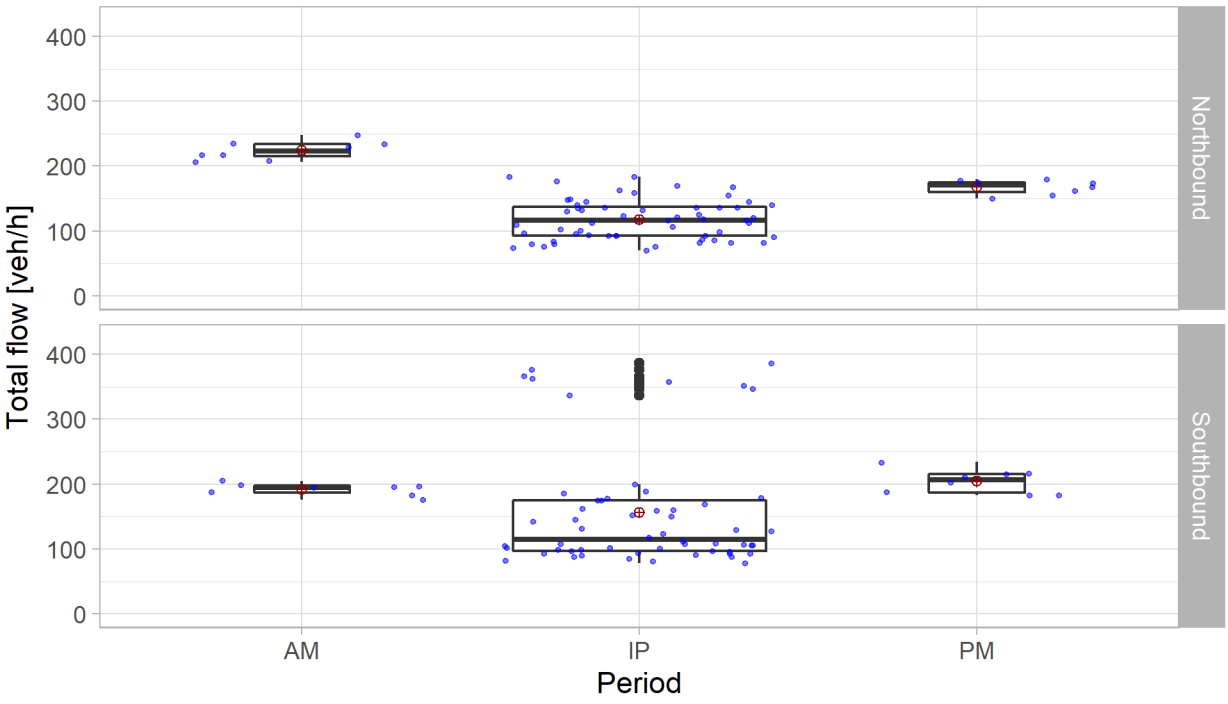
Site 44



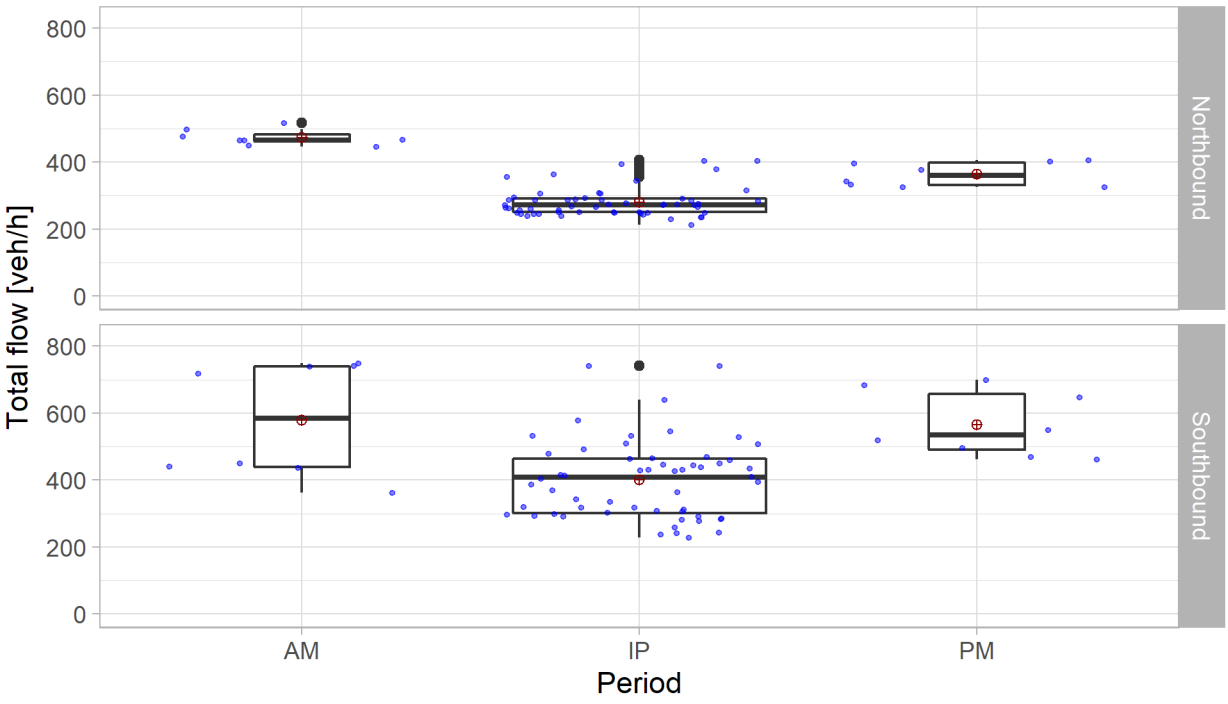
Site 45



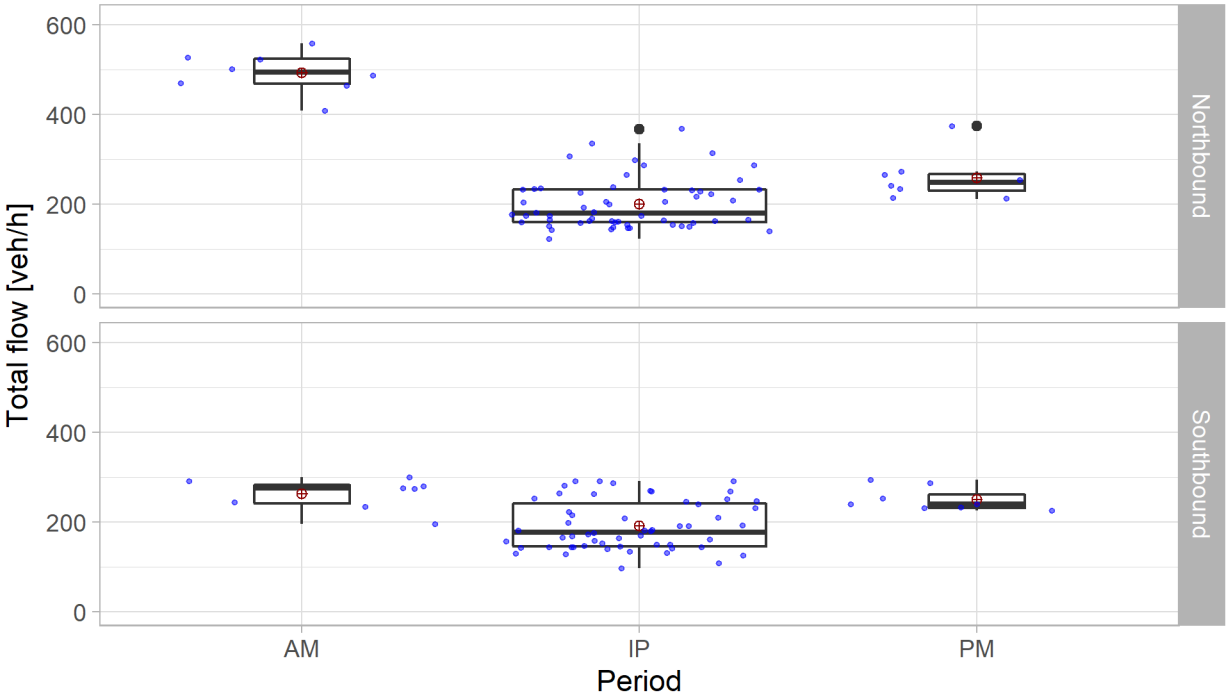
Site 46



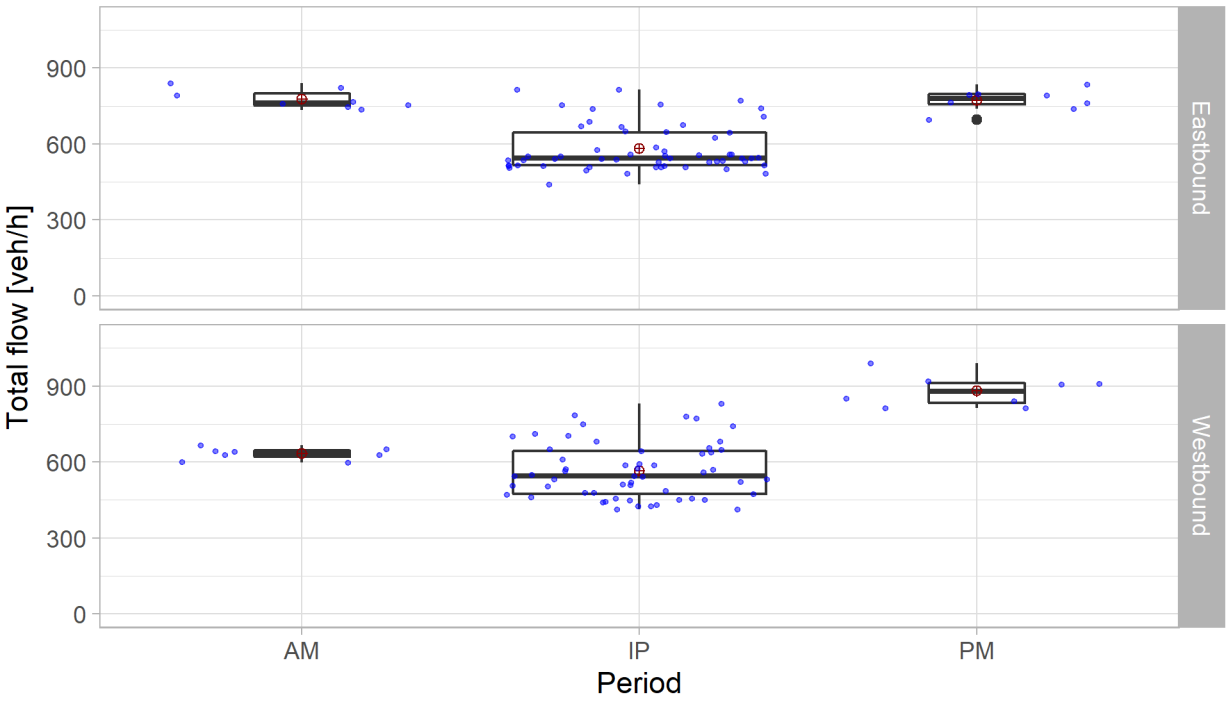
Site 47

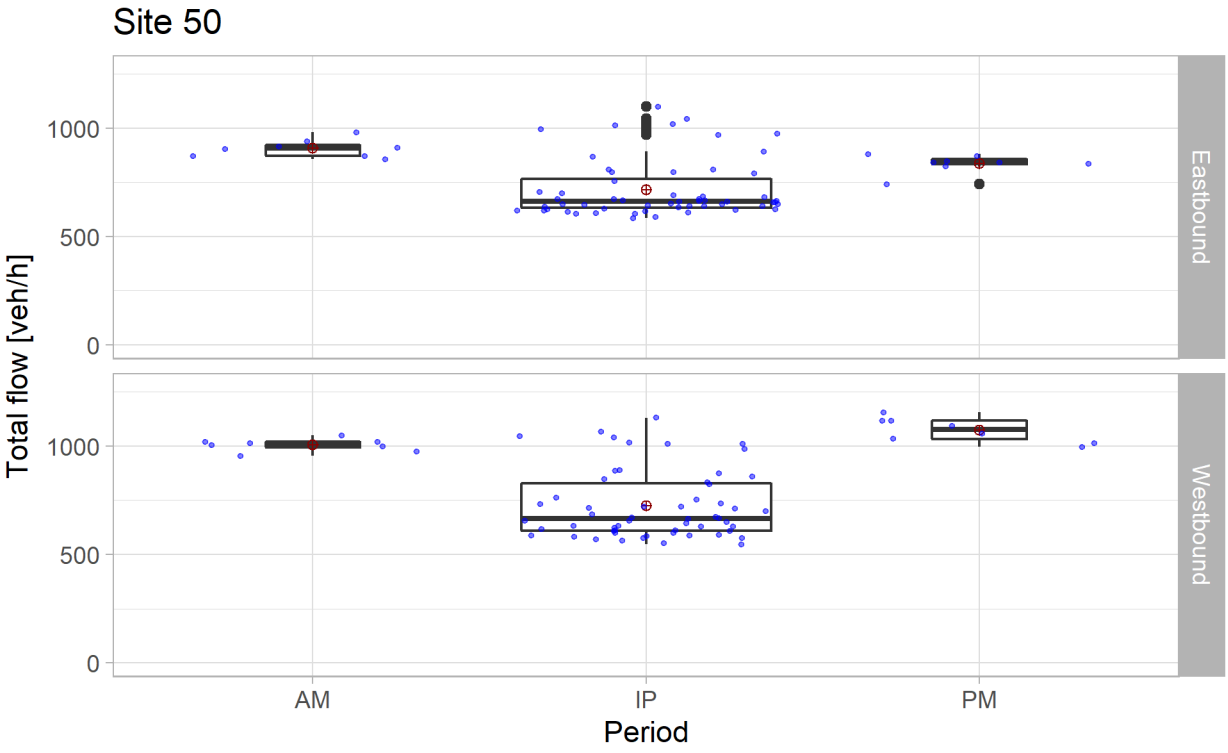


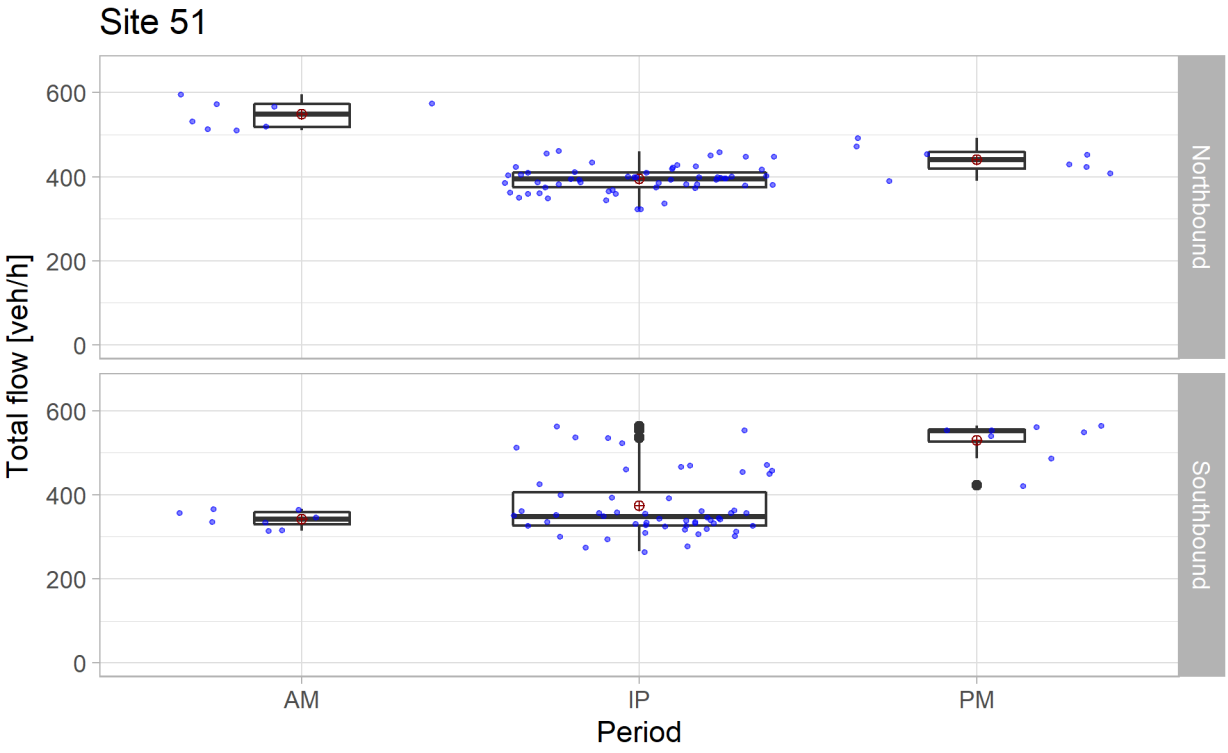
Site 48



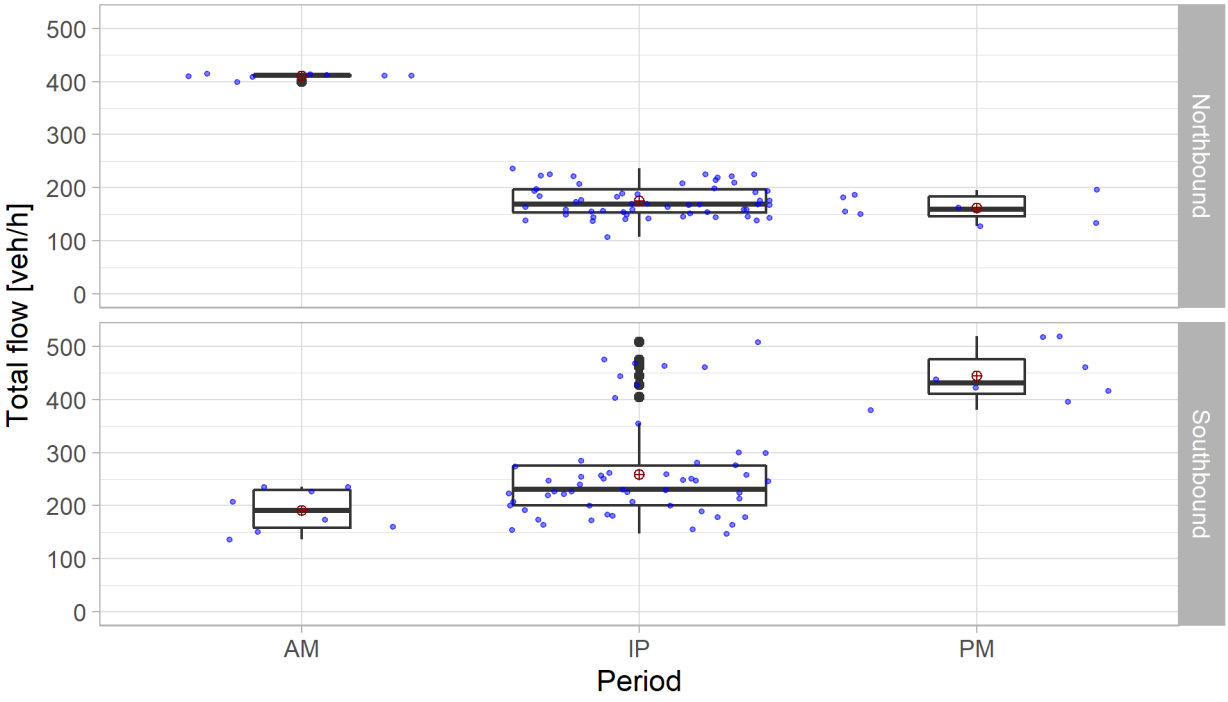
Site 49



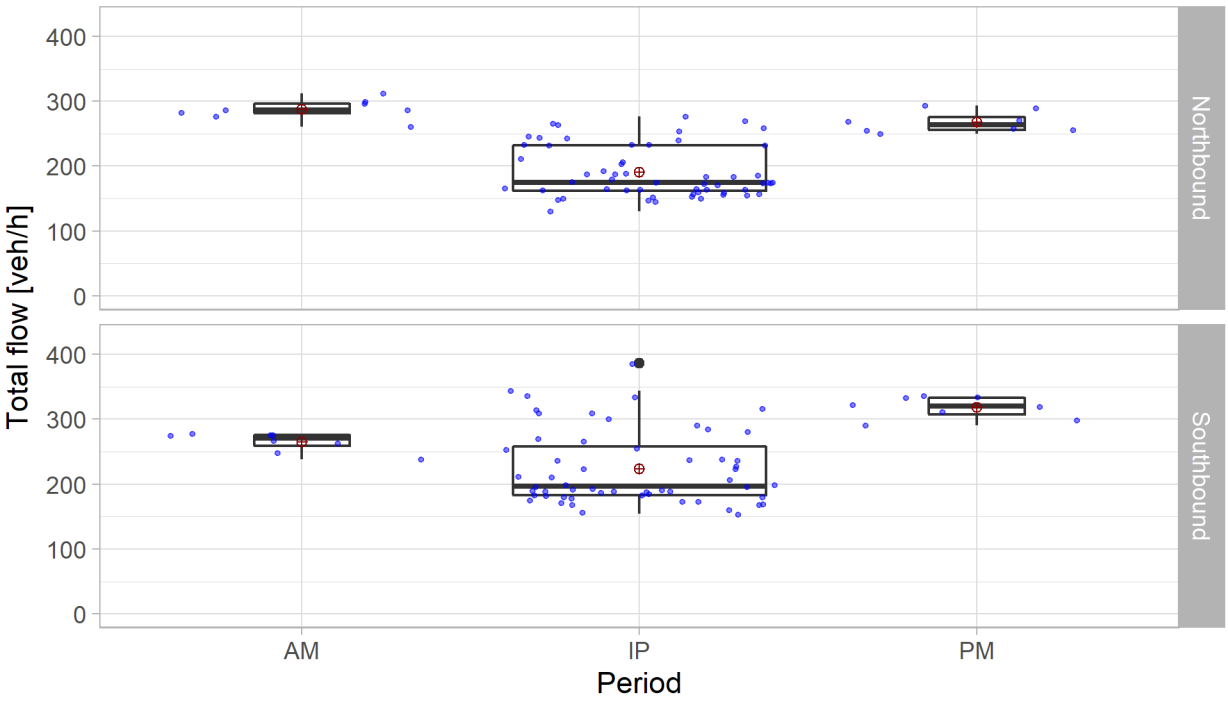

Site 50
Total flow [veh/h]
1000
500
0
Eastbound
Westbound
AM
IP
PM
Period


Site 51
Total flow [veh/h]
600
400
200
0
Northbound
Southbound
AM
IP
PM
Period

