ABSTRACT

SMITH, RUSSELL CHARLES. Development and Evaluation of a Prototype Travel Time Reliability Monitoring System for Freeway Facilities in North Carolina. (Under the direction of Dr. George F. List).

SHRP 2 L02 presented a framework for the development of a travel time reliability monitoring system for freeway facilities. Increasing congestion levels spurred a shift in focus from density-based capacity measures to travel time reliability, a measure of the variability of trip travel times experienced by the user. Recent rulemaking by the FHWA has increased focus on reliability-based performance measures. A prototype reliability monitoring system was developed for North Carolina Department of Transportation (NCDOT) by analyzing historical travel time/rate data in conjunction with other data sources including flow rates, incident records, and weather data. Measuring travel time reliability under various operating conditions assists in the diagnosis of problem spots across the network and the identification of possible remediations.

Interstate freeways in the Research Triangle region of North Carolina were designated as study facilities due to the availability of flow rate data. Study duration was limited to a single year to keep the quantity of data manageable. 2010 was identified as a favorable study area due to the lack of major construction projects and the availability of quality data. Vehicle speed data were obtained from INRIX via the Regional Intelligent Transportation Information System (RITIS) in aggregated five-minute intervals and spatially segmented into TMC segments approximately one mile in length. All other data sources were transformed spatiotemporally into TMC segmentation and five-minute interval.

In addition to travel time/rate data, side-fire radar data were obtained from 60 stations across the study area in five-minute temporal intervals. Incident data were obtained from the Traveler Information Management System (TIMS) maintained by NCDOT; both planned work

zones and unplanned vehicle collisions were included in this dataset. Observational weather data were obtained from five weather stations spatially distributed across the study area. Historical National Weather Service (NWS) warning data were obtained from a repository maintained by Iowa State University. Potential abnormal demand-generating events were identified by an internet search of local media outlets and the engineering judgement of the research team. These datasets were summarized and tabulated for all facilities in the study area.

TMC segments along both directions of I-40 and I-440 in the Triangle region were analyzed individually. Key travel rate percentiles were generated to calculate the level of travel time reliability (LOTTR) and buffer time index (BTI) for all TMC segments for each facility direction. TMC segments were ranked by each metric relative to the set of TMC segments along each facility direction and the difference in those rankings was tabulated to illustrate that quantitative metrics may not paint the entire reliability picture. Three TMC segments spatially distributed along each facility direction were selected for more in-depth analysis. Travel rate percentiles were generated for all observations, observations impacted by an external event, and peak period observations. CDF plots of each distribution were also generated.

Primarily, the prototype monitoring system demonstrates the feasibility of constructing such a system using existing data sources, both public and proprietary. Analysis produced by the reliability monitoring system identified possible problem spots along each facility direction and impacts of weather and incidents on travel rates.

Development and Evaluation of a Prototype Travel Time Reliability Monitoring System for Freeway Facilities in North Carolina

by
Russell Charles Smith

A thesis submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Master of Science

Civil Engineering

Raleigh, North Carolina

2018

APPROVED BY:

_____	_____
Dr. George F. List Committee Chair	Dr. Billy Williams
_____	
Dr. Nagui Rouphail	

DEDICATION

This thesis is dedicated to my parents, Steve and Kellye, for their guidance and support over an academic career spanning 19+ years. I wouldn't be at this point in my journey without them. I would also like to thank the many family and friends that have made this work possible.

BIOGRAPHY

Originally from Richmond, VA, the author received a bachelor's degree in Civil Engineering from North Carolina State University in 2016. Initially pursuing a concentration in structures, Smith gravitated to transportation after completing a summer internship at the North Carolina Department of Transportation. While completing his undergraduate studies, the author was Co-Captain of the ASCE Steel Bridge Team, inducted into Chi Epsilon, and completed the University Scholars Program. In addition, the author was a proud member of the Raleigh Wesley Foundation, Delta Upsilon Fraternity, and Student Wolfpack Club.

Smith continued his studies at NCSU by entering the graduate program in Civil Engineering with a focus on transportation systems. In addition to this project, he served as a research assistant for other projects at the Institute of Transportation Research and Education (ITRE), a teaching assistant for several undergraduate transportation classes, and president of the ITE/ASHE/AREMA student chapter. When not at work or school, the author enjoys boating, golfing, and otherwise being outside.

ACKNOWLEDGMENTS

I would like to first acknowledge my academic advisor, Dr. George List, for the guidance and support throughout my graduate studies. In addition, I would like to thank the other members of my committee, Dr. Billy Williams and Dr. Nagui Rouphail, for their insights and advice. This research was supported by NCDOT and FHWA and I would like to thank Kelly Wells, Meredith McDiarmid, Jennifer Portanova, and Douglas Laird for their guidance and feedback.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1: Introduction to Travel Time Reliability in North Carolina

Increasing travel demand across freeways in the United States shifted focus from traditional density-based measures of capacity and Level of Service (LOS) measures of effectiveness to travel time reliability. Within the vehicular paradigm, reliability is more accurately defined as the variability in travel times observed along a freeway segment for a given period of time. In practice, freeway users that must arrive on-time allow additional, or buffer, time to account for variation of the trip travel time anticipated and experienced. The quantity of this extra time is addressed by travel time reliability analysis methods. These methods are either part of predictive methodologies used to estimate the reliability impact of improvement efforts or monitoring systems using field data to measure reliability as experienced by users along the freeway facility. This study focuses on the implementation of a travel time reliability monitoring system for the North Carolina Department of Transportation (NCDOT) based on the methods presented in Strategic Highway Research Program 2 (SHRP 2) Project L02 Establishing Monitoring Programs for Mobility and Travel Time Reliability.