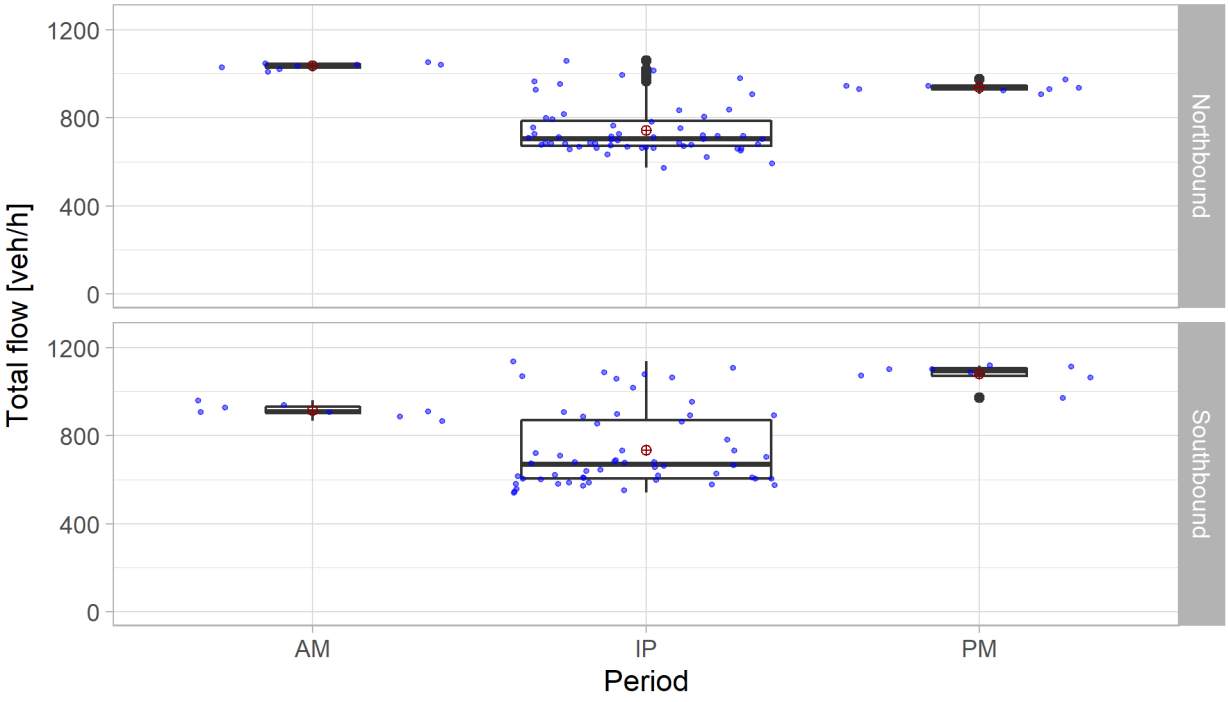
Site 52



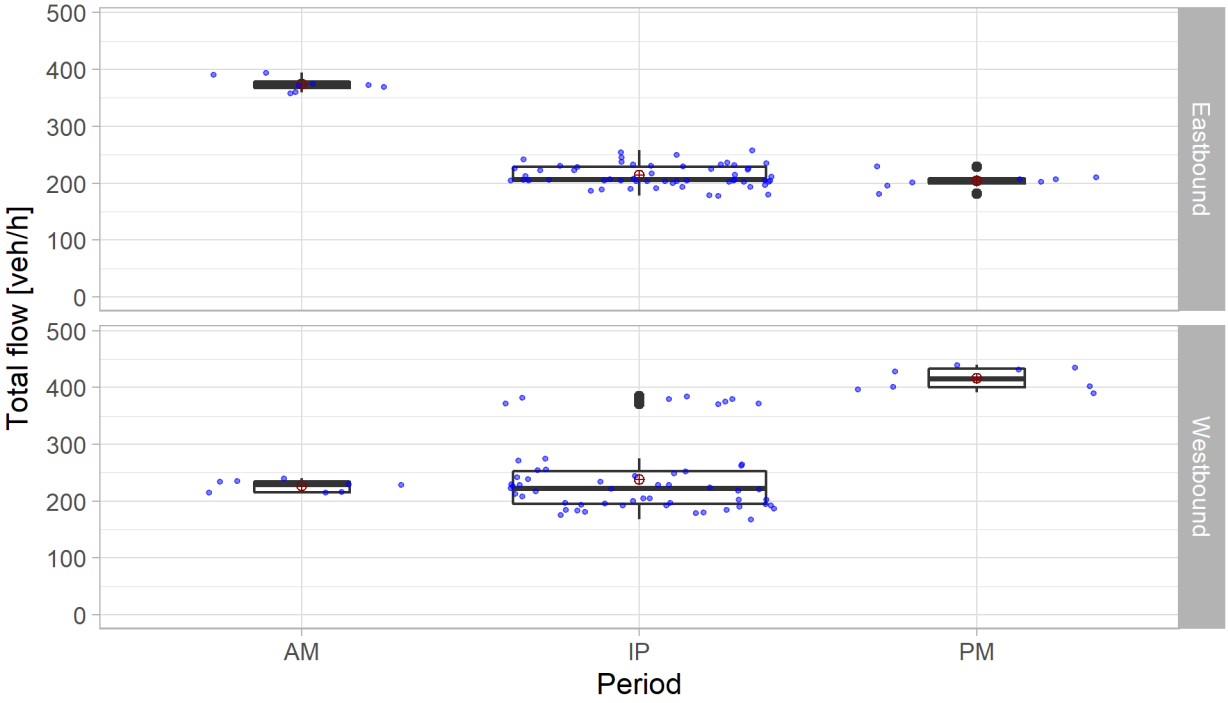
Site 53



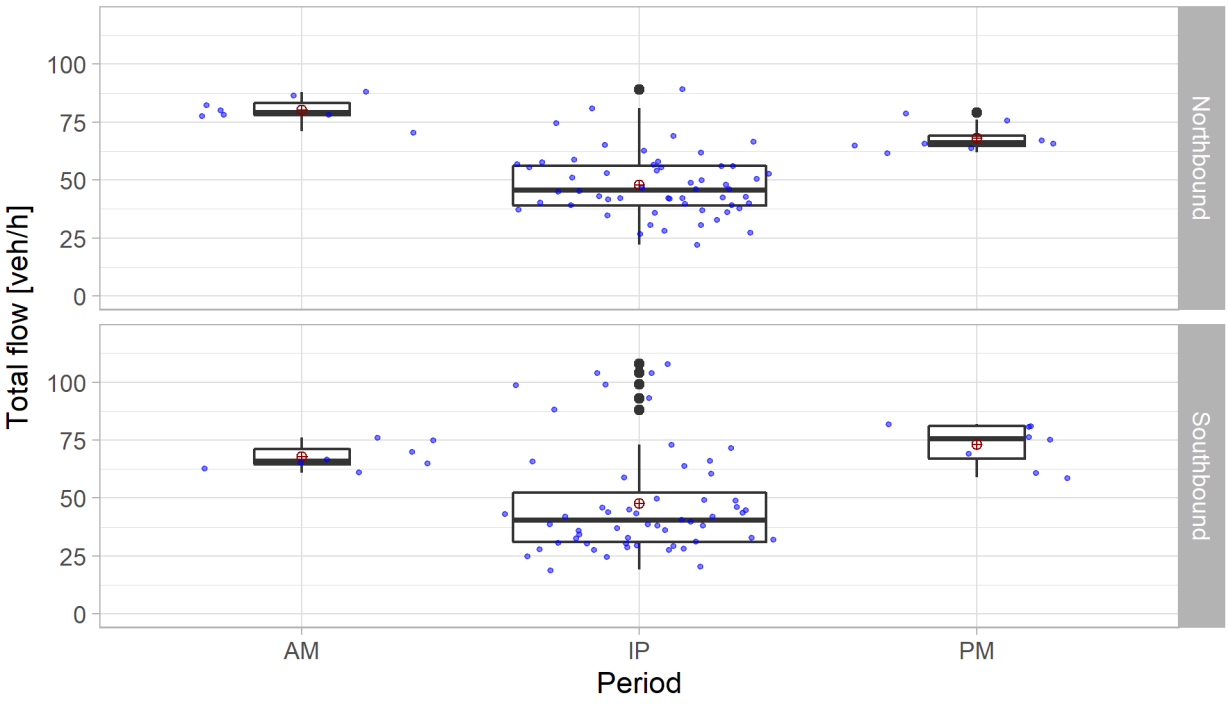
Site 54



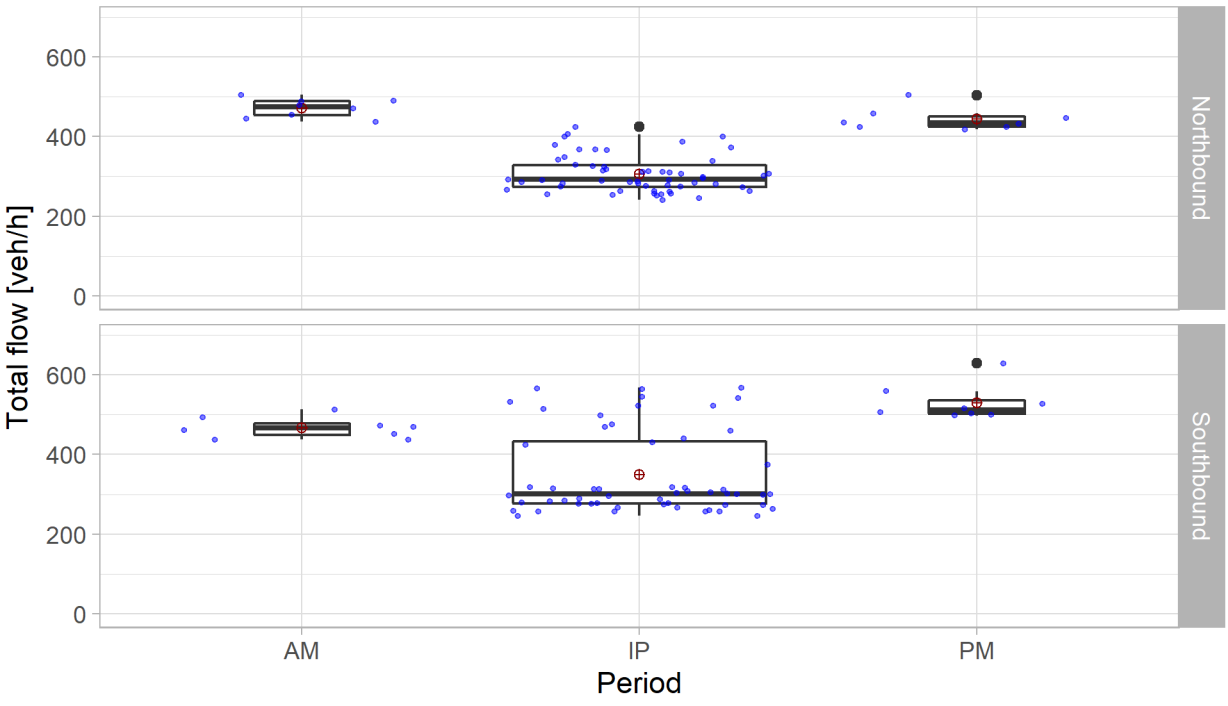
Site 55

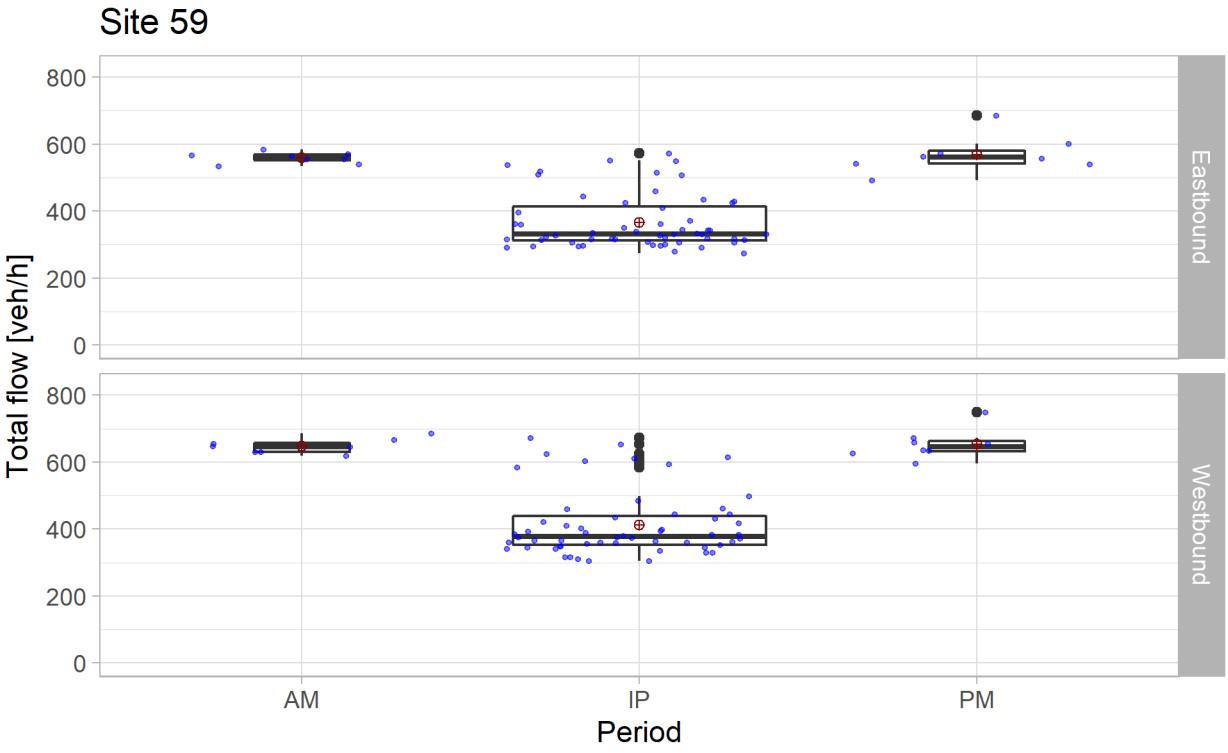


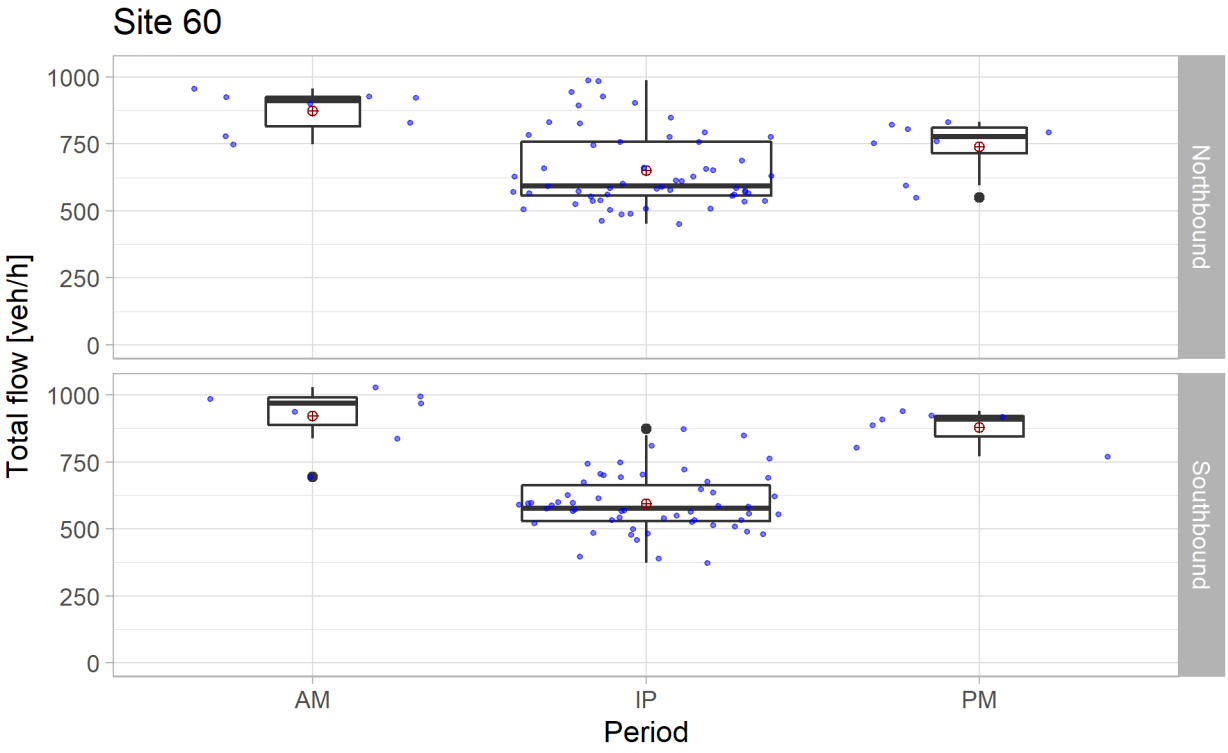
Site 57



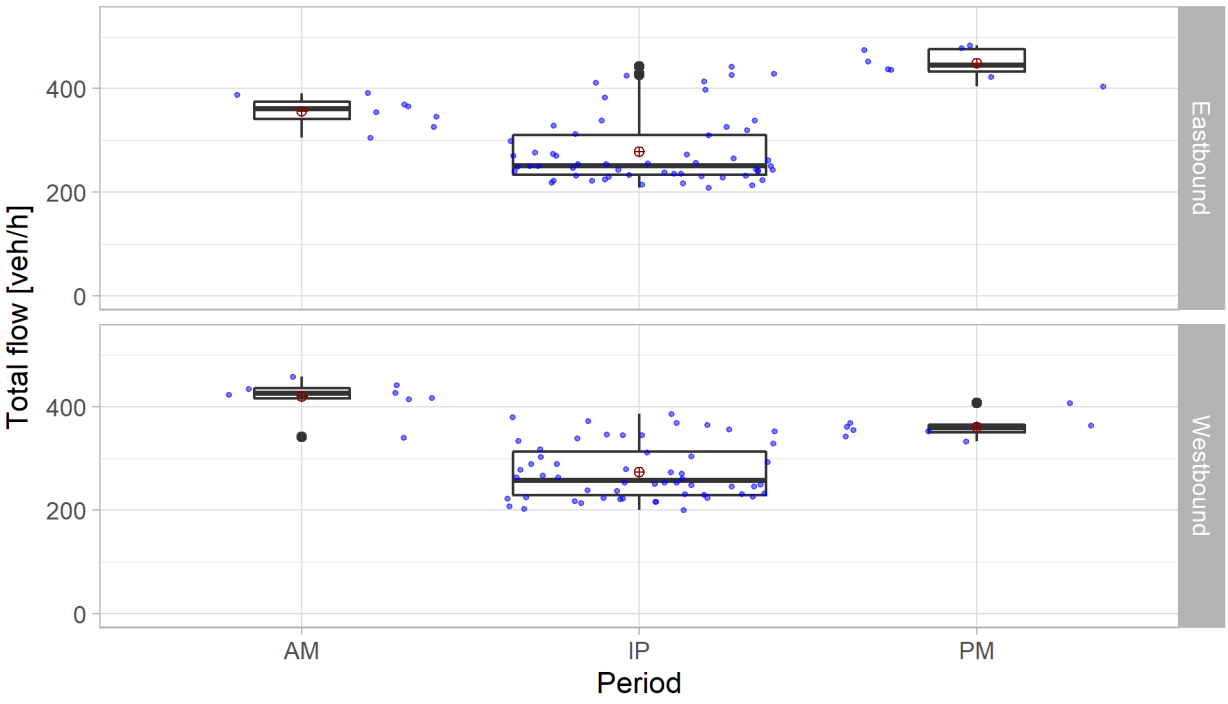
Site 58



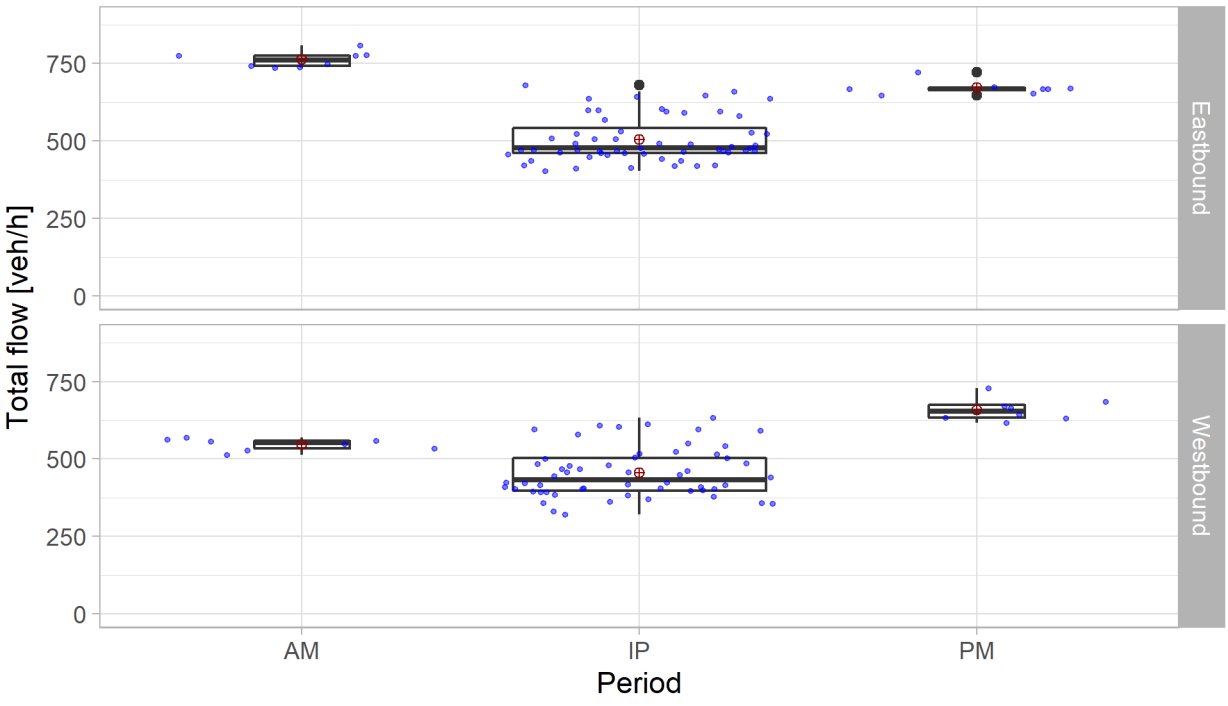

Site 59
Total flow [veh/h]
800
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period


Site 60
Total flow [veh/h]
1000
750
500
250
0
Northbound
Southbound
AM
IP
PM
Period

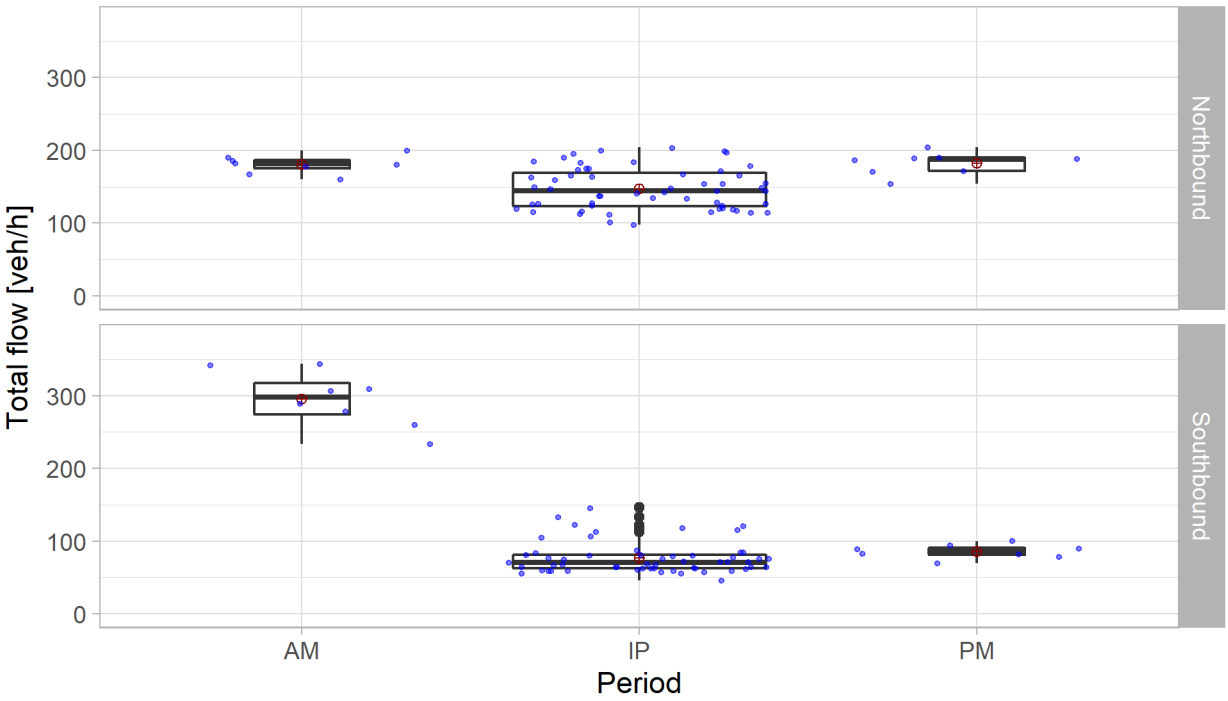
Site 62



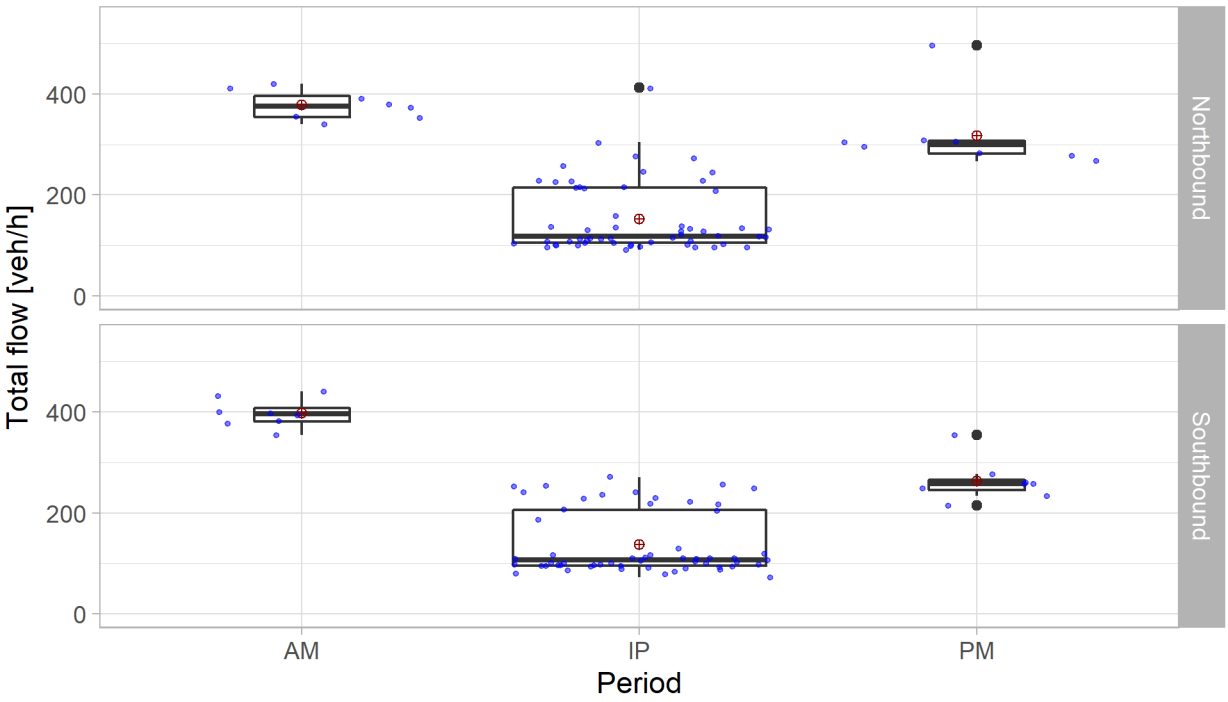
Site 66



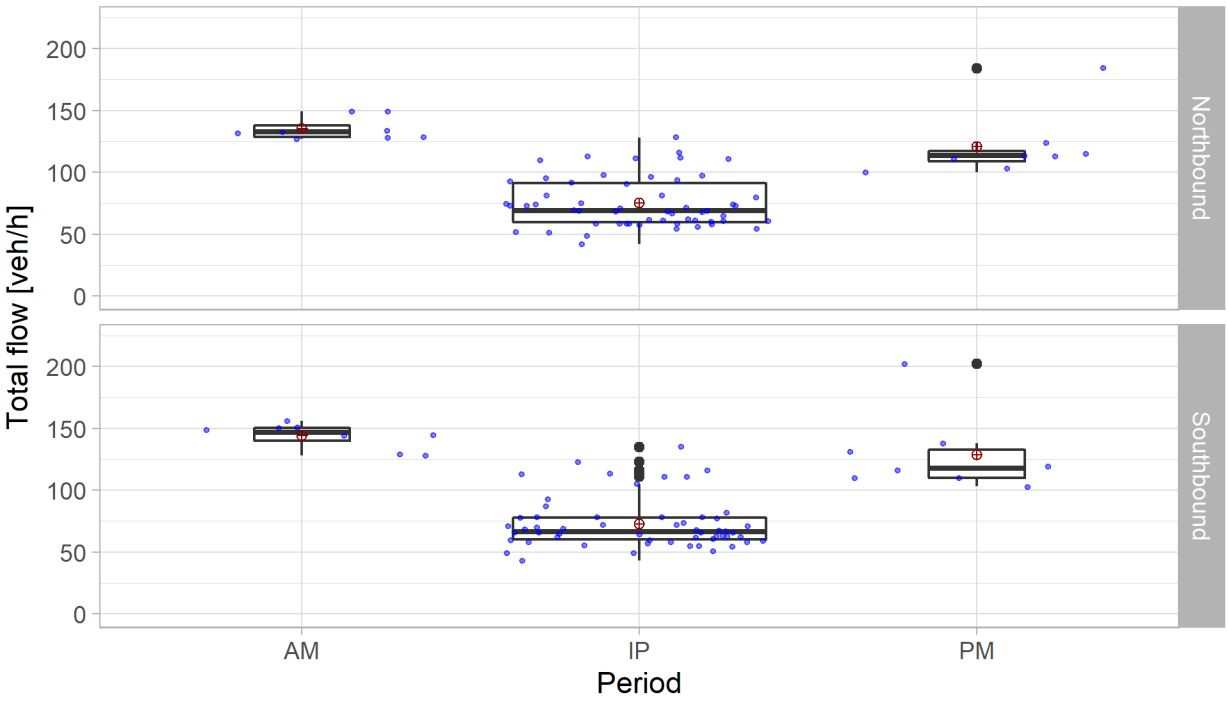
Site 68



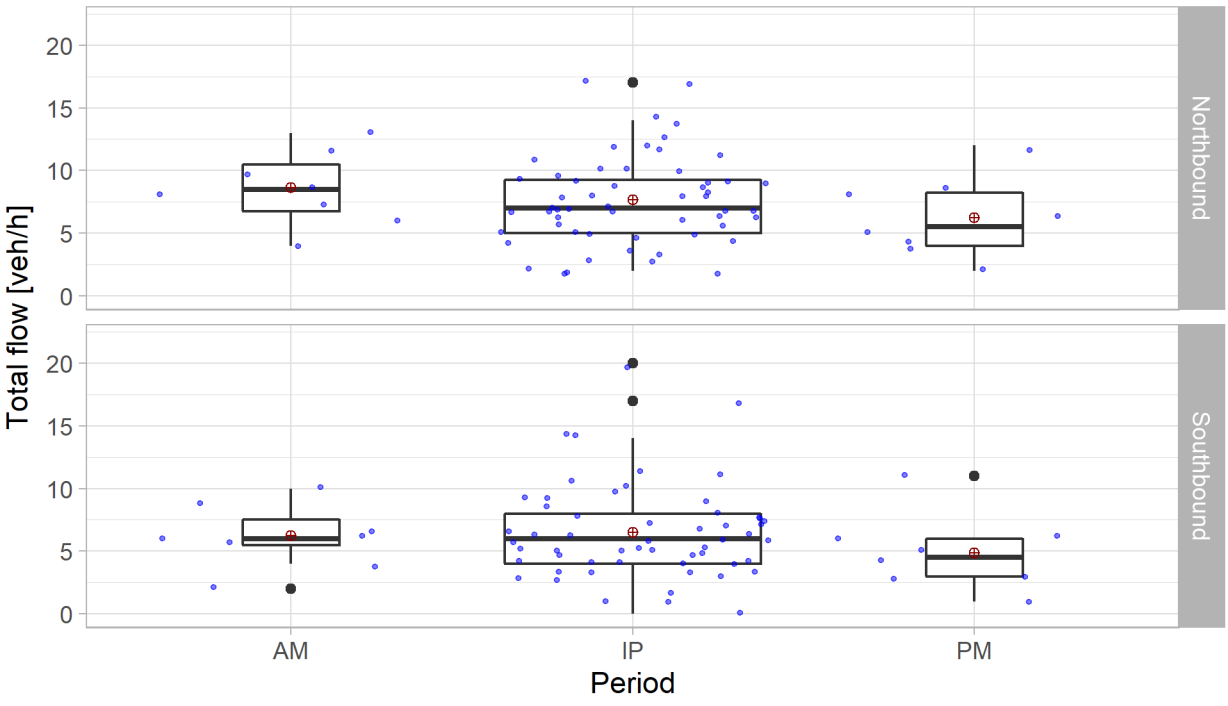
Site 69



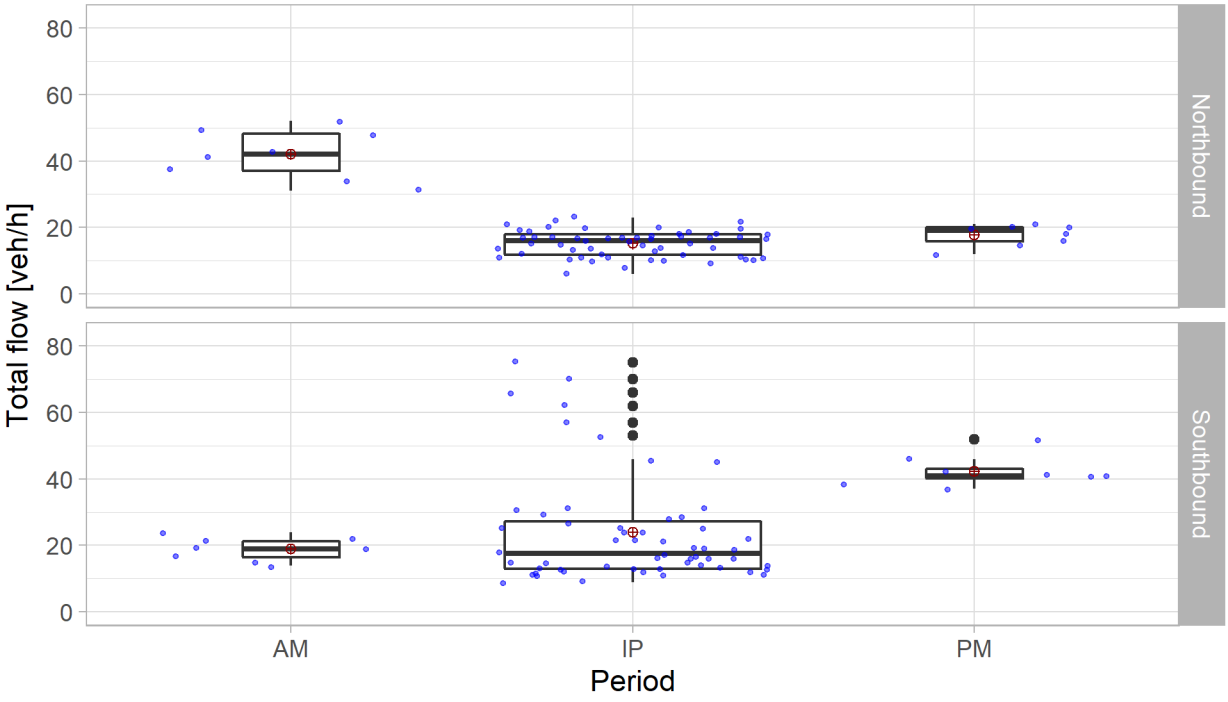
Site 70



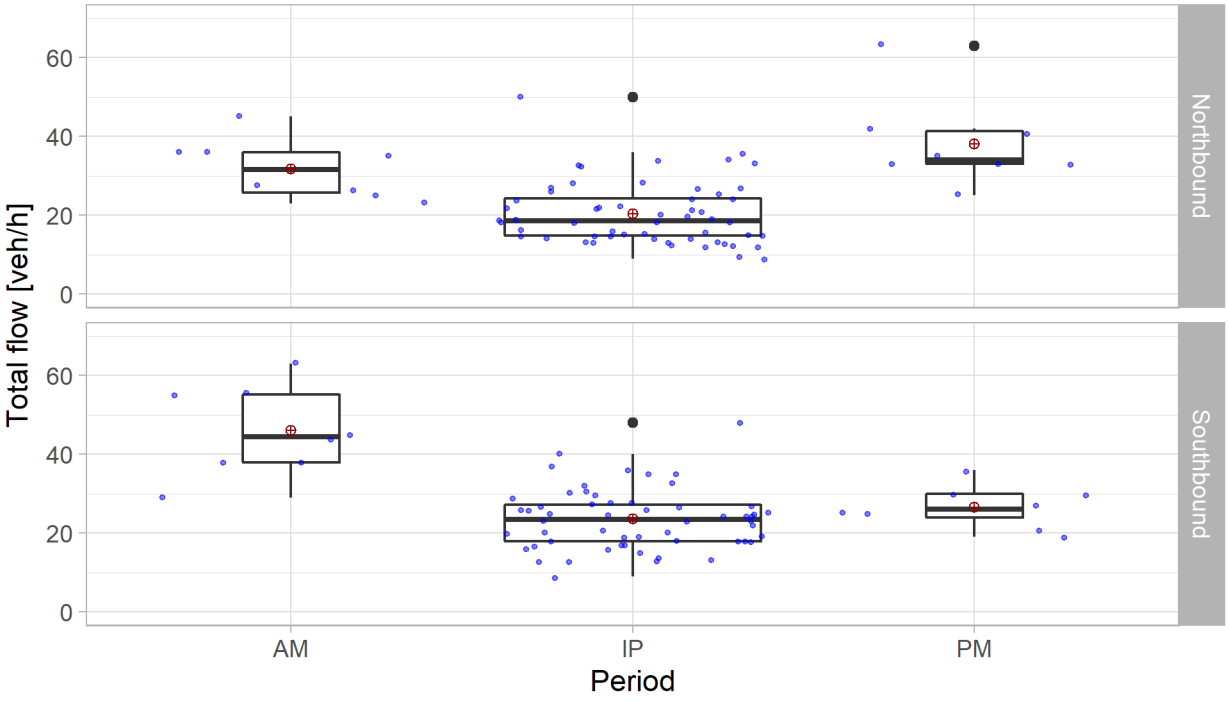
Site 71



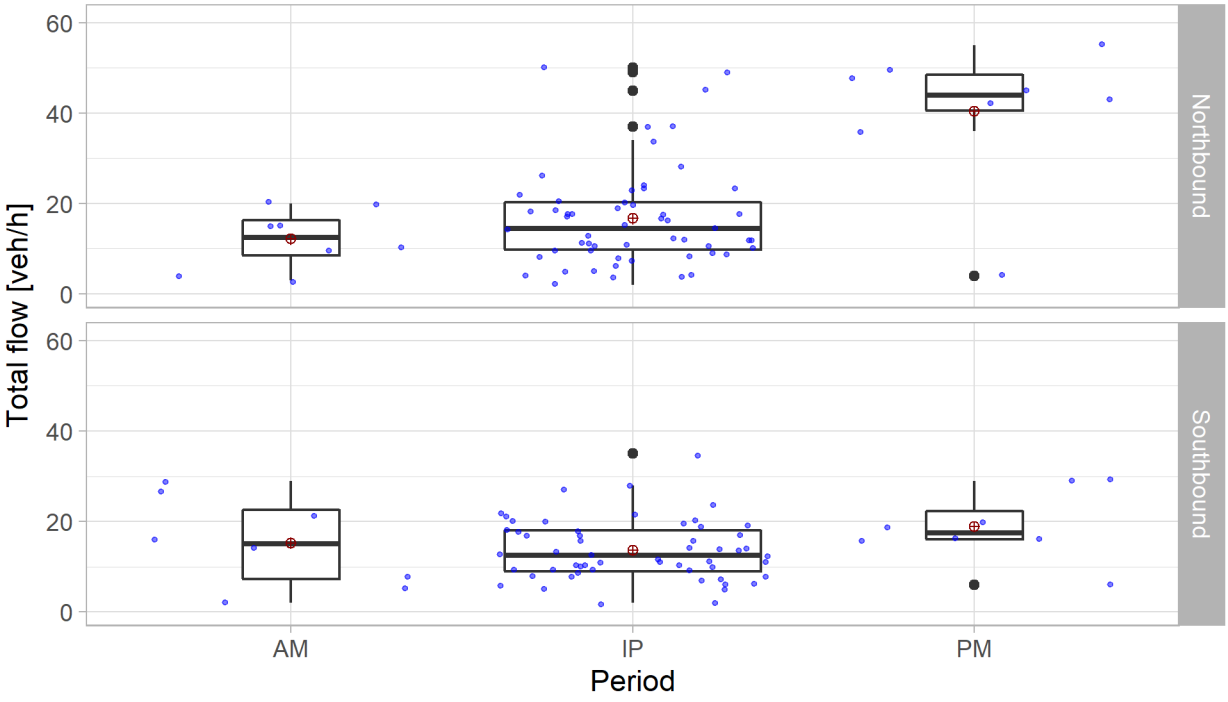
Site 72



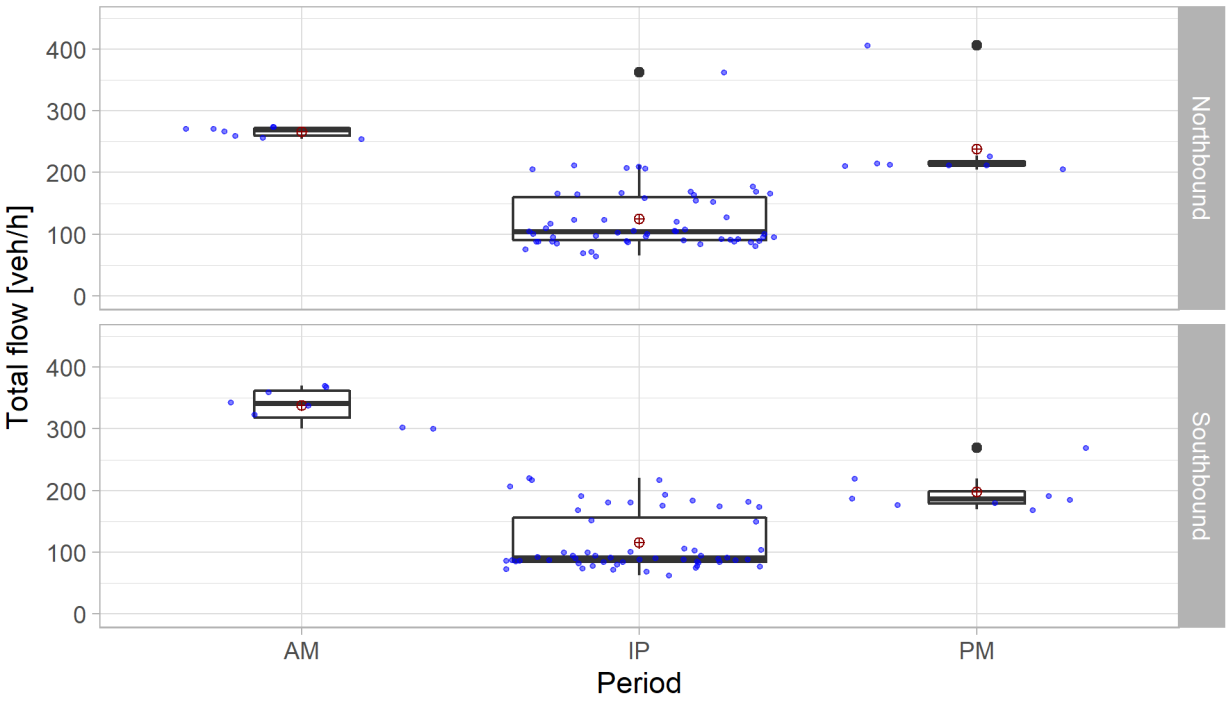
Site 73



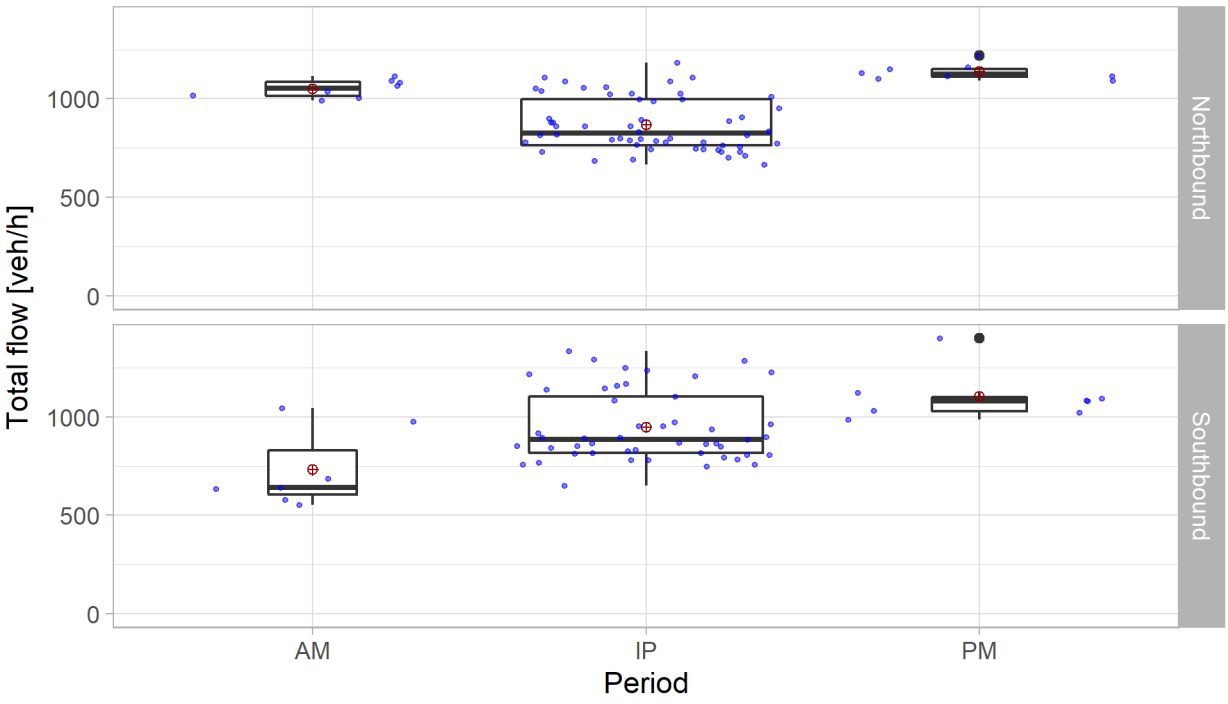
Site 74



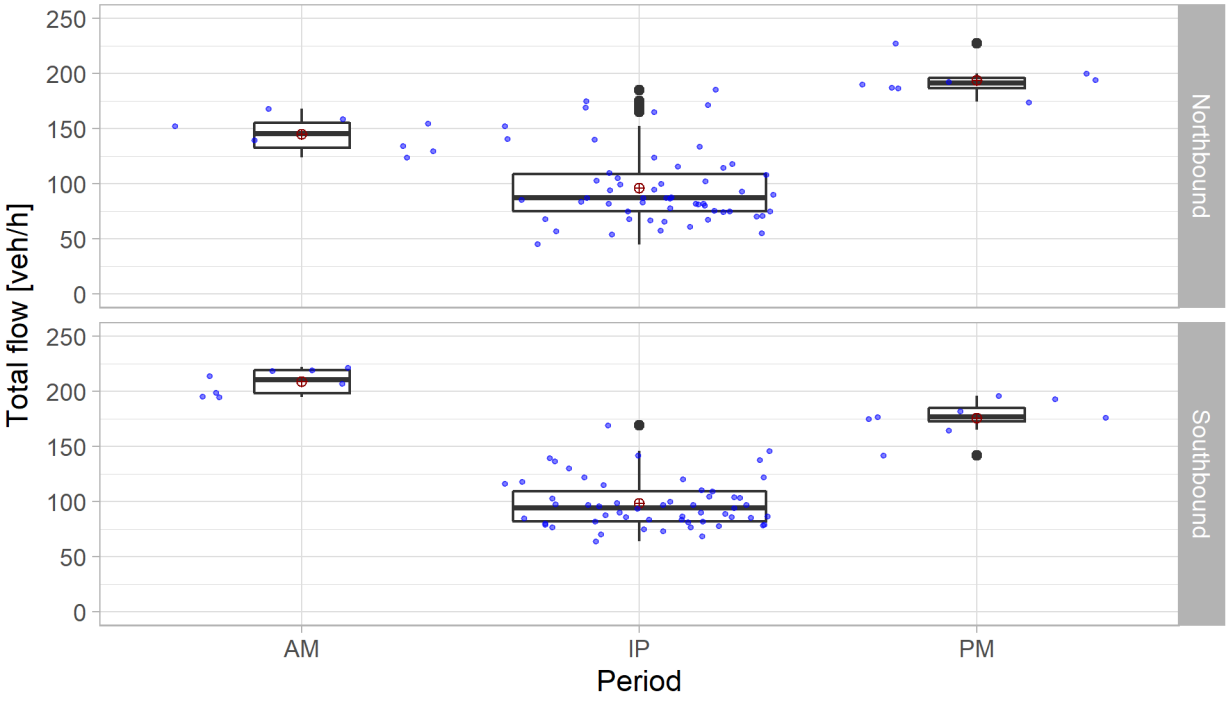
Site 75



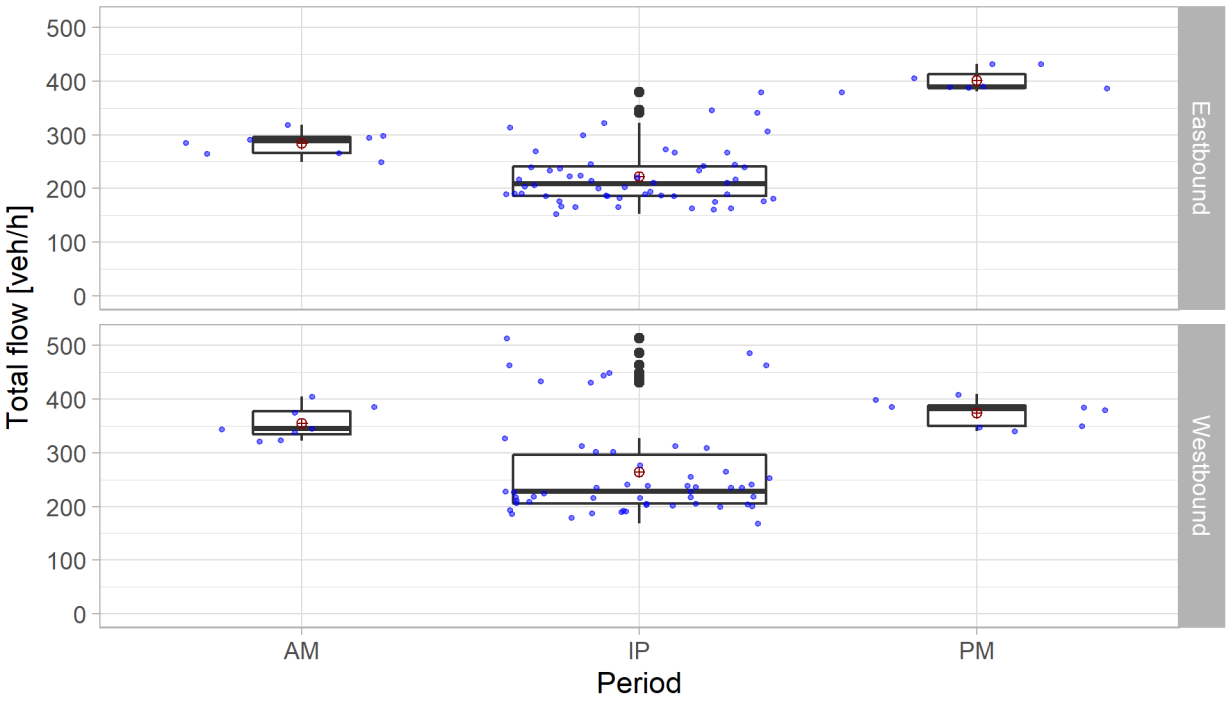
Site 76



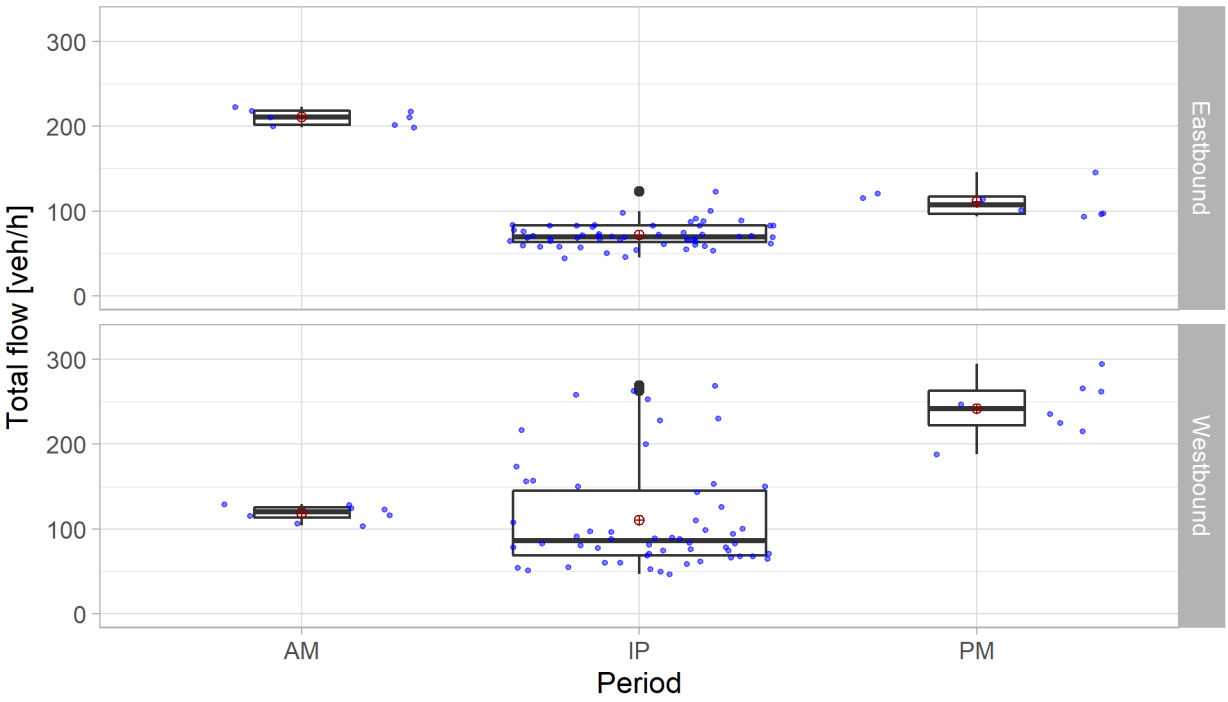
Site 77

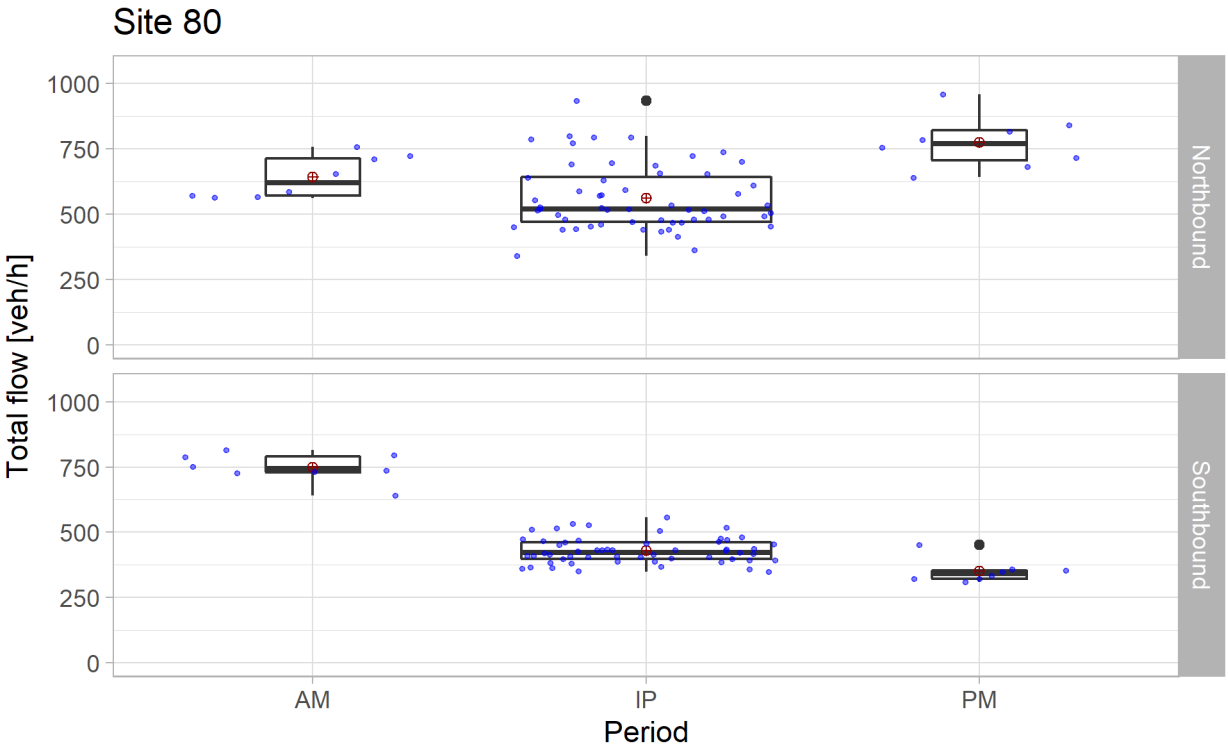


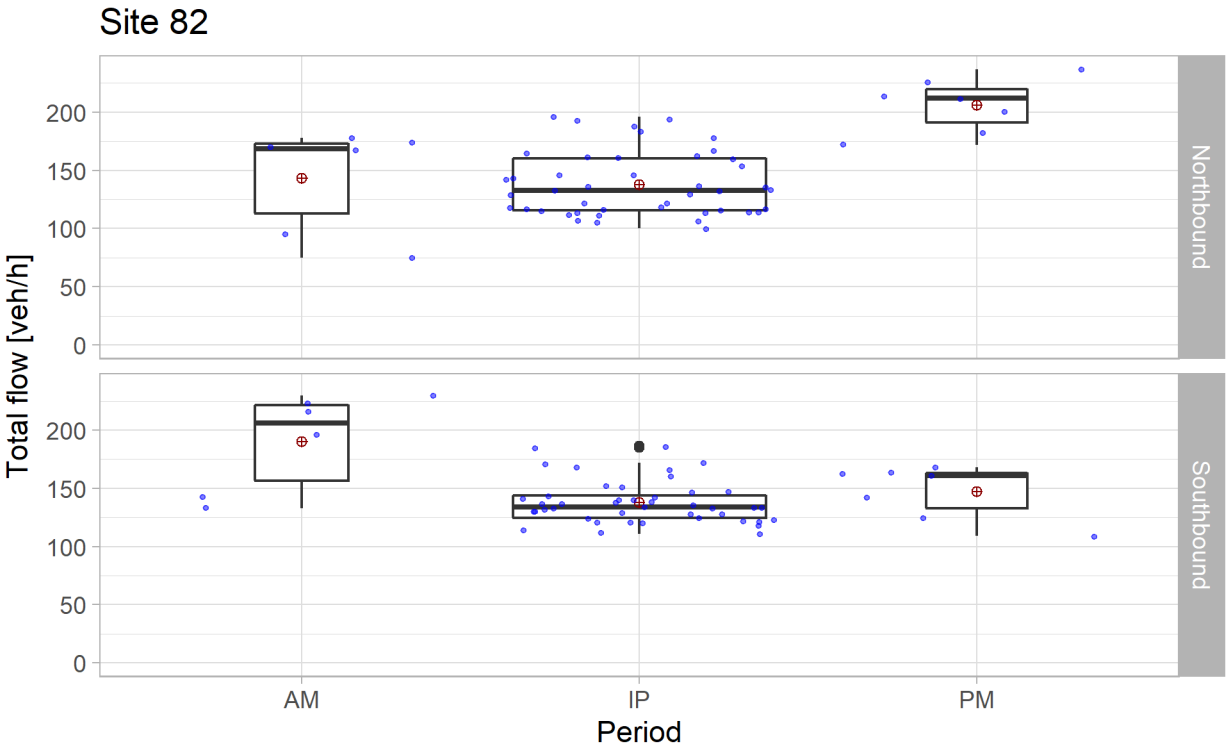
Site 78

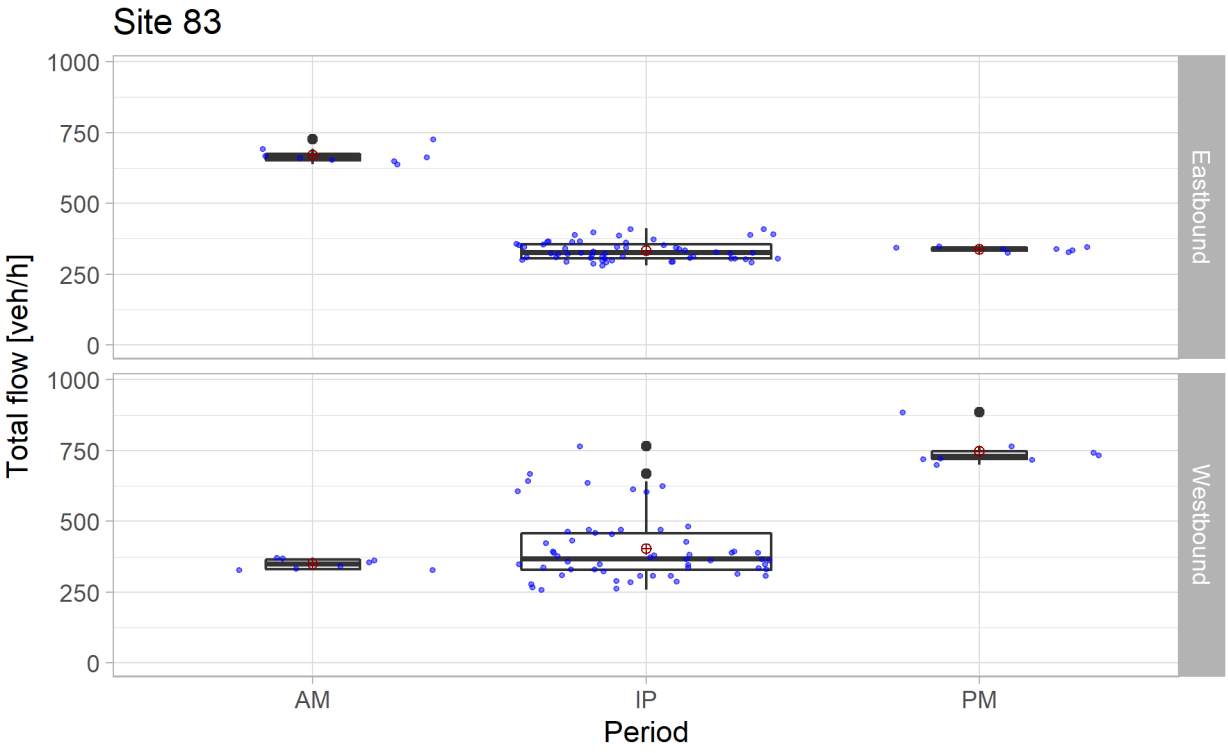


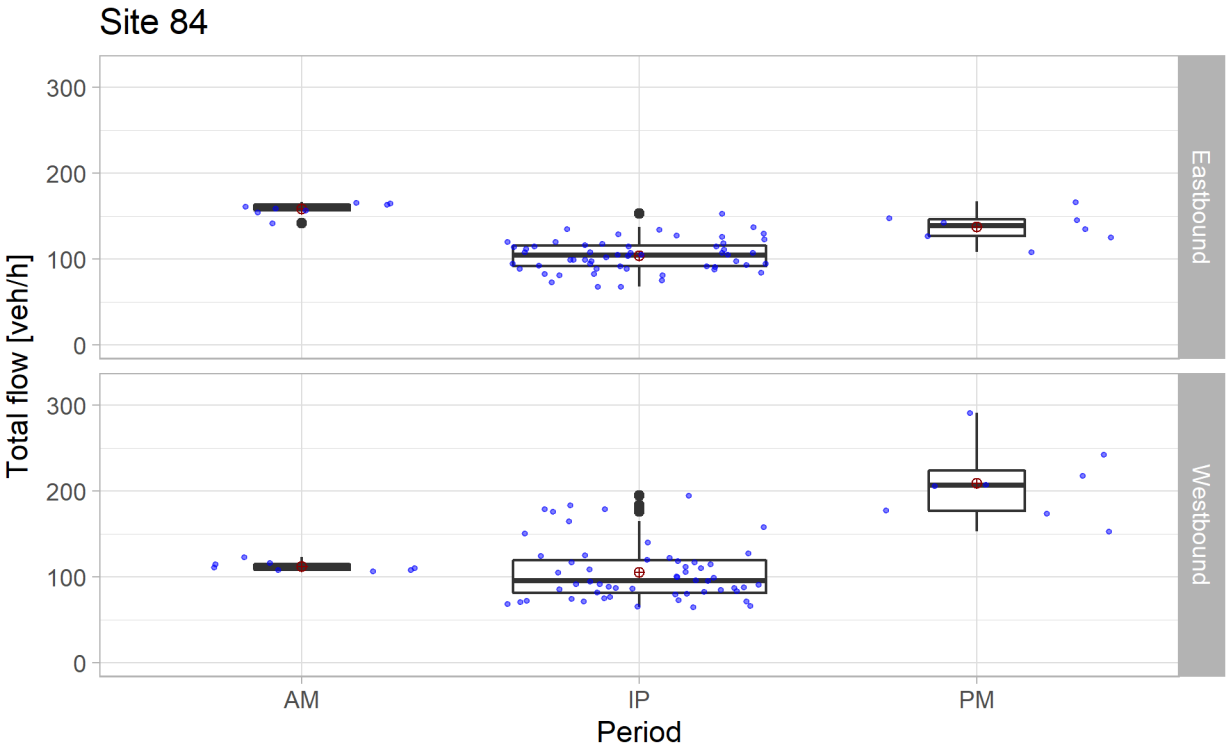
Site 79



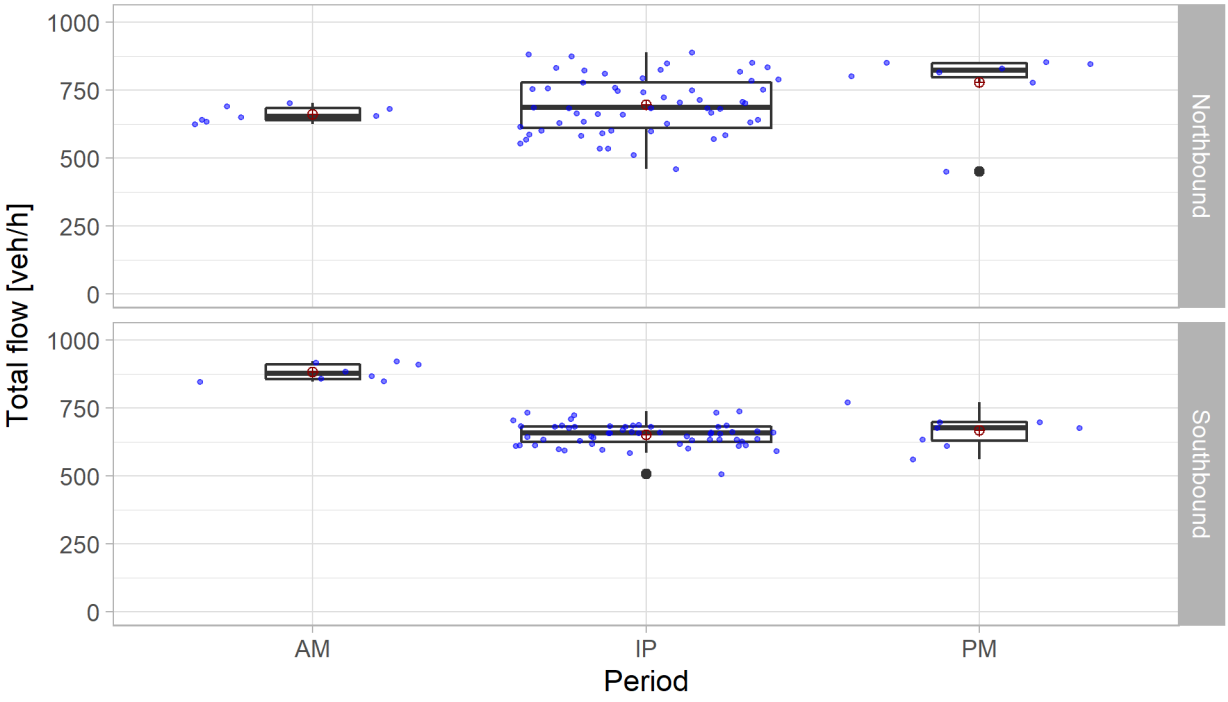

Site 80
Total flow [veh/h]
1000
750
500
250
0
Northbound
Southbound
AM
IP
PM
Period


Site 82
Total flow [veh/h]
200
150
100
50
0
Northbound
Southbound
AM
IP
PM
Period

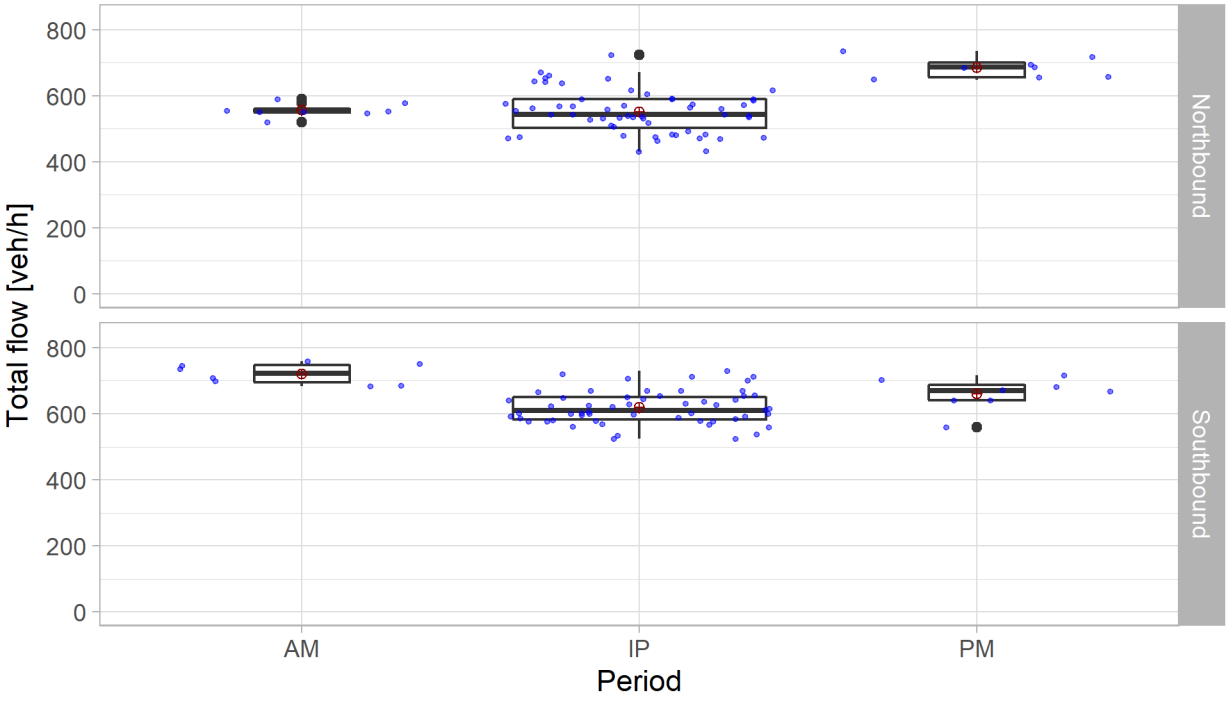

Site 83
Total flow [veh/h]
1000
750
500
250
0
Eastbound
Westbound
AM
IP
PM
Period

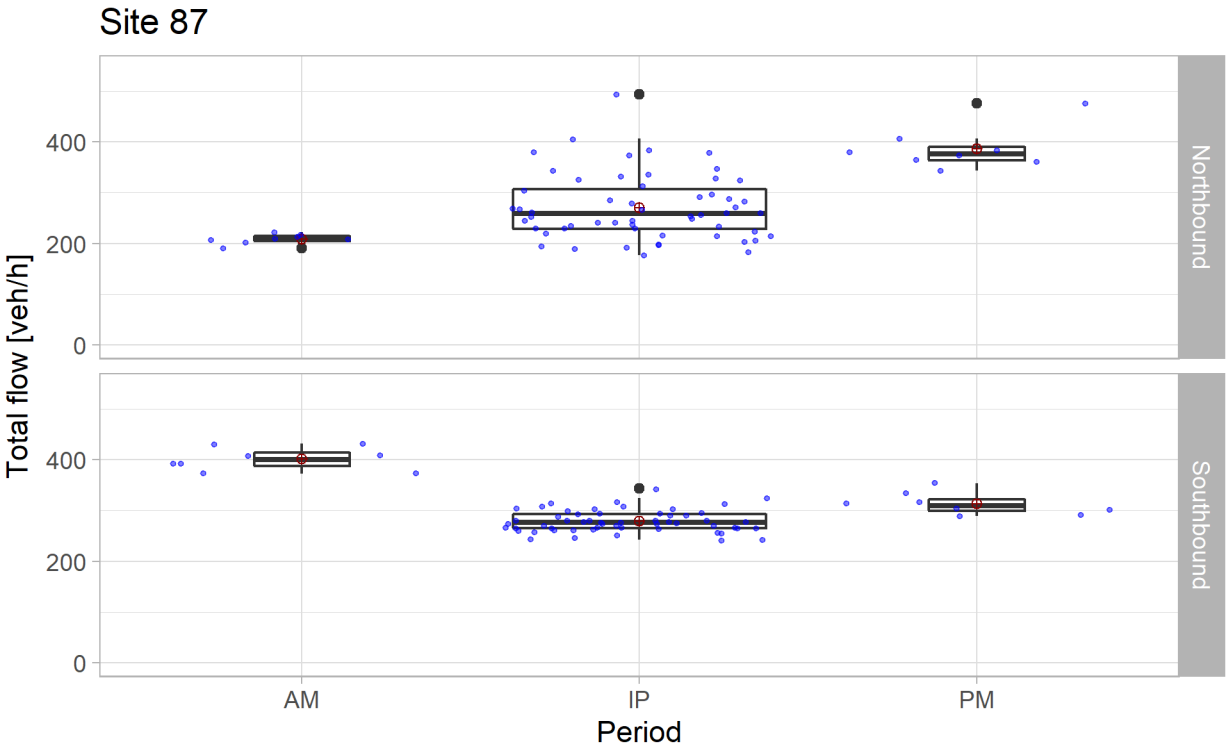

Site 84
Total flow [veh/h]
300
200
100
0
Eastbound
Westbound
AM
IP
PM
Period

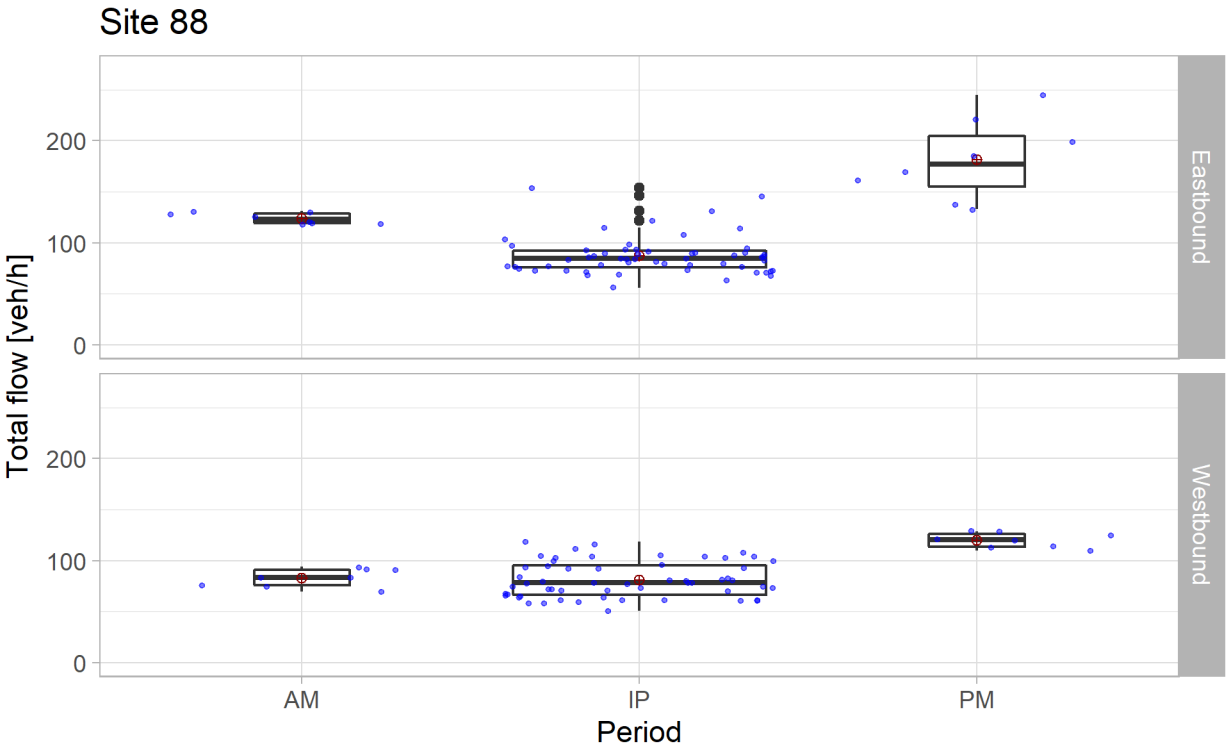
Site 85

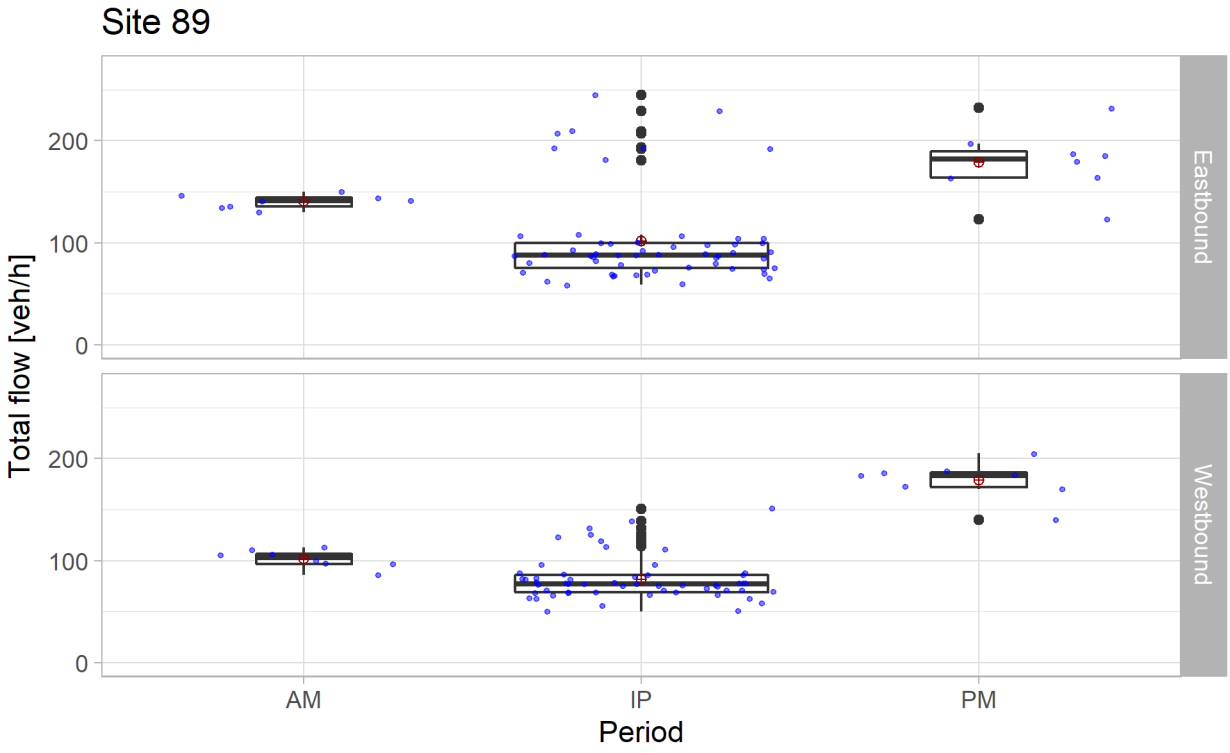


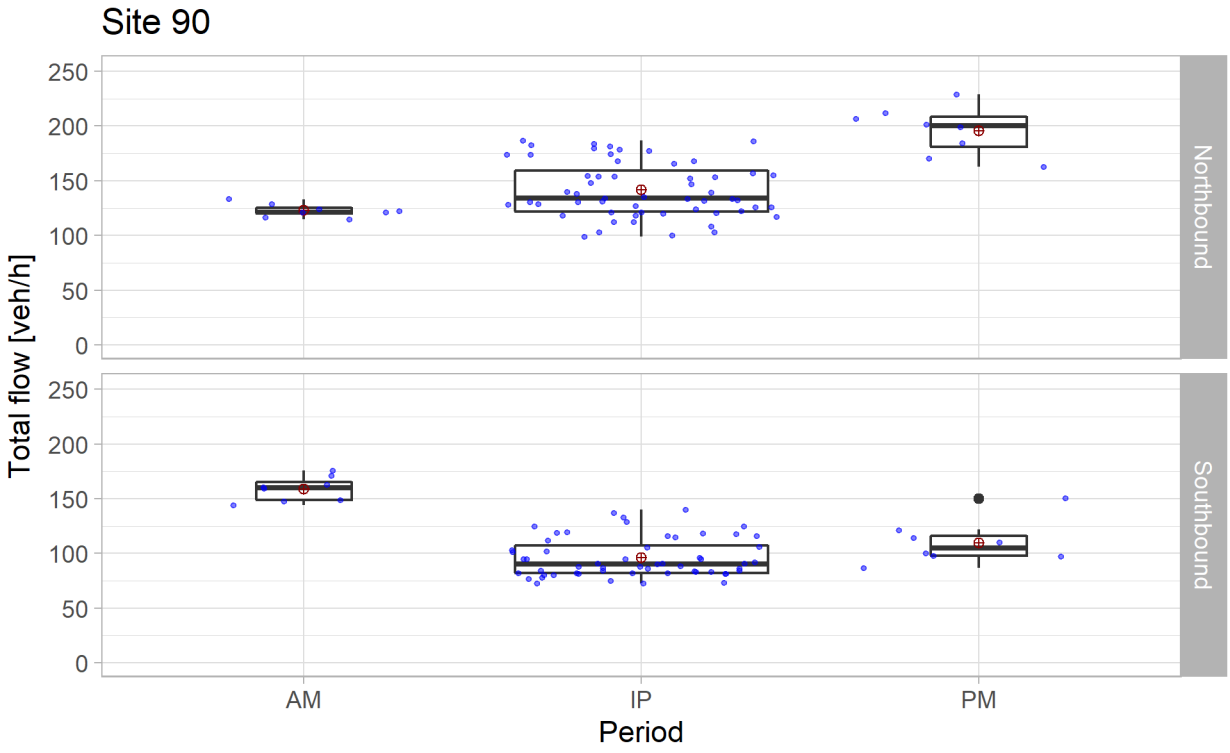
Site 86

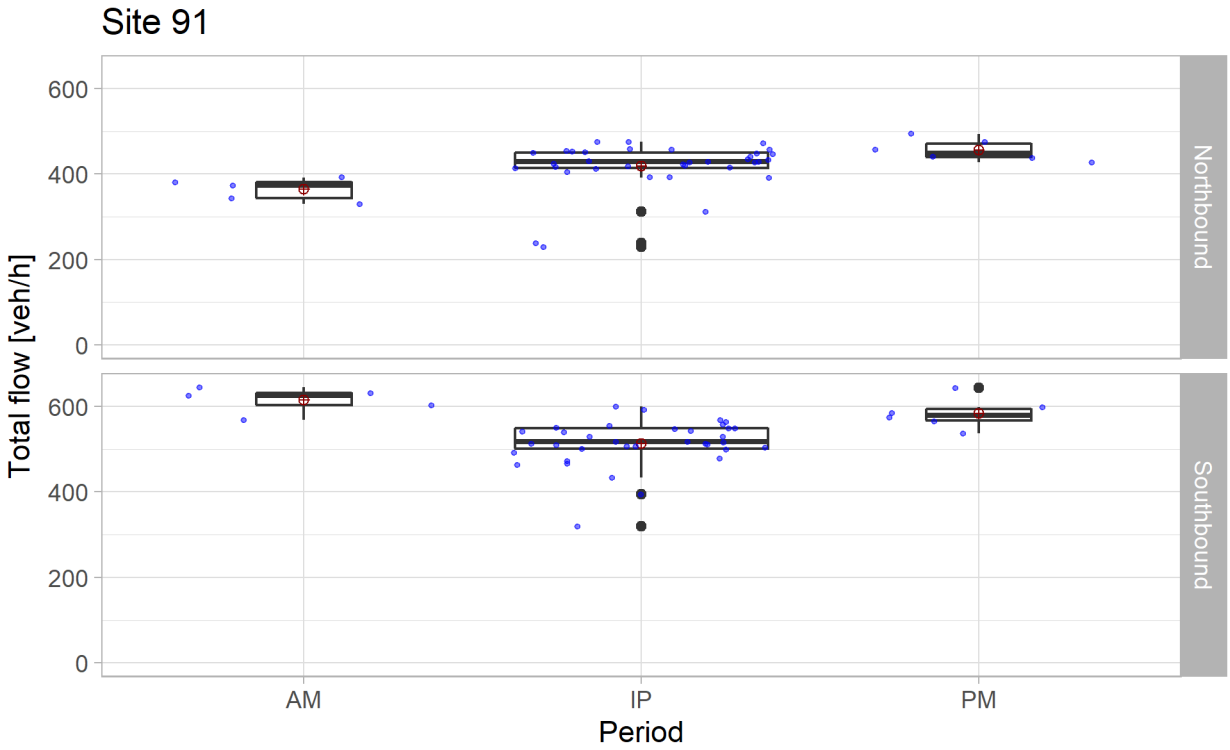


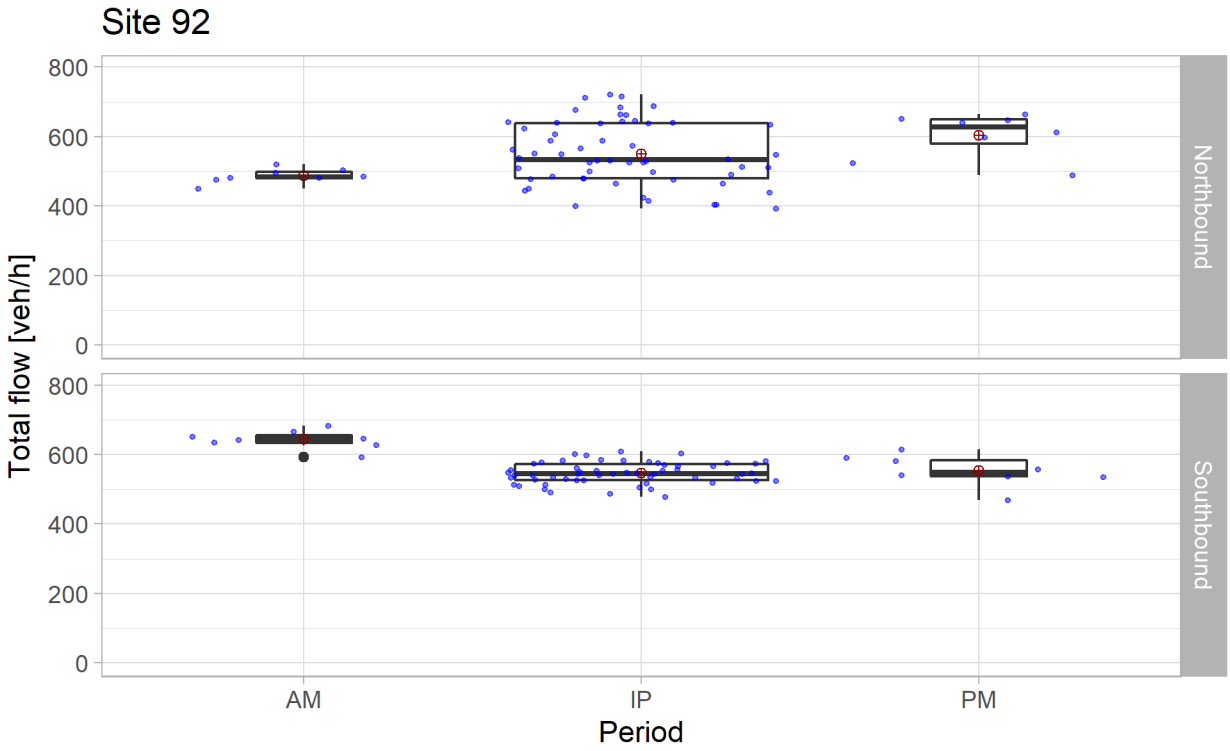

Site 87
Total flow [veh/h]
400
200
0
Northbound
Southbound
AM
IP
PM
Period

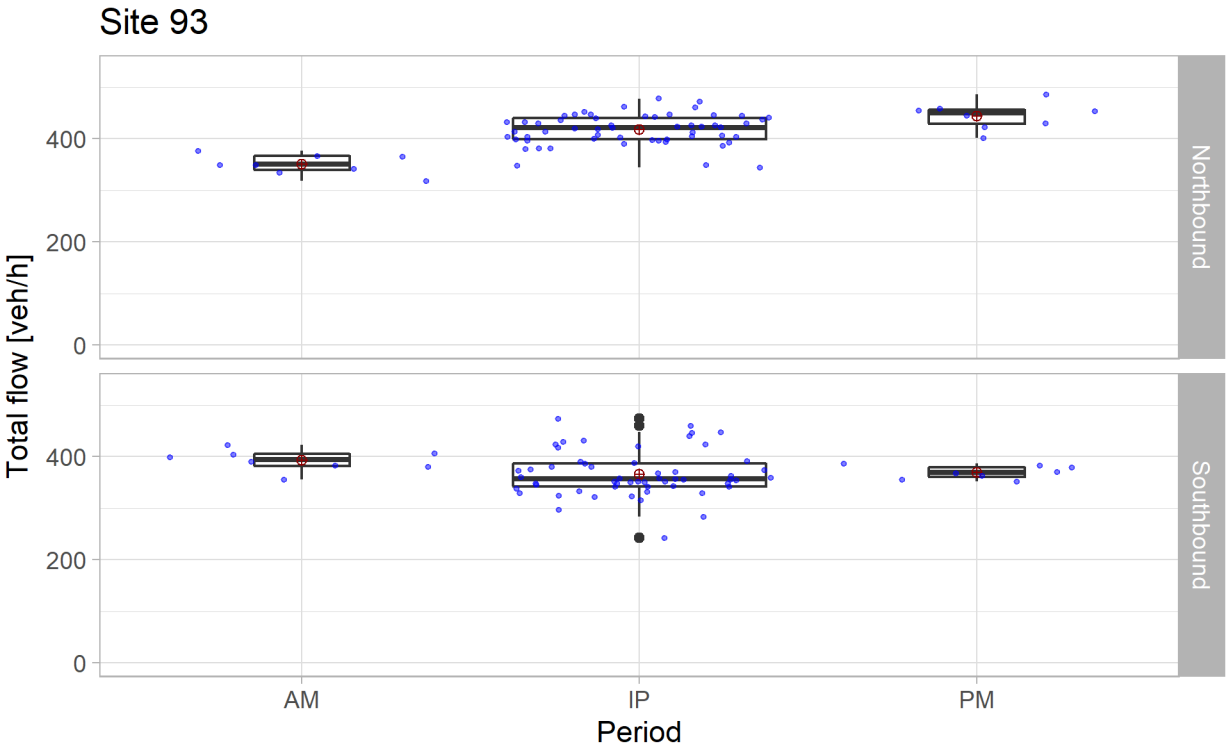

Site 88
Total flow [veh/h]
200
100
0
Eastbound
Westbound
AM
IP
PM
Period

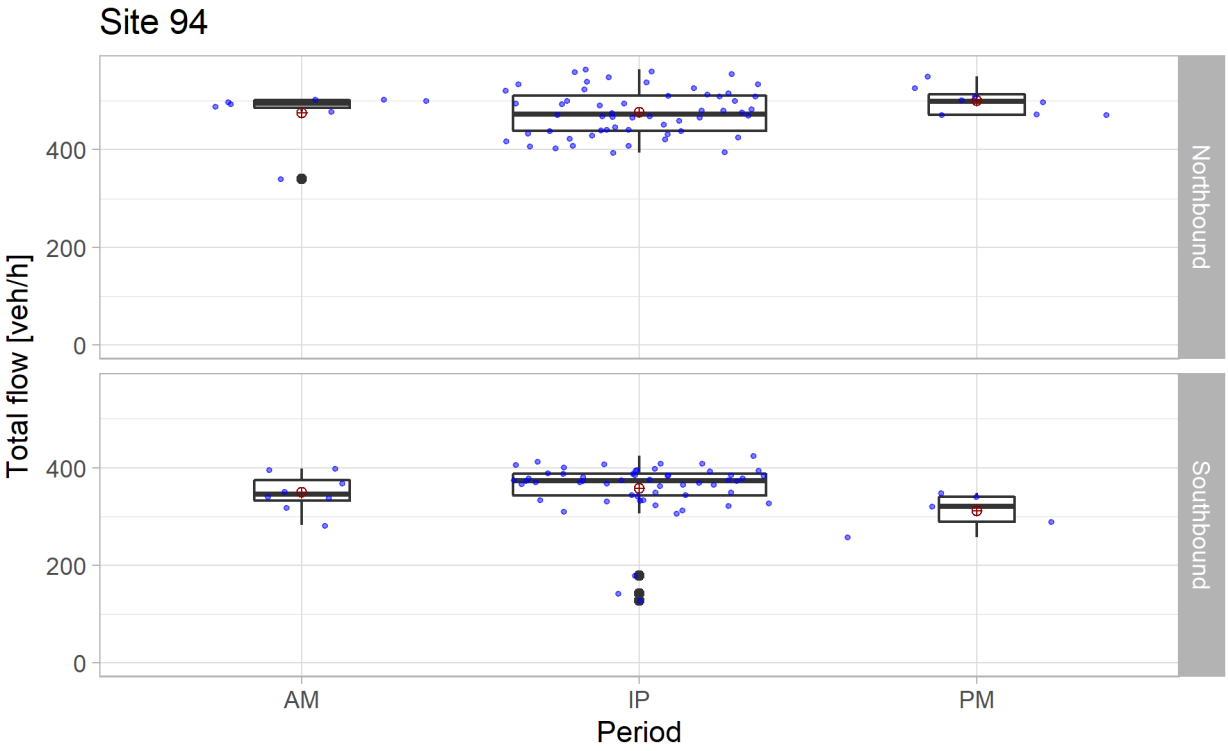

Site 89
Total flow [veh/h]
200
100
0
Eastbound
Westbound
AM
IP
PM
Period

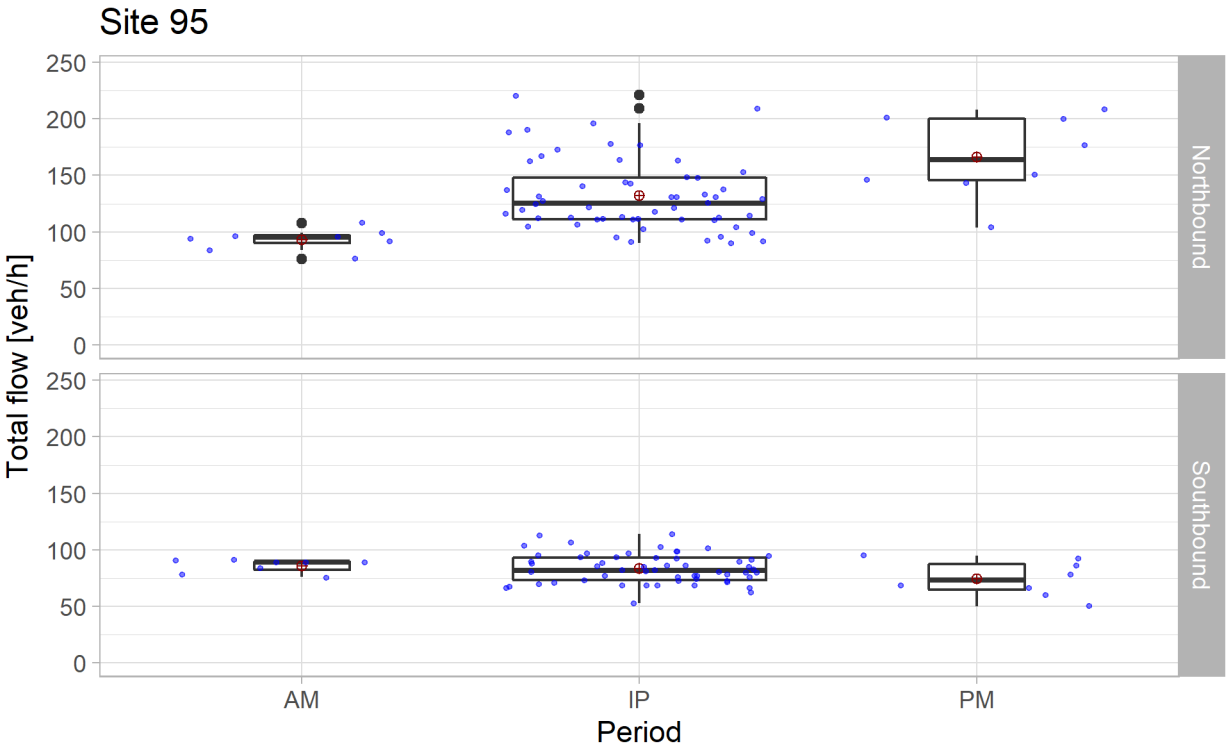

Site 90
Total flow [veh/h]
250
200
150
100
50
0
Northbound
Southbound
AM
IP
PM
Period

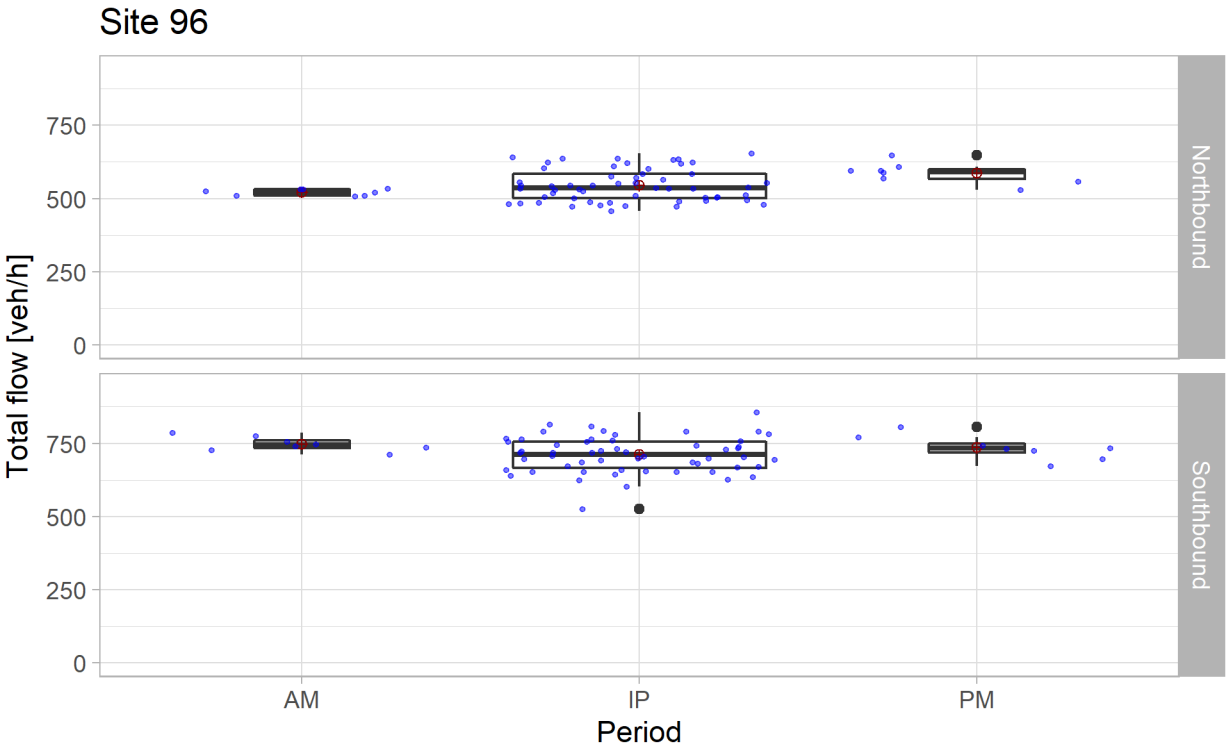

Site 91
Total flow [veh/h]
600
400
200
0
Northbound
Southbound
AM
IP
PM
Period


Site 92
Total flow [veh/h]
800
600
400
200
0
Northbound
Southbound
AM
IP
PM
Period

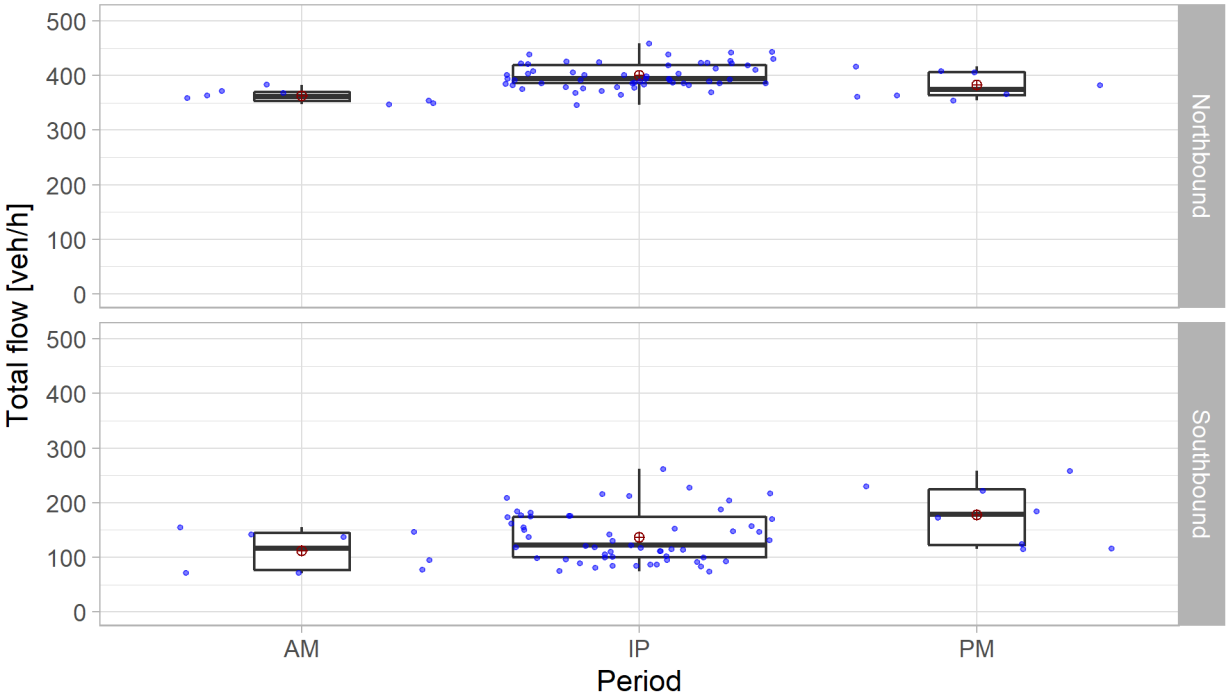

Site 93
Total flow [veh/h]
400
200
0
Northbound
Southbound
AM
IP
PM
Period


Site 94
Total flow [veh/h]
400
200
0
Northbound
Southbound
AM
IP
PM
Period

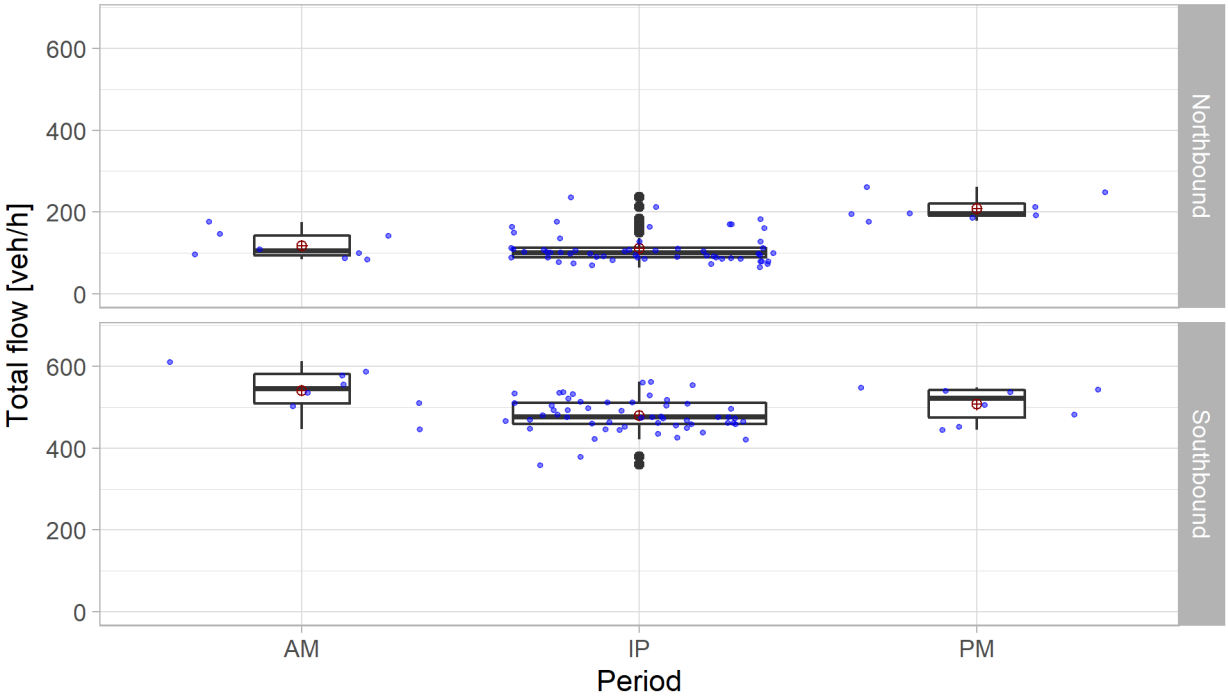

Site 95
Total flow [veh/h]
250
200
150
100
50
0
Northbound
Southbound
AM
IP
PM
Period

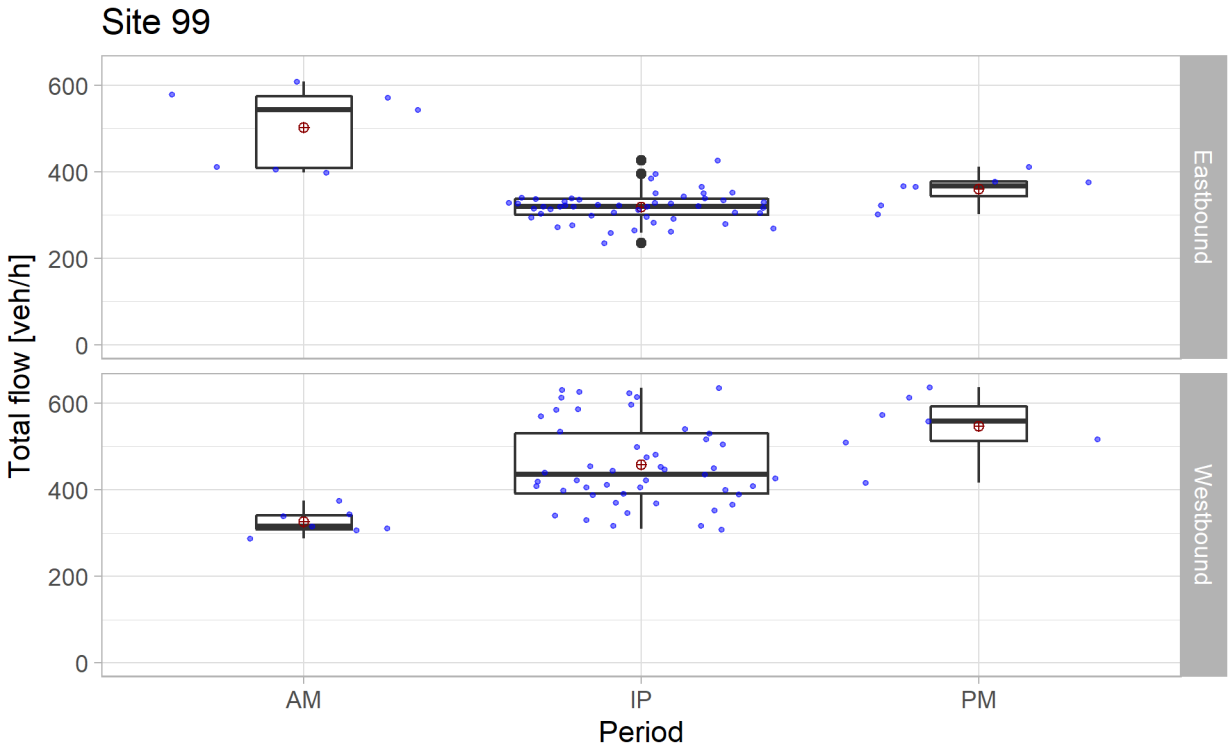

Site 96
Total flow [veh/h]
750
500
250
0
Northbound
Southbound
AM
IP
PM
Period

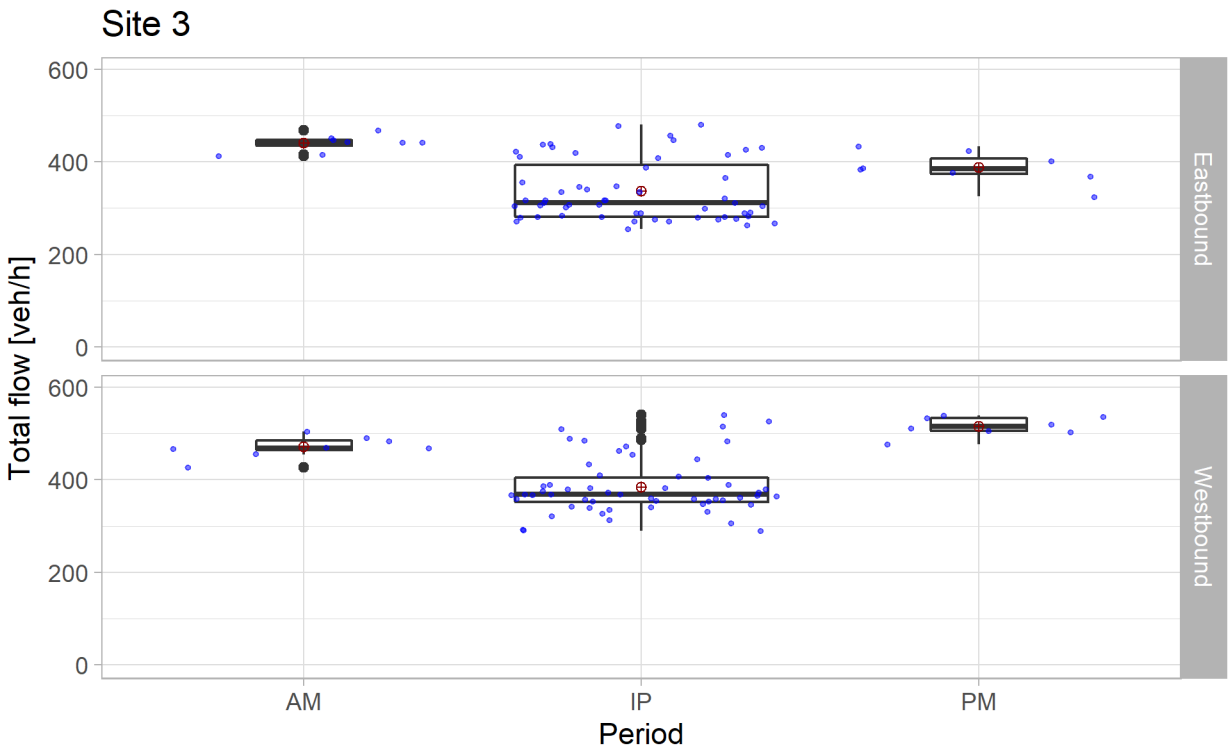
Site 97



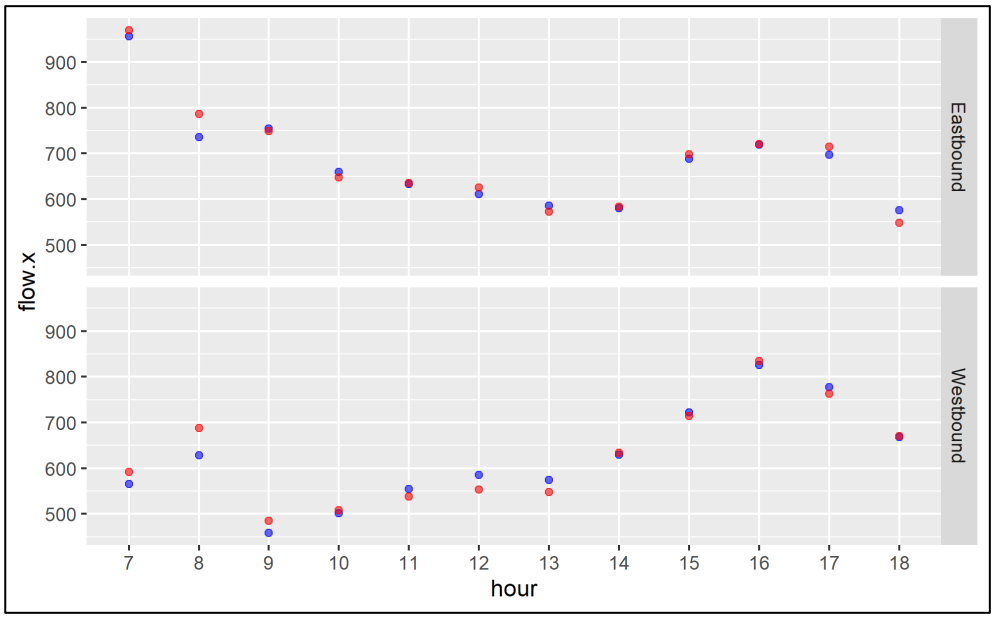
Site 98



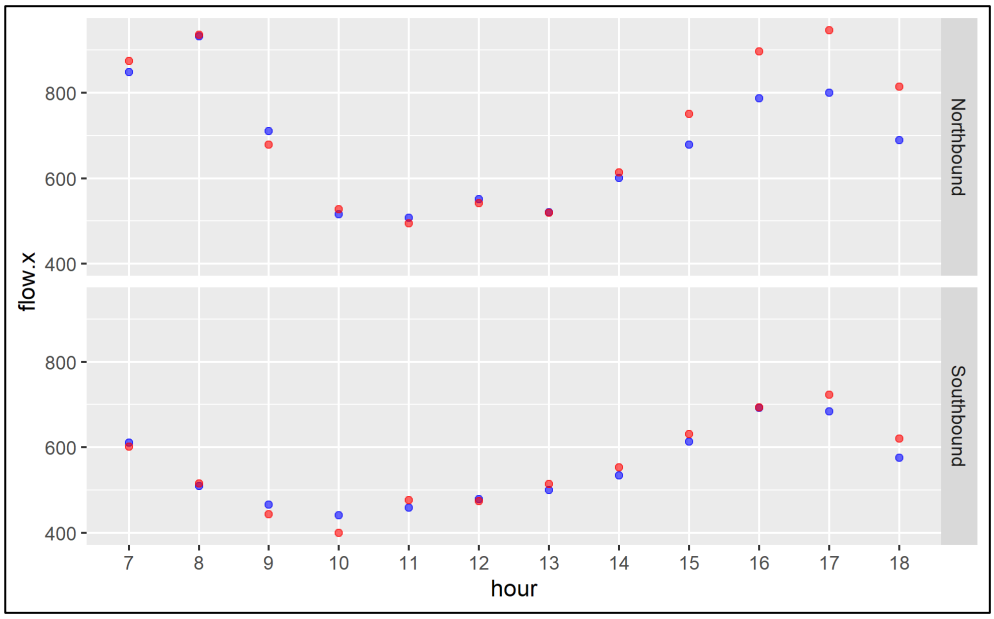

Site 99
Total flow [veh/h]
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period


Site 3
Total flow [veh/h]
600
400
200
0
Eastbound
Westbound
AM
IP
PM
Period

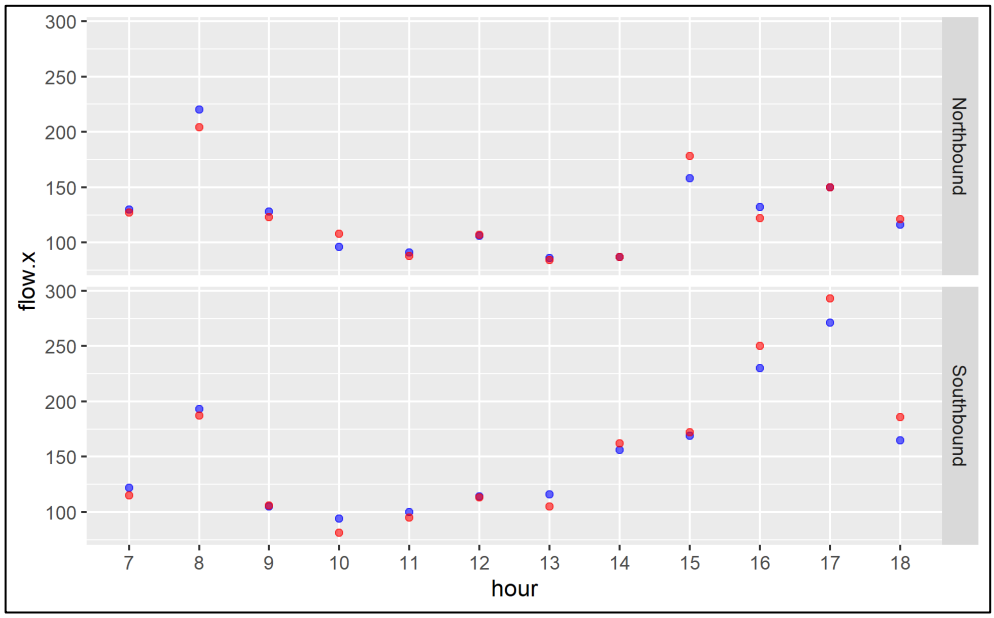
D.3 Manual Traffic Counts and ATC/ATR Traffic Profile



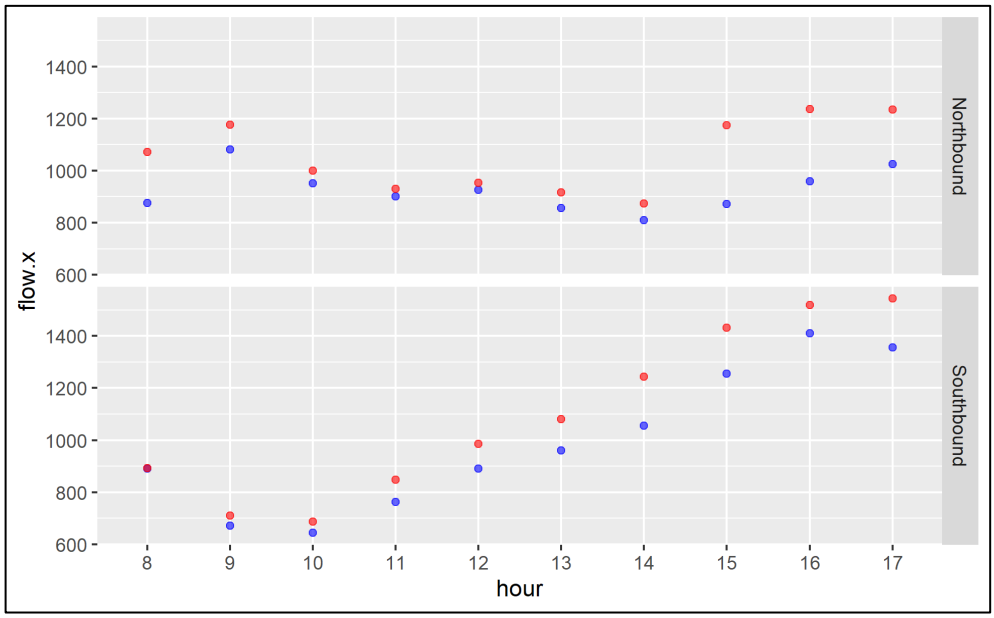
Site 1



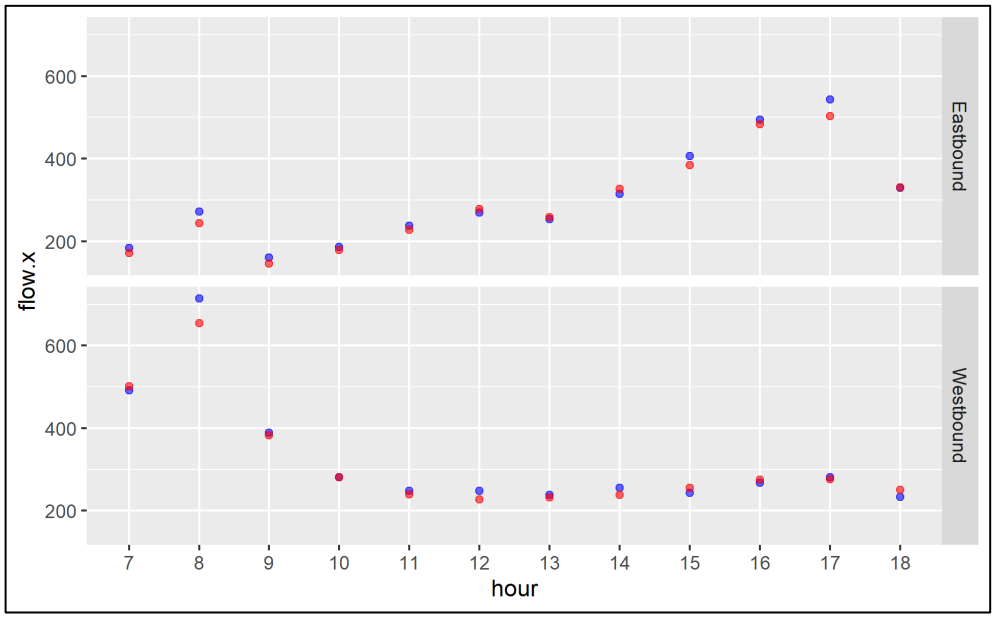
Site 5


flow.x
300
250
200
150
100
Northbound
Southbound
7
8
9
10
11
12
13
14
15
16
17
18
hour

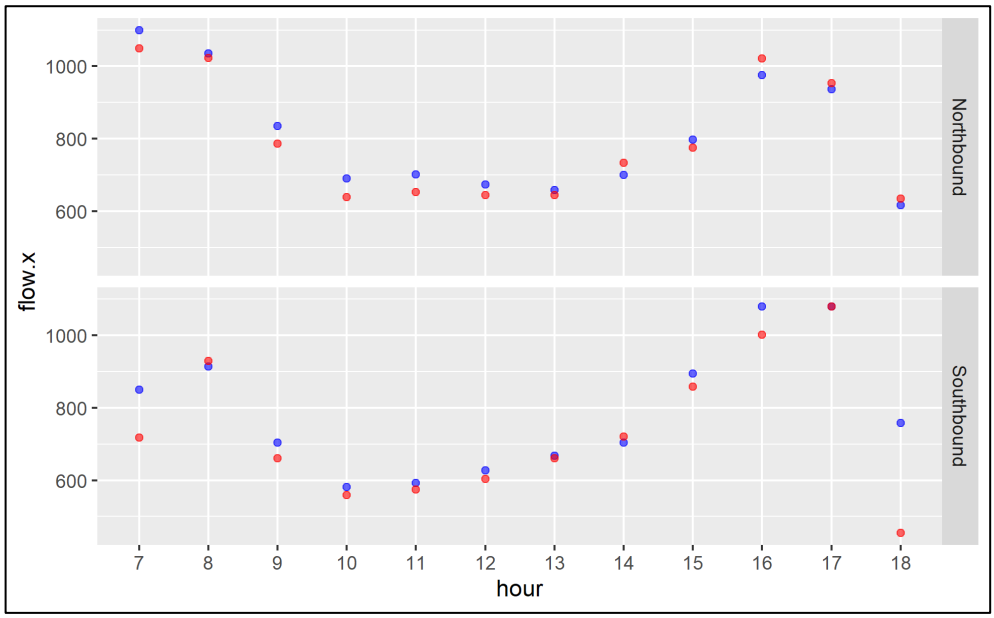
Site 6


flow.x
1400
1200
1000
800
600
Northbound
Southbound
8
9
10
11
12
13
14
15
16
17
hour

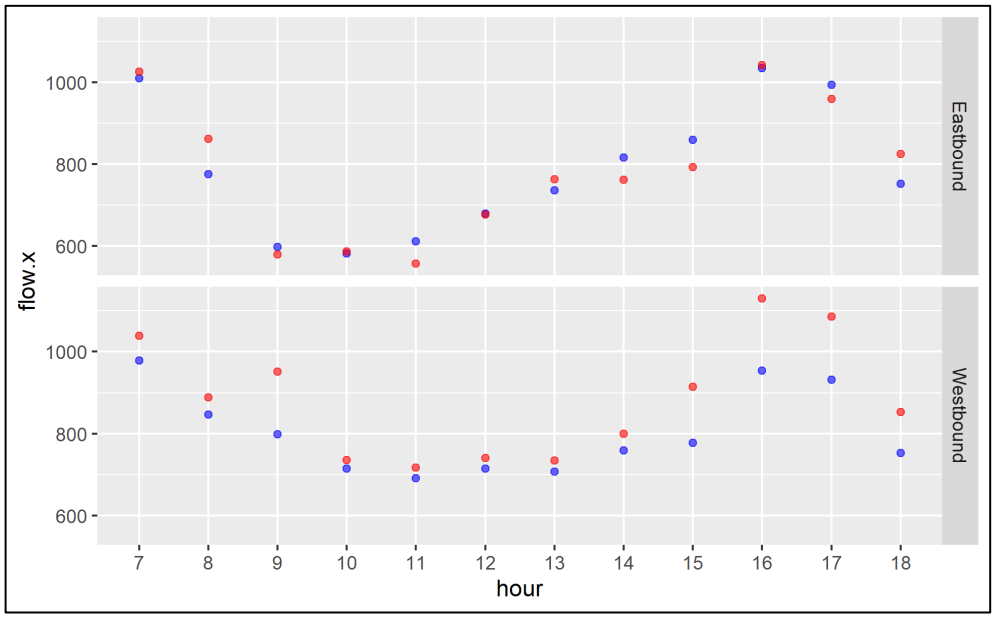
Site 7



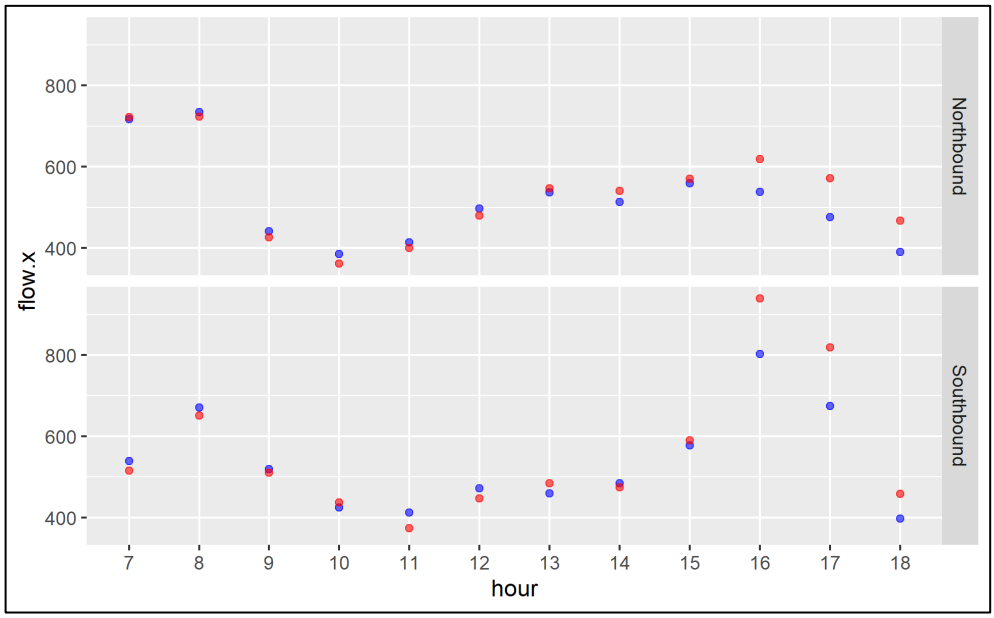
Site 9



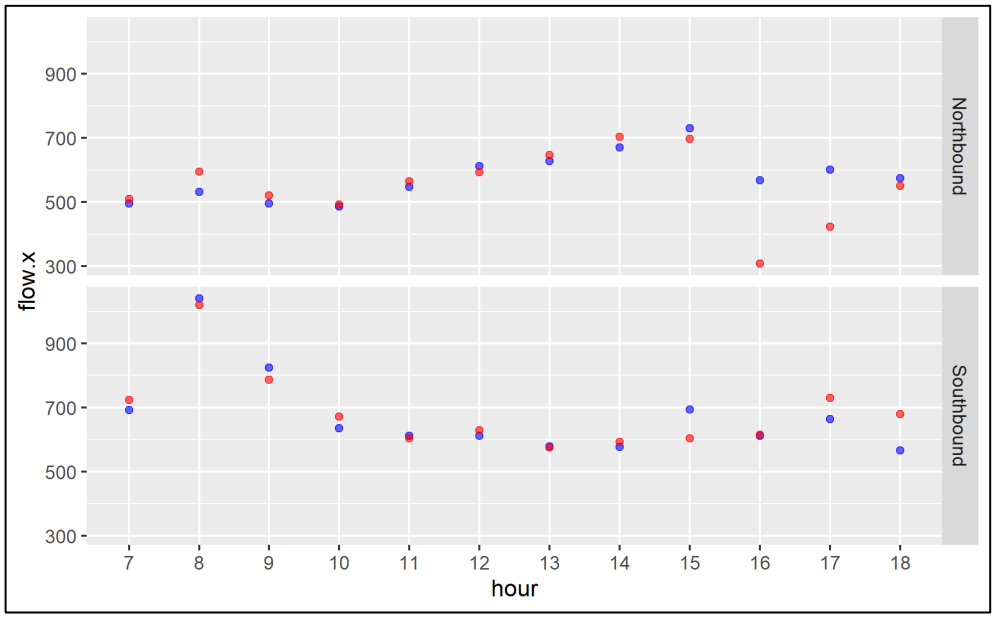
Site 54



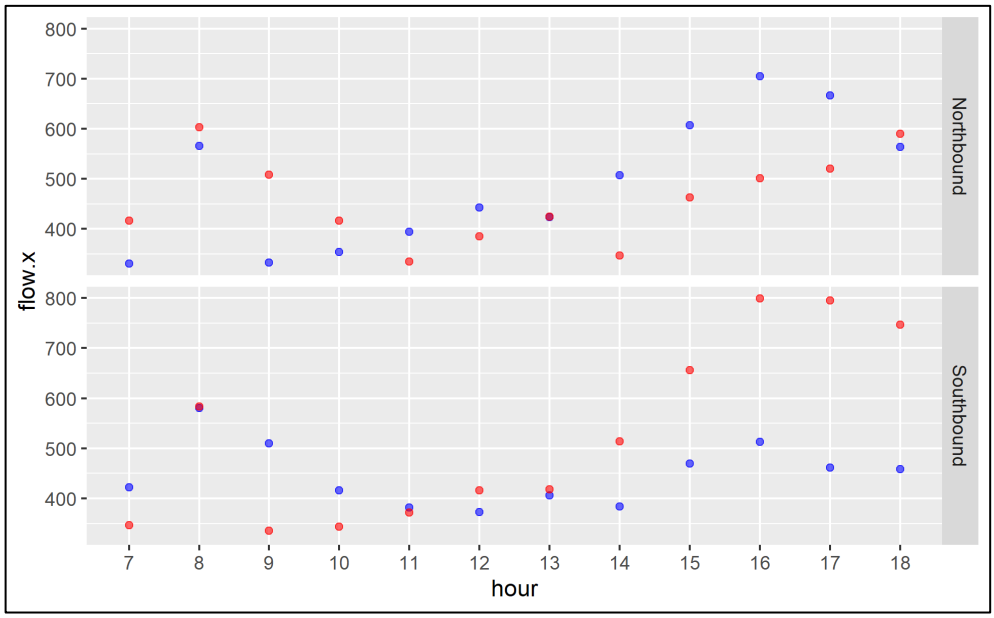
Site 123



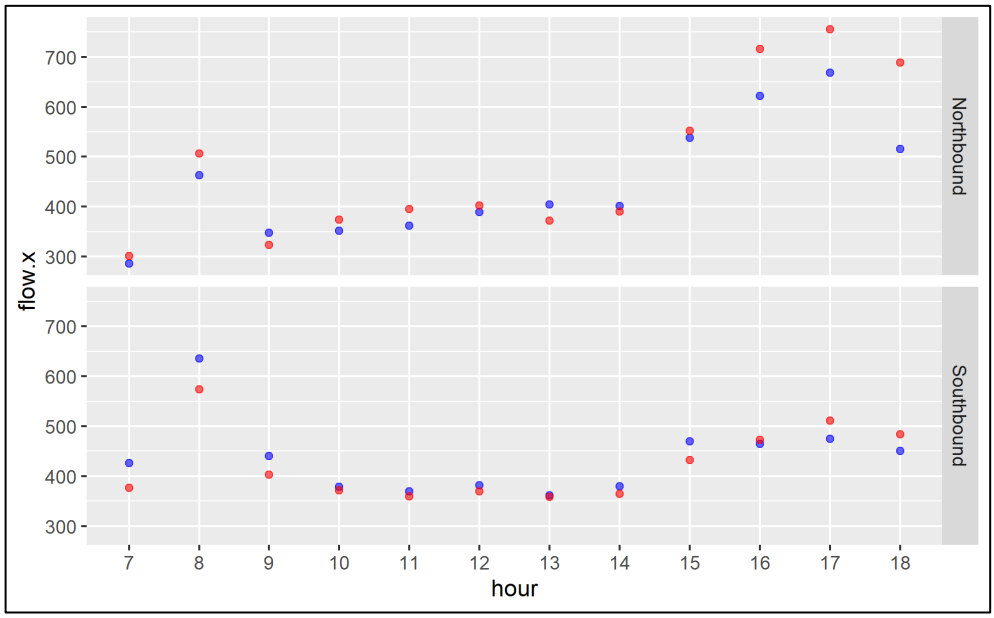
Site 124



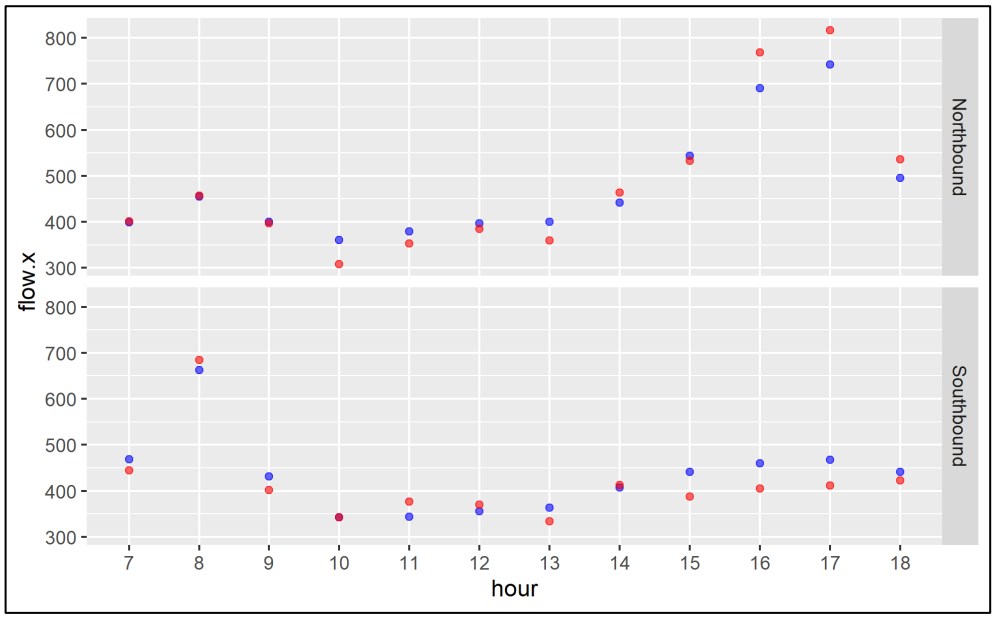
Site 126



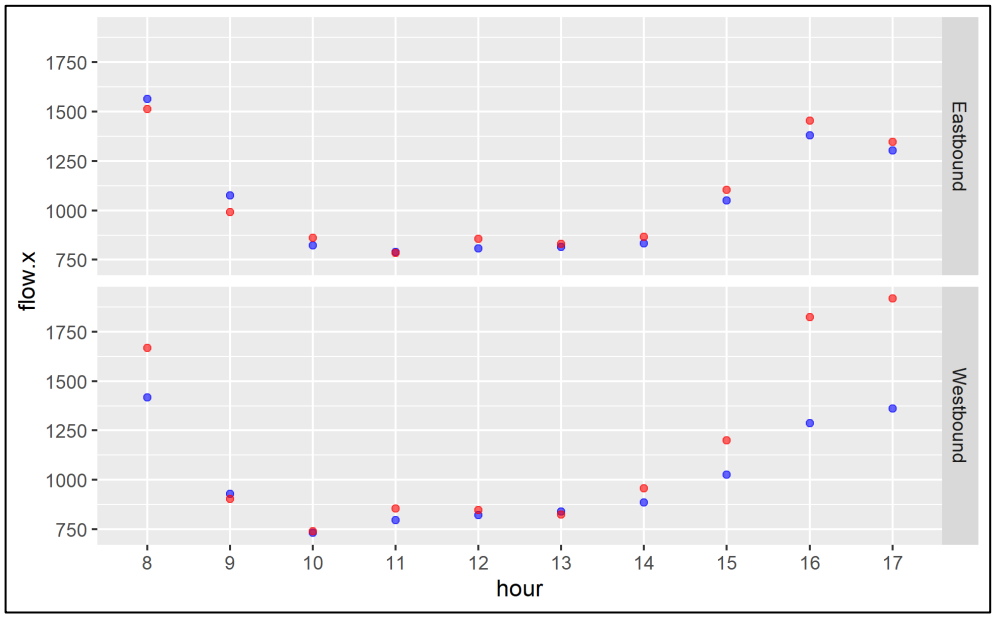
Site 127



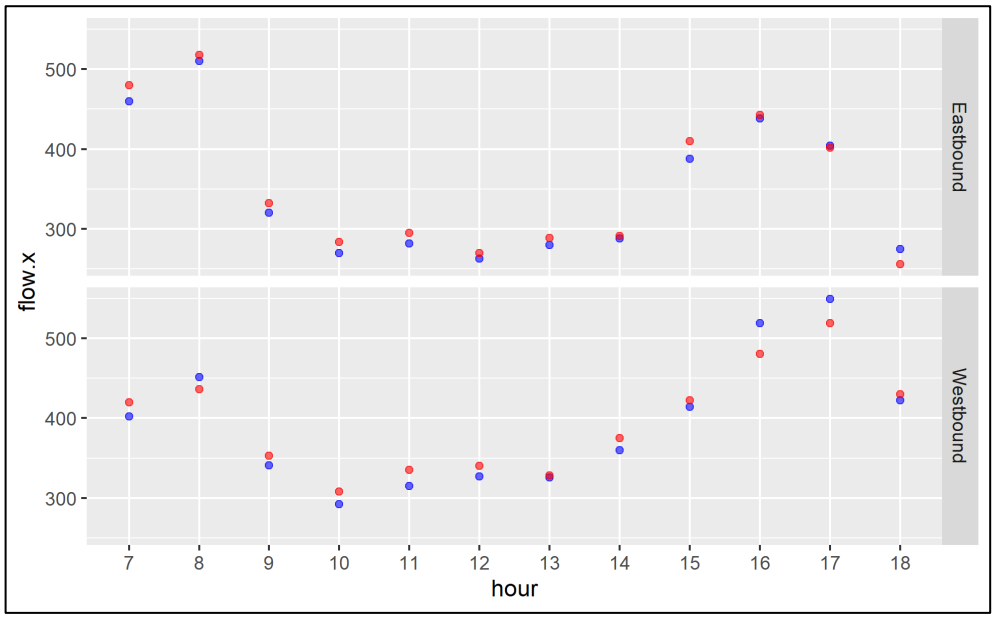
Site 128



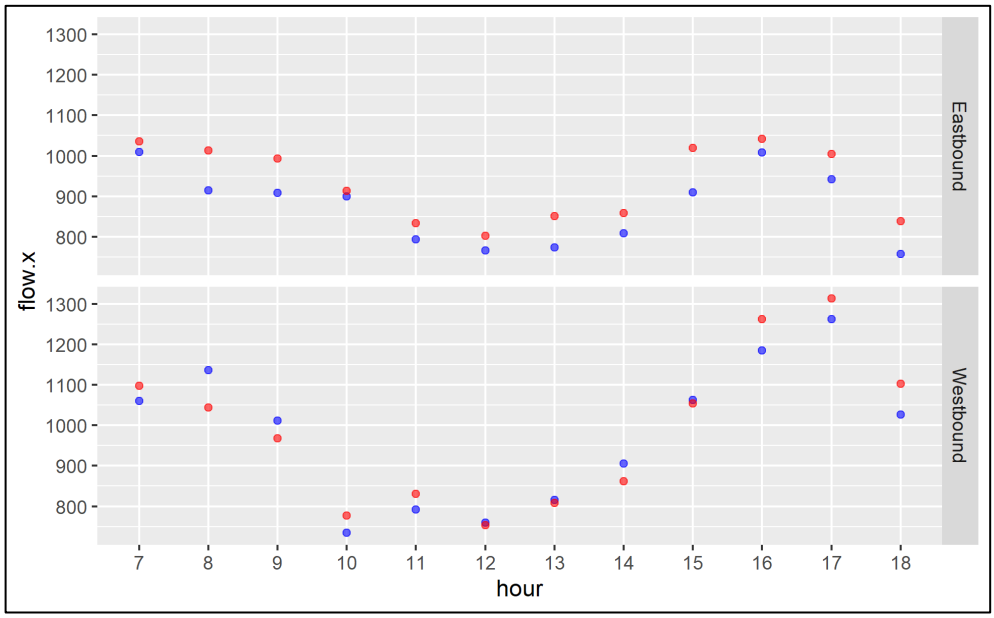
Site 129



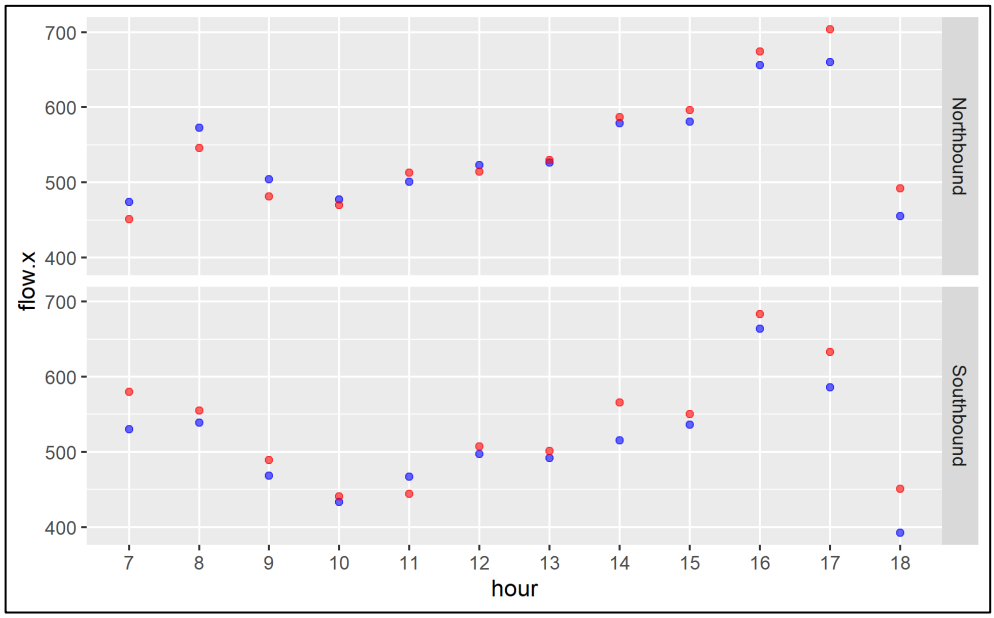
Site 130



Site 132



Site 133



Site 134

D.4 ATC/Radar site correspondence to MCC sites

Site	Type	Direction	MCC Site	MCC Dir.
1	ATC	WB	1	WB
1	ATC	EB	1	EB
2	ATC	SB	131	EB
2	ATC	NB	131	WB
3	ATC	EB	132	EB
3	ATC	WB	132	WB
4	ATC	NB	54	NB
4	ATC	SB	54	SB
5	ATC	NB	5	NB
5	ATC	SB	5	SB
6	ATC	NB	6	NB
6	ATC	SB	6	SB
8	ATC	SB	134	SB
8	ATC	NB	134	NB
9	ATC	EB	9	EB
9	ATC	WB	9	WB
10	ATC	WB	122	WB
10	ATC	EB	122	EB
11	ATC	NB	5	NB
11	ATC	SB	5	SB
13	ATC	NB	5	NB
13	ATC	SB	5	SB
14	ATC	NB	134	NB
14	ATC	SB	134	SB
15	ATC	NB	1	EB
15	ATC	SB	1	WB
16	ATC	EB	54	NB
16	ATC	WB	54	SB
17	ATC	EB	54	SB
17	ATC	WB	54	SB
18	ATC	NB	9	EB
18	ATC	SB	9	WB
19	ATC	NB	132	EB
19	ATC	SB	132	WB
20	ATC	EB	127	NB
20	ATC	WB	127	SB
21	ATC	NB	54	NB
21	ATC	SB	54	SB
22	ATC	NB	134	NB
22	ATC	SB	134	SB
23	ATC	NB	54	NB
23	ATC	SB	54	SB
24	ATC	NB	134	NB
24	ATC	SB	134	SB
25	ATC	WB	132	WB
25	ATC	EB	132	EB
26	ATC	EB	127	NB
26	ATC	WB	127	SB
27	ATC	WB	54	NB
27	ATC	EB	54	SB
28	ATC	WB	54	NB
28	ATC	EB	54	SB
29	ATC	NB	134	NB

Site	Type	Direction	MCC Site	MCC Dir.
29	ATC	SB	134	SB
30	ATC	NB	134	NB
30	ATC	SB	134	SB
31	ATC	EB	54	NB
31	ATC	WB	54	SB
32	ATC	WB	132	WB
32	ATC	EB	132	EB
33	ATC	SB	54	SB
33	ATC	NB	54	NB
34	ATC	SB	132	WB
34	ATC	NB	132	EB
35	ATC	SB	54	SB
35	ATC	NB	54	NB
36	ATC	WB	131	WB
36	ATC	EB	131	EB
37	ATC	WB	9	WB
37	ATC	EB	9	EB
38	ATC	SB	122	WB
38	ATC	NB	122	EB
40	ATC	WB	54	SB
40	ATC	EB	54	NB
41	ATC	WB	54	SB
41	ATC	EB	54	NB
43	ATC	NB	132	EB
43	ATC	SB	132	WB
44	ATC	NB	54	NB
44	ATC	SB	54	SB
45	ATC	EB	54	NB
45	ATC	WB	54	SB
46	ATC	NB	131	EB
46	ATC	SB	131	WB
47	ATC	NB	54	NB
47	ATC	SB	54	SB
48	ATC	NB	132	EB
48	ATC	SB	132	WB
49	ATC	WB	54	NB
49	ATC	EB	54	SB
50	ATC	WB	54	NB
50	ATC	EB	54	SB
51	ATC	SB	54	SB
51	ATC	NB	54	NB
52	ATC	SB	131	WB
52	ATC	NB	131	EB
53	ATC	SB	132	WB
53	ATC	NB	132	EB
54	ATC	SB	54	SB
54	ATC	NB	54	NB
55	ATC	EB	132	EB
55	ATC	WB	132	WB
57	ATC	NB	127	NB
57	ATC	SB	127	SB
58	ATC	NB	129	NB
58	ATC	SB	129	SB

Site	Type	Direction	MCC Site	MCC Dir.
59	ATC	EB	130	WB
59	ATC	WB	130	EB
60	ATC	SB	1	WB
60	ATC	NB	1	EB
62	ATC	EB	129	SB
62	ATC	WB	129	NB
66	ATC	EB	130	EB
66	ATC	WB	130	WB
68	ATC	SB	131	WB
68	ATC	NB	131	WB
69	ATC	SB	128	SB
69	ATC	NB	128	NB
70	ATC	SB	127	SB
70	ATC	NB	127	NB
71	ATC	SB	128	SB
71	ATC	NB	128	NB
72	ATC	SB	128	SB
72	ATC	NB	128	NB
73	ATC	SB	128	SB
73	ATC	NB	128	NB
74	ATC	SB	128	SB
74	ATC	NB	128	NB
75	ATC	SB	128	SB
75	ATC	NB	128	NB
76	ATC	SB	126	SB
76	ATC	NB	126	NB
77	ATC	NB	127	NB
77	ATC	SB	127	SB
78	ATC	WB	124	SB
78	ATC	EB	124	NB
79	ATC	WB	127	SB
79	ATC	EB	127	NB
80	ATC	SB	125	SB
80	ATC	NB	125	NB
82	ATC	SB	1	WB
82	ATC	NB	1	EB
83	ATC	EB	129	SB
83	ATC	WB	129	NB
84	ATC	EB	129	NB
84	ATC	WB	129	SB
85	ATC	SB	126	SB
85	ATC	NB	126	NB
86	ATC	SB	125	SB
86	ATC	NB	125	NB
87	ATC	SB	127	SB
87	ATC	NB	127	NB
88	ATC	EB	127	NB
88	ATC	WB	127	SB
89	ATC	EB	127	SB
89	ATC	WB	127	NB
90	ATC	SB	127	SB
90	ATC	NB	127	NB
91	ATC	SB	124	SB
91	ATC	NB	124	NB
92	ATC	SB	123	WB

Site	Type	Direction	MCC Site	MCC Dir.
92	ATC	NB	123	EB
93	ATC	SB	124	SB
93	ATC	NB	124	NB
94	ATC	SB	125	SB
94	ATC	NB	125	NB
95	ATC	NB	127	NB
95	ATC	SB	127	SB
96	ATC	SB	126	SB
96	ATC	NB	126	NB
97	ATC	SB	129	SB
97	ATC	NB	129	NB
98	ATC	SB	129	SB
98	ATC	NB	129	NB
99	ATC	EB	129	SB
99	ATC	WB	129	NB
100	ATC	EB	133	EB
100	ATC	WB	133	WB
101	ATC	SB	1	WB
102	ATC	EB	5	SB
102	ATC	WB	5	NB
103	ATC	NB	5	NB
103	ATC	SB	5	SB
104	ATC	WB	9	WB
104	ATC	EB	9	EB
105	ATC	WB	123	WB
105	ATC	EB	123	EB
108	ATC	NB	9	WB
108	ATC	SB	9	EB
109	ATC	NB	122	WB
109	ATC	SB	122	EB
111	ATC	NB	5	NB
111	ATC	SB	5	SB
113	ATC	EB	1	EB
113	ATC	WB	1	WB
114	ATC	SB	131	WB
114	ATC	NB	131	WB
115	ATC	NB	131	WB
116	ATC	NB	1	EB
116	ATC	SB	1	WB
121	ATC	EB	131	EB
122	ATC	NB	122	EB
122	ATC	SB	122	WB
123	ATC	EB	123	EB
123	ATC	WB	123	WB
124	ATC	NB	124	NB
124	ATC	SB	124	SB
125	ATC	WB	125	NB
125	ATC	EB	125	SB
126	ATC	NB	126	NB
126	ATC	SB	126	SB
127	ATC	NB	127	NB
127	ATC	SB	127	SB
128	ATC	NB	128	NB
128	ATC	SB	128	SB
129	ATC	NB	129	NB

Site	Type	Direction	MCC Site	MCC Dir.
129	ATC	SB	129	SB
131	ATC	SB	131	EB
131	ATC	NB	131	WB
132	ATC	EB	132	EB
132	ATC	WB	132	WB
133	ATC	EB	133	EB
133	ATC	WB	133	WB
134	ATC	NB	134	NB
134	ATC	SB	134	SB
135	ATC	SB	125	SB
135	ATC	NB	125	NB
136	ATC	SB	126	SB
136	ATC	NB	126	NB
137	ATC	SB	129	SB
137	ATC	NB	129	NB
138	ATC	WB	127	SB
138	ATC	EB	127	NB
139	ATC	WB	124	SB
139	ATC	EB	124	NB
140	ATC	NB	127	NB
140	ATC	SB	127	SB
141	ATC	EB	123	EB
141	ATC	WB	123	WB
142	ATC	EB	123	EB
142	ATC	WB	123	WB
143	ATC	WB	123	WB
143	ATC	EB	123	EB
144	ATC	SB	123	WB
144	ATC	NB	123	EB
145	ATC	NB	133	EB
145	ATC	SB	133	WB
146	ATC	WB	133	WB
146	ATC	EB	133	EB
148	ATC	WB	133	WB
148	ATC	EB	133	EB
149	ATC	NB	5	NB
149	ATC	SB	5	SB
150	ATC	SB	127	SB
150	ATC	NB	127	NB
151	ATC	SB	127	SB
151	ATC	NB	127	NB
152	ATC	NB	5	NB
153	ATC	NB	5	NB
153	ATC	SB	5	SB
154	ATC	SB	5	SB
155	ATC	EB	5	NB
155	ATC	WB	5	SB
156	ATC	EB	127	NB
156	ATC	WB	127	SB
157	ATC	NB	5	NB
157	ATC	SB	5	SB
158	ATC	WB	1	WB
158	ATC	EB	1	EB
159	ATC	EB	133	EB
159	ATC	WB	133	WB

Site	Type	Direction	MCC Site	MCC Dir.
160	ATC	EB	123	EB
160	ATC	WB	123	WB
161	ATC	EB	123	EB
161	ATC	WB	123	WB
162	ATC	EB	123	EB
162	ATC	WB	123	WB
163	ATC	SB	5	SB
163	ATC	NB	5	NB
164	ATC	SB	131	EB
164	ATC	NB	131	WB
165	ATC	NB	5	NB
165	ATC	SB	5	SB
167	ATC	SB	126	SB
167	ATC	NB	126	NB
168	ATC	NB	125	NB
168	ATC	SB	125	SB
169	ATC	EB	125	SB
169	ATC	WB	125	NB
170	ATC	EB	127	NB
170	ATC	WB	127	SB
7	Radar	NB	7	NB
7	Radar	SB	7	SB
39	Radar	WB	123	WB
39	Radar	EB	123	EB
42	Radar	NB	1	EB
42	Radar	SB	1	WB
56	Radar	EB	130	EB
56	Radar	WB	130	WB
61	Radar	EB	130	EB
61	Radar	WB	130	WB
63	Radar	EB	130	EB
63	Radar	WB	130	WB
64	Radar	EB	130	EB
64	Radar	WB	130	WB
65	Radar	EB	130	EB
65	Radar	WB	130	WB
67	Radar	SB	126	SB
67	Radar	NB	126	NB
81	Radar	EB	130	EB
81	Radar	WB	130	WB
106	Radar	NB	1	EB
106	Radar	SB	1	WB
107	Radar	WB	1	WB
107	Radar	EB	1	EB
110	Radar	NB	7	NB
110	Radar	SB	7	SB
112	Radar	NB	54	NB
112	Radar	SB	54	SB
117	Radar	WB	123	WB
117	Radar	EB	123	EB
118	Radar	WB	123	WB
118	Radar	EB	123	EB
119	Radar	EB	123	EB
119	Radar	WB	123	WB
120	Radar	WB	132	WB

Site	Type	Direction	MCC Site	MCC Dir.
130	Radar	EB	130	EB
130	Radar	WB	130	WB
147	Radar	WB	133	WB

Site	Type	Direction	MCC Site	MCC Dir.
147	Radar	EB	133	EB
166	Radar	SB	5	SB
166	Radar	NB	5	NB

D.5 Classed surveyed traffic counts

		AM				IP				PM			
Site	Direction	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV
1	Eastbound	738	653	69	16	641	522	105	14	698	641	53	4
1	Westbound	629	541	81	7	629	536	83	10	779	710	65	4
2	Northbound	746	667	67	12	290	248	38	4	387	342	42	3
2	Southbound	379	354	23	2	355	302	48	5	597	543	54	0
3	Eastbound	441	410	29	2	338	293	40	5	389	356	32	1
3	Westbound	472	401	66	5	385	320	58	7	518	472	43	3
4	Northbound	1235	1002	194	39	671	536	116	19	1034	902	118	14
4	Southbound	1010	787	200	23	774	601	143	30	1161	1013	134	14
5	Northbound	934	815	110	9	595	492	99	4	801	712	87	2
5	Southbound	511	439	69	3	533	449	80	4	685	632	53	0
6	Northbound	221	200	21	0	109	97	12	0	151	136	15	0
6	Southbound	194	184	10	0	141	129	12	0	272	254	18	0
7	Northbound	877	801	67	9	898	783	105	10	1028	932	90	6
7	Southbound	892	760	119	13	999	887	101	11	1357	1285	69	3
8	Northbound	527	431	82	14	420	342	70	8	597	522	72	3
8	Southbound	571	461	99	11	404	328	68	8	574	511	59	4
9	Eastbound	274	224	47	3	311	268	39	4	545	502	43	0
9	Westbound	716	680	33	3	257	214	40	3	283	248	32	3
10	Eastbound	328	298	28	2	177	151	23	3	292	270	18	4
10	Westbound	398	349	40	9	206	179	24	3	448	407	39	2
11	Northbound	484	422	57	5	501	414	83	4	520	461	57	2
11	Southbound	617	531	83	3	486	410	73	3	527	486	41	0
13	Northbound	43	37	5	1	72	59	12	1	136	120	15	1
13	Southbound	190	163	26	1	51	42	8	1	57	52	5	0
14	Northbound	466	381	73	12	356	291	59	6	445	389	54	2
14	Southbound	449	362	78	9	400	325	67	8	655	583	67	5
15	Northbound	922	816	86	20	563	459	92	12	659	605	50	4
15	Southbound	697	599	90	8	631	537	84	10	881	803	74	4
16	Eastbound	249	202	39	8	121	96	21	4	149	130	17	2
16	Westbound	159	123	32	4	132	102	25	5	277	241	32	4
17	Eastbound	268	209	53	6	165	127	31	7	203	176	24	3
17	Westbound	230	178	46	6	172	133	32	7	255	222	30	3
18	Northbound	203	166	35	2	119	102	15	2	150	138	12	0
18	Southbound	151	143	7	1	125	104	19	2	191	167	22	2
19	Northbound	178	165	12	1	144	125	17	2	185	169	15	1
19	Southbound	211	179	30	2	138	114	21	3	195	178	16	1
20	Eastbound	463	429	34	0	372	339	32	1	460	420	40	0
20	Westbound	447	406	41	0	461	416	44	1	724	666	58	0
21	Northbound	351	285	55	11	302	241	52	9	463	404	53	6
21	Southbound	393	306	78	9	302	234	56	12	370	322	43	5
22	Northbound	328	268	51	9	243	197	41	5	320	279	39	2
22	Southbound	294	237	51	6	250	203	42	5	359	319	37	3
23	Northbound	713	578	112	23	455	363	79	13	543	474	62	7
23	Southbound	419	326	83	10	423	328	78	17	596	520	69	7
24	Northbound	897	734	140	23	715	584	119	12	976	853	118	5
24	Southbound	919	742	159	18	706	575	118	13	983	875	101	7
25	Eastbound	265	245	18	2	124	107	15	2	252	230	21	1
25	Westbound	203	172	29	2	129	106	20	3	268	244	22	2
26	Eastbound	355	329	26	0	130	118	11	1	188	171	17	0
26	Westbound	256	233	23	0	192	173	18	1	352	324	28	0
27	Eastbound	419	326	83	10	419	325	78	16	613	535	71	7
27	Westbound	661	536	104	21	440	351	76	13	558	486	64	8
28	Eastbound	494	385	98	11	432	335	80	17	495	432	57	6

		AM				IP				PM			
Site	Direction	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV
28	Westbound	376	305	59	12	300	239	52	9	334	291	38	5
29	Northbound	435	356	68	11	349	285	58	6	389	340	47	2
29	Southbound	433	349	75	9	356	289	60	7	492	437	51	4
30	Northbound	769	629	120	20	555	453	92	10	672	587	82	3
30	Southbound	704	568	122	14	562	458	94	10	759	676	78	5
31	Eastbound	824	669	129	26	444	354	77	13	754	658	86	10
31	Westbound	714	556	142	16	444	345	82	17	744	649	86	9
32	Eastbound	147	136	10	1	105	90	13	2	166	151	14	1
32	Westbound	169	143	24	2	110	91	17	2	153	139	13	1
33	Northbound	692	561	109	22	300	239	52	9	510	445	58	7
33	Southbound	528	411	105	12	319	247	59	13	608	531	70	7
34	Northbound	4	2	1	1	5	3	1	1	9	7	1	1
34	Southbound	4	2	1	1	5	3	1	1	6	4	1	1
35	Northbound	235	190	37	8	95	75	17	3	164	142	19	3
35	Southbound	122	95	24	3	89	68	17	4	168	146	20	2
36	Eastbound	39	35	3	1	28	23	4	1	44	40	4	0
36	Westbound	40	35	4	1	31	26	4	1	52	45	6	1
37	Eastbound	358	293	62	3	215	185	27	3	352	324	28	0
37	Westbound	400	380	18	2	211	176	33	2	367	322	42	3
38	Northbound	345	314	29	2	182	155	24	3	297	275	18	4
38	Southbound	400	351	40	9	210	182	25	3	462	419	41	2
39	Eastbound	1554	1253	267	34	922	756	144	22	1445	1325	113	7
39	Westbound	1349	1162	162	25	915	728	168	19	1528	1317	202	9
40	Eastbound	441	358	69	14	289	230	50	9	367	320	42	5
40	Westbound	305	237	61	7	274	212	51	11	397	346	46	5
41	Eastbound	271	219	43	9	179	142	31	6	285	248	33	4
41	Westbound	307	239	61	7	167	129	31	7	295	257	34	4
42	Northbound	1046	926	97	23	550	448	90	12	681	625	52	4
42	Southbound	607	522	78	7	628	535	83	10	924	842	78	4
43	Northbound	278	258	18	2	123	106	15	2	170	155	14	1
43	Southbound	156	132	22	2	138	114	21	3	311	283	26	2
44	Northbound	697	566	109	22	446	356	77	13	518	452	59	7
44	Southbound	564	439	112	13	498	387	92	19	795	694	92	9
45	Eastbound	373	302	59	12	270	215	47	8	346	301	40	5
45	Westbound	376	292	75	9	285	221	53	11	439	383	51	5
46	Northbound	225	210	14	1	119	101	16	2	169	153	16	0
46	Southbound	193	172	18	3	157	134	21	2	206	181	23	2
47	Northbound	475	385	75	15	281	224	49	8	366	319	42	5
47	Southbound	581	453	115	13	403	312	75	16	567	495	65	7
48	Northbound	494	460	32	2	203	176	24	3	260	238	21	1
48	Southbound	264	224	37	3	193	160	29	4	252	230	21	1
49	Eastbound	777	605	154	18	584	453	108	23	774	676	89	9
49	Westbound	633	514	99	20	566	452	98	16	881	769	100	12
50	Eastbound	908	707	180	21	718	557	133	28	837	731	96	10
50	Westbound	1007	817	158	32	727	580	126	21	1075	939	122	14
51	Northbound	550	446	86	18	396	315	69	12	441	385	50	6
51	Southbound	343	267	68	8	376	291	70	15	530	463	61	6
52	Northbound	411	384	25	2	177	150	24	3	163	148	15	0
52	Southbound	193	172	18	3	260	223	34	3	446	394	49	3
53	Northbound	290	269	19	2	192	166	23	3	269	246	22	1
53	Southbound	267	226	38	3	225	187	34	4	320	291	27	2
54	Northbound	1037	841	163	33	744	594	129	21	938	819	107	12
54	Southbound	916	713	182	21	737	572	136	29	1081	944	124	13
55	Eastbound	376	349	25	2	215	187	25	3	206	188	17	1
55	Westbound	229	194	32	3	239	199	36	4	418	381	35	2
56	Eastbound	633	565	62	6	458	385	65	8	816	756	58	2
56	Westbound	830	727	91	12	353	310	37	6	534	492	39	3
57	Northbound	81	75	6	0	50	44	5	1	69	63	6	0
57	Southbound	69	62	7	0	50	44	5	1	74	68	6	0
58	Northbound	472	410	55	7	307	266	36	5	445	412	30	3
58	Southbound	469	432	32	5	351	305	42	4	531	490	39	2
59	Eastbound	560	491	61	8	367	322	39	6	571	527	41	3
59	Westbound	649	578	64	7	413	347	58	8	655	607	47	1
60	Northbound	875	775	81	19	651	531	106	14	740	679	56	5
60	Southbound	924	795	119	10	594	506	79	9	881	803	74	4
61	Eastbound	628	560	62	6	425	357	60	8	560	519	40	1

		AM				IP				PM			
Site	Direction	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV
61	Westbound	717	629	78	10	517	454	54	9	726	670	52	4
62	Eastbound	358	330	24	4	280	242	34	4	451	415	34	2
62	Westbound	420	365	49	6	276	239	33	4	361	335	24	2
63	Eastbound	894	797	88	9	515	433	73	9	618	573	44	1
63	Westbound	677	593	74	10	542	476	57	9	813	750	59	4
64	Eastbound	705	629	69	7	483	406	68	9	799	740	57	2
64	Westbound	894	783	98	13	420	369	44	7	730	673	53	4
65	Eastbound	1192	1063	117	12	921	775	130	16	828	767	59	2
65	Westbound	961	843	105	13	702	616	74	12	1157	1069	83	5
66	Eastbound	765	682	75	8	507	426	72	9	673	623	48	2
66	Westbound	549	481	60	8	457	401	48	8	660	609	48	3
67	Northbound	733	637	85	11	733	633	89	11	1019	921	67	31
67	Southbound	504	466	34	4	808	699	98	11	950	855	81	14
68	Northbound	183	163	17	3	149	127	20	2	184	162	20	2
68	Southbound	298	266	27	5	79	67	11	1	88	77	10	1
69	Northbound	379	332	43	4	153	134	17	2	318	284	32	2
69	Southbound	398	358	39	1	139	120	17	2	264	237	26	1
70	Northbound	136	126	10	0	77	69	7	1	121	110	11	0
70	Southbound	145	132	13	0	74	66	7	1	130	119	11	0
71	Northbound	11	8	2	1	10	8	1	1	8	6	1	1
71	Southbound	8	6	1	1	8	6	1	1	7	5	1	1
72	Northbound	43	37	5	1	17	14	2	1	20	17	2	1
72	Southbound	21	18	2	1	25	21	3	1	44	38	5	1
73	Northbound	34	29	4	1	22	18	3	1	39	34	4	1
73	Southbound	48	42	5	1	25	21	3	1	29	25	3	1
74	Northbound	14	11	2	1	18	15	2	1	42	36	5	1
74	Southbound	17	14	2	1	16	13	2	1	21	18	2	1
75	Northbound	267	234	30	3	126	110	14	2	239	213	24	2
75	Southbound	339	305	33	1	117	100	15	2	199	178	20	1
76	Northbound	1052	915	122	15	871	752	106	13	1137	1027	75	35
76	Southbound	732	678	49	5	948	820	115	13	1103	993	94	16
77	Northbound	146	135	11	0	98	88	9	1	195	178	17	0
77	Southbound	210	191	19	0	100	89	10	1	177	163	14	0
78	Eastbound	285	235	44	6	223	172	43	8	402	352	43	7
78	Westbound	356	285	61	10	265	210	48	7	375	322	50	3
79	Eastbound	211	195	16	0	74	66	7	1	112	102	10	0
79	Westbound	119	108	11	0	113	101	11	1	243	223	20	0
80	Northbound	645	593	48	4	563	501	59	3	776	716	60	0
80	Southbound	750	675	70	5	432	378	50	4	351	318	32	1
81	Eastbound	1116	996	109	11	623	524	88	11	674	624	48	2
81	Westbound	886	777	97	12	670	589	70	11	1031	952	74	5
82	Northbound	145	127	14	4	139	113	23	3	208	190	16	2
82	Southbound	191	164	25	2	140	118	19	3	149	135	13	1
83	Eastbound	670	619	45	6	334	290	40	4	339	313	25	1
83	Westbound	350	304	41	5	404	350	48	6	749	695	50	4
84	Eastbound	160	138	19	3	106	91	13	2	139	128	10	1
84	Westbound	113	104	8	1	107	92	13	2	211	194	16	1
85	Northbound	662	575	77	10	698	602	85	11	780	704	52	24
85	Southbound	882	817	59	6	652	564	79	9	667	600	57	10
86	Northbound	557	513	41	3	552	491	58	3	686	633	53	0
86	Southbound	723	651	67	5	619	542	72	5	662	600	60	2
87	Northbound	210	194	16	0	273	248	24	1	387	353	34	0
87	Southbound	403	366	37	0	281	253	27	1	314	289	25	0
88	Eastbound	125	115	10	0	89	80	8	1	182	166	16	0
88	Westbound	84	76	8	0	83	74	8	1	121	111	10	0
89	Eastbound	141	128	13	0	104	93	10	1	180	165	15	0
89	Westbound	103	95	8	0	83	75	7	1	180	164	16	0
90	Northbound	124	115	9	0	142	129	12	1	197	180	17	0
90	Southbound	160	145	15	0	98	87	10	1	111	102	9	0
91	Northbound	365	301	56	8	421	325	80	16	457	401	48	8
91	Southbound	616	493	106	17	515	407	94	14	585	502	78	5
92	Northbound	488	393	84	11	552	452	86	14	606	555	48	3
92	Southbound	644	554	78	12	547	435	101	11	556	478	74	4
93	Northbound	352	290	54	8	420	324	80	16	446	391	47	8
93	Southbound	395	316	68	11	368	291	67	10	371	318	50	3
94	Northbound	478	439	36	3	477	424	50	3	501	462	39	0

		AM				IP				PM			
Site	Direction	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV
94	Southbound	351	315	33	3	359	314	42	3	313	283	29	1
95	Northbound	94	87	7	0	134	121	12	1	167	152	15	0
95	Southbound	87	79	8	0	85	76	8	1	75	69	6	0
96	Northbound	524	455	61	8	545	471	66	8	588	531	39	18
96	Southbound	748	693	50	5	712	616	86	10	736	662	63	11
97	Northbound	363	315	43	5	401	348	47	6	383	355	26	2
97	Southbound	113	104	8	1	139	120	17	2	180	165	14	1
98	Northbound	119	103	14	2	113	97	14	2	211	195	14	2
98	Southbound	543	501	37	5	482	418	58	6	509	469	38	2
99	Eastbound	504	465	34	5	321	278	39	4	361	333	27	1
99	Westbound	326	283	38	5	459	398	54	7	547	508	36	3
100	Eastbound	1546	1305	187	54	927	722	161	44	1043	919	108	16
100	Westbound	396	318	72	6	572	444	102	26	1036	924	99	13
101	Southbound	571	491	74	6	521	444	69	8	777	708	65	4
102	Eastbound	415	357	56	2	146	123	22	1	196	181	15	0
102	Westbound	287	250	34	3	203	167	34	2	297	263	33	1
103	Northbound	372	324	44	4	120	99	20	1	147	130	16	1
103	Southbound	72	61	10	1	83	69	13	1	139	128	11	0
104	Eastbound	863	707	148	8	1049	907	131	11	1353	1247	106	0
104	Westbound	1262	1201	57	4	918	768	142	8	1002	881	113	8
105	Eastbound	529	426	91	12	622	510	97	15	756	693	59	4
105	Westbound	732	630	88	14	528	420	97	11	550	473	73	4
106	Northbound	2568	2275	238	55	1518	1238	247	33	1631	1497	124	10
106	Southbound	1118	962	144	12	1210	1031	160	19	1908	1740	160	8
107	Eastbound	547	484	51	12	667	543	109	15	952	874	72	6
107	Westbound	696	598	90	8	226	192	30	4	279	253	24	2
108	Northbound	1347	1281	61	5	931	779	144	8	990	870	112	8
108	Southbound	972	796	167	9	1232	1065	154	13	1677	1546	131	0
109	Northbound	410	359	41	10	621	541	73	7	960	873	84	3
109	Southbound	861	784	72	5	554	474	72	8	622	576	38	8
110	Northbound	1099	1004	84	11	875	763	102	10	933	846	82	5
110	Southbound	578	493	77	8	940	834	95	11	1240	1174	63	3
111	Northbound	981	857	115	9	512	423	85	4	579	514	63	2
111	Southbound	407	350	55	2	538	453	81	4	779	719	60	0
112	Northbound	1662	1349	261	52	646	515	112	19	810	707	92	11
112	Southbound	756	589	150	17	844	655	156	33	1524	1331	175	18
113	Eastbound	871	771	81	19	722	588	118	16	750	688	57	5
113	Westbound	662	570	85	7	659	562	87	10	820	747	69	4
114	Northbound	496	443	45	8	474	406	62	6	595	526	65	4
114	Southbound	828	740	75	13	551	472	72	7	526	465	57	4
115	Northbound	1099	983	99	17	577	495	75	7	669	591	73	5
116	Northbound	635	562	59	14	564	460	92	12	602	552	46	4
116	Southbound	853	734	110	9	776	661	103	12	761	693	64	4
117	Eastbound	1323	1067	227	29	1200	984	187	29	1287	1180	101	6
117	Westbound	975	839	117	19	803	638	148	17	669	576	89	4
118	Eastbound	668	538	115	15	595	487	93	15	630	577	50	3
118	Westbound	432	372	52	8	512	407	94	11	564	485	75	4
119	Eastbound	668	538	115	15	595	487	93	15	628	576	49	3
119	Westbound	432	372	52	8	512	407	94	11	564	485	75	4
120	Westbound	692	588	97	7	614	510	93	11	678	619	56	3
121	Eastbound	744	696	44	4	374	318	51	5	447	406	41	0
122	Northbound	346	315	29	2	197	168	26	3	312	289	19	4
122	Southbound	323	282	33	8	159	138	19	2	361	327	32	2
123	Eastbound	776	626	133	17	761	623	119	19	996	913	78	5
123	Westbound	847	729	102	16	761	605	140	16	934	804	124	6
124	Northbound	736	607	114	15	493	381	94	18	478	419	51	8
124	Southbound	672	538	115	19	521	412	95	14	676	580	90	6
125	Eastbound	850	766	79	5	674	591	78	5	897	814	81	2
125	Westbound	783	721	58	4	647	575	68	4	789	728	61	0
126	Northbound	533	463	62	8	607	524	74	9	603	544	40	19
126	Southbound	1042	965	70	7	619	535	75	9	665	598	57	10
127	Northbound	567	525	42	0	492	448	42	2	668	610	58	0
127	Southbound	581	528	53	0	422	381	40	1	463	426	37	0
128	Northbound	464	407	52	5	439	386	48	5	669	597	68	4
128	Southbound	637	573	62	2	403	347	50	6	476	428	47	1
129	Northbound	457	396	54	7	460	399	54	7	743	690	49	4

		AM				IP				PM			
Site	Direction	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV
129	Southbound	664	613	45	6	390	338	47	5	470	433	35	2
130	Eastbound	1564	1396	153	15	929	782	131	16	1305	1210	93	2
130	Westbound	1419	1244	155	20	914	803	96	15	1361	1257	98	6
131	Northbound	261	233	24	4	184	157	24	3	320	282	35	3
131	Southbound	447	418	27	2	156	132	21	3	257	233	24	0
132	Eastbound	511	475	34	2	317	276	37	4	406	371	33	2
132	Westbound	453	384	64	5	367	305	55	7	551	502	46	3
133	Eastbound	916	773	111	32	852	664	148	40	944	831	98	15
133	Westbound	1137	913	207	17	883	686	157	40	1263	1127	120	16
134	Northbound	575	470	90	15	551	449	92	10	661	578	80	3
134	Southbound	541	436	94	11	517	421	86	10	587	523	60	4
135	Northbound	736	677	55	4	647	575	68	4	705	651	54	0
135	Southbound	756	681	70	5	690	604	80	6	899	816	81	2
136	Northbound	426	369	50	7	807	697	98	12	853	771	56	26
136	Southbound	1035	958	70	7	839	725	102	12	950	855	81	14
137	Northbound	822	714	96	12	619	537	73	9	783	727	52	4
137	Southbound	573	528	39	6	543	472	65	6	717	662	53	2
138	Eastbound	356	330	26	0	150	136	13	1	198	180	18	0
138	Westbound	397	361	36	0	254	229	24	1	535	492	43	0
139	Eastbound	572	472	88	12	569	439	109	21	880	772	93	15
139	Westbound	1080	865	185	30	504	399	92	13	742	637	99	6
140	Northbound	321	297	24	0	144	130	13	1	213	194	19	0
140	Southbound	218	198	20	0	182	164	17	1	279	256	23	0
141	Eastbound	884	713	152	19	583	478	91	14	699	641	55	3
141	Westbound	622	535	75	12	566	450	104	12	677	583	90	4
142	Eastbound	790	637	136	17	621	509	97	15	689	632	54	3
142	Westbound	701	603	85	13	680	541	125	14	815	702	108	5
143	Eastbound	605	488	104	13	603	494	94	15	640	587	50	3
143	Westbound	422	363	51	8	523	416	96	11	492	424	65	3
144	Northbound	571	460	98	13	596	488	93	15	691	634	54	3
144	Southbound	602	517	73	12	605	481	111	13	713	615	94	4
145	Northbound	1182	997	143	42	834	650	145	39	1197	1054	124	19
145	Southbound	980	786	179	15	839	652	149	38	1092	974	104	14
146	Eastbound	929	783	113	33	797	620	139	38	919	809	96	14
146	Westbound	851	683	155	13	763	592	136	35	1102	983	105	14
147	Eastbound	1451	1224	176	51	1319	1028	229	62	1480	1303	154	23
147	Westbound	1425	1144	260	21	1308	1016	232	60	1280	1142	122	16
148	Eastbound	1174	991	142	41	828	645	144	39	1006	885	105	16
148	Westbound	1054	846	192	16	859	667	153	39	1047	934	100	13
149	Northbound	460	401	54	5	507	419	84	4	678	602	74	2
149	Southbound	806	693	109	4	503	424	76	3	767	708	59	0
150	Northbound	131	121	10	0	59	53	5	1	88	80	8	0
150	Southbound	85	77	8	0	59	52	6	1	93	85	8	0
151	Northbound	508	471	37	0	380	346	33	1	469	428	41	0
151	Southbound	691	628	63	0	324	292	31	1	447	411	36	0
152	Northbound	285	248	34	3	507	419	84	4	630	559	69	2
153	Northbound	291	254	34	3	573	474	95	4	957	850	104	3
153	Southbound	702	604	95	3	379	319	57	3	297	274	23	0
154	Southbound	400	344	54	2	400	337	60	3	543	501	42	0
155	Eastbound	485	423	57	5	409	338	68	3	437	388	48	1
155	Westbound	442	380	60	2	498	420	75	3	596	550	46	0
156	Eastbound	460	426	34	0	323	294	28	1	417	381	36	0
156	Westbound	401	365	36	0	387	349	37	1	606	557	49	0
157	Northbound	279	243	33	3	181	149	30	2	334	296	37	1
157	Southbound	241	207	33	1	139	117	21	1	192	177	15	0
158	Eastbound	1226	1086	114	26	721	587	118	16	883	810	67	6
158	Westbound	902	776	116	10	803	684	106	13	1277	1164	107	6
159	Eastbound	662	558	80	24	383	298	67	18	419	368	44	7
159	Westbound	459	368	84	7	416	323	74	19	644	575	61	8
160	Eastbound	685	552	118	15	557	456	87	14	868	796	68	4
160	Westbound	946	814	114	18	517	411	95	11	593	510	79	4
161	Eastbound	720	580	124	16	446	365	70	11	816	748	64	4
161	Westbound	977	840	118	19	483	384	89	10	910	784	120	6
162	Eastbound	674	543	116	15	524	429	82	13	841	771	66	4
162	Westbound	877	754	106	17	496	395	91	10	561	483	74	4
163	Northbound	240	209	28	3	199	164	33	2	245	217	27	1

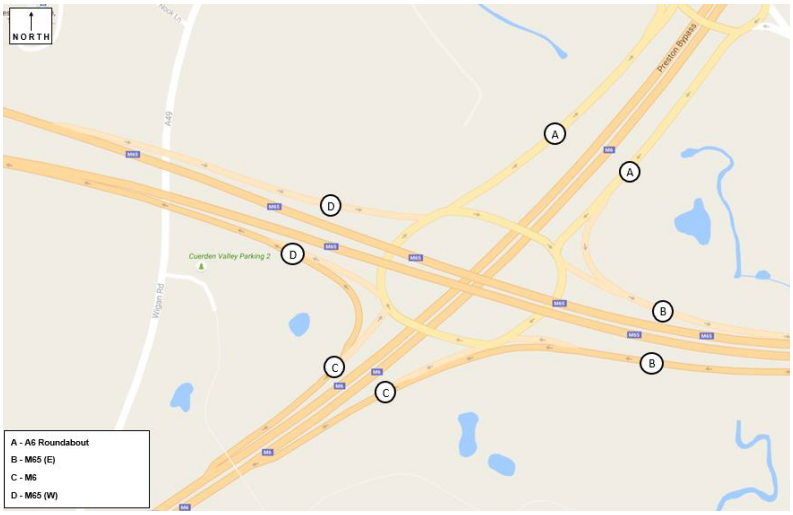
Site	Direction	AM				IP				PM			
		Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV
163	Southbound	323	277	44	2	239	201	36	2	319	294	25	0
164	Northbound	457	409	41	7	341	292	45	4	514	454	56	4
164	Southbound	495	462	30	3	325	276	44	5	369	335	34	0
165	Northbound	278	242	33	3	354	292	59	3	464	411	51	2
165	Southbound	475	409	64	2	197	165	30	2	346	319	27	0
166	Northbound	105	91	13	1	70	57	12	1	90	79	10	1
166	Southbound	419	360	57	2	401	338	60	3	429	396	33	0
167	Northbound	1080	939	125	16	906	782	110	14	1142	1032	75	35
167	Southbound	899	832	61	6	999	864	121	14	1068	961	91	16
168	Northbound	123	113	9	1	131	116	14	1	286	264	22	0
168	Southbound	236	212	22	2	87	76	10	1	154	139	14	1
169	Eastbound	815	734	76	5	504	441	59	4	519	470	47	2
169	Westbound	412	378	31	3	555	494	58	3	632	583	49	0
170	Eastbound	165	153	12	0	138	125	12	1	237	216	21	0
170	Westbound	225	204	21	0	106	95	10	1	169	155	14	0

Appendix E. Travel Time Data

Route	Section	Length [m]	Mean Travel Time [s] AM	IP	PM
1A	1	2836	257	206	219
	2	8103	714	520	589
	3	5283	736	596	631
	4	7278	883	871	1091
1B	1	3263	257	261	326
	2	8133	667	530	656
	3	4904	624	596	708
	4	7443	1154	846	974
2A	1	7711	1355	913	1045
	2	3141	371	439	556
	3	3632	342	318	368
	4	6300	602	537	689
2B	1	7763	1221	930	1102
	2	3309	678	415	457
	3	3790	334	335	362
	4	6120	548	497	593
3A	1	6289	414	421	437
	2	5514	390	390	526
	3	3601	291	315	510
	4	5596	449	447	533
3B	1	6332	477	416	425
	2	5309	380	360	433
	3	3733	345	305	390
	4	5511	515	408	423
4A	1	6975	379	369	362
	2	3155	531	309	292
	3	4478	537	515	670
	4	4033	459	326	337
	5	6094	696	522	632
4B	1	6949	369	366	593
	2	3159	335	316	372
	3	4578	642	632	909
	4	4093	551	361	457
	5	5942	781	552	854
5A	1	2923	368	318	364
	2	5912	678	576	569
	3	8237	568	587	594
5B	1	2891	297	286	338
	2	5839	651	586	573
	3	8280	578	596	625
6A	1	3200	507	512	677
	2	4214	588	587	651
	3	6157	715	558	636
6B	1	3328	578	564	690
	2	4292	615	596	720
	3	6051	671	544	825

Route	Section	Length [m]	Mean Travel Time [s] AM	IP	PM
7A	1	4540	665	669	768
	2	4652	711	521	742
	3	3735	667	672	887
7B	1	4608	573	567	615
	2	4602	609	574	684
	3	3864	752	761	1183
8A	1	3815	385	375	422
	2	3499	591	443	462
	3	5337	375	377	372
	4	4063	228	225	252
8B	1	3846	408	341	458
	2	3489	520	493	535
	3	5365	397	365	368
	4	4054	246	246	342
9A	1	5195	415	408	411
	2	4056	246	247	252
9B	1	5225	577	426	410
	2	4015	260	249	231
10A	1	3906	357	323	542
10B	1	3823	417	346	407
M1A	1	21047	681	673	645
	2	3036	140	102	112
	3	3760	151	126	132
	4	2385	104	82	82
	5	3419	123	112	108
	6	2536	93	88	85
	7	11229	413	373	357
M1B	1	20254	641	650	630
	2	4181	135	139	157
	3	2578	86	89	104
	4	3586	121	128	146
	5	3264	107	109	112
	6	2296	79	79	96
	7	11498	389	389	391
M2A	1	2241	81	83	84
	2	6536	212	213	208
M2B	1	3464	161	118	119
	2	5522	191	180	177
M3A	1	2104	79	76	77
	2	5399	285	193	221
M3B	1	3165	116	109	129
	2	4411	186	152	159
M4A	1	1279	74	48	55
	2	12330	397	390	386
	3	6409	207	204	196
M4B	1	2062	76	76	85
	2	10636	337	341	343
	3	7411	239	243	236

Appendix F. M65(J1) turning counts data summary



Turning Counts:

Entry : A - A6 Roundabout

	Destination : A - A6 Roundabout				Destination : B - M65 (E)				Destination : C - M6				Destination : D - M65 (W)			
	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total
AM	1	0	0	1	73	21	16	110	114	50	27	191	110	16	9	135
PM	1	0	0	1	131	17	4	152	225	39	15	279	226	37	9	272

Entry : B - M65 (E)

	Destination : A - A6 Roundabout				Destination : B - M65 (E)				Destination : C - M6				Destination : D - M65 (W)			
	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total
AM	132	33	5	170	0	0	0	0	775	157	83	1015	3	0	1	4
PM	100	15	2	117	0	0	0	0	988	128	57	1173	5	1	0	6

Entry : C - M6

	Destination : A - A6 Roundabout				Destination : B - M65 (E)				Destination : C - M6				Destination : D - M65 (W)			
	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total
AM	238	50	18	306	751	177	95	1023	0	0	0	0	520	77	31	628
PM	112	34	15	161	754	155	47	956	0	0	0	0	365	68	8	441

Entry : D - M65 (W)

	Destination : A - A6 Roundabout				Destination : B - M65 (E)				Destination : C - M6				Destination : D - M65 (W)			
	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total
AM	172	25	8	205	0	0	0	0	243	57	32	332	0	0	0	0
PM	68	17	0	85	1	0	0	1	426	38	13	477	1	0	0	1

Link counts:

Origin:

	A - A6 Roundabout				B - M65 (E)				C - M6				D - M65 (W)			
	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total
AM	298	87	52	437	910	190	89	1189	1509	304	144	1957	415	82	40	537
PM	583	93	28	704	1093	144	59	1296	1231	257	70	1558	496	55	13	564

Destination:

	A - A6 Roundabout				B - M65 (E)				C - M6				D - M65 (W)			
	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total	CAR	LGV	HGV	Total
AM	543	108	31	682	824	198	111	1133	1132	264	142	1538	633	93	41	767
PM	281	66	17	364	886	172	51	1109	1639	205	85	1929	597	106	17	720