Both directions of four limited-access freeway facilities in the Research Triangle region of North Carolina were selected for study: I-40, I-440, I-540, and Wade Avenue Extension. These facilities were selected due to the availability of quality external event data. 2010 was established as the study year due to limited construction and other changes to the network. The quantity of data input into the prototype necessitated limiting the study duration to a single calendar year. Operational reliability monitoring systems should include multiple years of data to generate a larger sample of observations for observation types and temporal analysis periods.

Aggregated five-minute vehicle speed data were obtained by INRIX via RITIS and the I-95 Corridor Coalition. Speed data were available in aggregated one-minute, five-minute, and

fifteen-minute intervals. One-minute interval data would have resulted in data sets with over 525,000 records while fifteen-minute intervals may not provide sufficient temporal resolution to capture abnormalities in travel times/rates. INRIX speed data were spatially segmented into traffic message channel (TMC) segments up to a mile in length. Travel rates were derived from the raw data and stitched into continuous vehicle trajectories to account for vehicle continuity between temporal intervals. All other external data sources were spatiotemporally translated into the five-minute interval temporal format and TMC segmentation.

Five-minute volume counts were obtained from 60 side-fire radar sensors deployed across the study area and maintained by HERE. Data from these sensors were assigned to specific TMC segments and converted into pc/hr/ln flow rates using a 2% heavy vehicle factor. The 95th percentile flow rate among the 95th percentile flow rate calculated for each TMC segment was utilized as the effective capacity threshold each facility direction. Incident records were obtained from the Traveler Information Management System (TIMS), a database of incidents occurring along freeways and other major facilities in North Carolina maintained by NCDOT. Records included temporal and spatial bounds along with the type of incident and the number of lanes closed if any.

As an external factor, weather was incorporated into the monitoring system via observational data from weather stations in the area and spatiotemporal data on warnings issued by the National Weather Service (NWS) during the 2010 study year. Air temperature and hourly precipitation rate data were collected from five weather stations located across the study area. A single weather station was assigned to each TMC segment based on visual assessment of the nearest weather station. Historical NWS warning data were obtained via GIS shapefile from a repository of such data maintained by Iowa State University. Warnings typically indicate

adverse weather in the immediate vicinity and serve as a proxy for the occurrence of such weather conditions.

Abnormal demand-generating special events can also adversely affect the reliability of the facility. Several factors were considered when determining which events to apply this designation; event frequency, time of day and day of week, and capacity of the adjacent freeway network. If a major event occurs with moderate frequency, it is recurring and can be anticipated by facility users and adjusted for. Events scheduled concurrently with peak travel periods have the greatest potential to adversely impact travel flow along the facility. If the surrounding facilities have been designed to handle the demand generated by such an event, then the demand generated could hardly be described as abnormal. Designation and analysis of these type of abnormal events can be used as a diagnostic tool to explain abnormal observations without an external event or focus on the reliability impacts of the event directly by generating a distribution of travel rates during the event to compare to the background for the day of the week and time of day.

For the purposes of analysis, flow rates were treated as a symptom of unreliability rather than an external cause. High flow rates without another plausible external explanation such as an incident, adverse weather, or a special event are a sign of recurring congestion due to the lack of sufficient geometric capacity. Weather and incident events were analyzed to identify trends in the occurrence of such events and broken down into type of event. Additionally, the variance of weather data among the five weather stations was tabulated to quantify the impact of spatial variation on the weather data itself. Observational weather data was difficult to obtain at five-minute resolution from the KRDU ASOS station, therefore an analysis of temporal variation between the five-minute ASOS data and hourly weather station data was unable to be completed.

Each five-minute interval and TMC segment combination is referred to as a single observation. Observations with at least one external event flag (weather and/or incidents) were deemed flagged, while observations without an external event flag were designated unflagged.

Due to the significant size of the datasets and the detailed analysis performed as part of the prototype development, only TMC segments along each direction of I-40 and I-440 were analyzed independently. For all TMCs along each facility direction, the level of travel time reliability (LOTTR) and buffer time index (BTI) were tabulated. The LOTTR is the ratio of the 80th percentile to the 50th percentile and the BTI is the ratio of the difference between the 95th percentile and 50th percentile to the median travel rate. Both metrics are measures of travel time reliability, however, the conclusions an analyst may draw from each metric vary greatly. Therefore, the TMC segments were ranked in terms of both metrics among TMCs along the same facility direction. The difference in rankings between metrics were generally between 5 to 15 positions for facility directions with between 30 and 50 TMC segments. A plot was also generated of the LOTTR values of each TMC segment for each temporal analysis period to identify segments reporting a travel rate greater than 1.5, the FHWA-designated threshold of unreliability (*1*).

Three TMC segments, spatially distributed along each facility direction, were selected for additional detailed analysis. Travel rate distributions were generated, and CDF plots produced for all observations, unflagged observations, and flagged observations over all temporal intervals. Conversely, the same distributions and CDF plots of all observation types were generated for the AM peak, PM peak, and weekend temporal analysis periods. CDF plots allow the analyst to visualize the distribution of travel rates and patterns of unreliability. For example, a TMC segment with a sharp increase in travel rates around the 90th percentile may result in an

unusually high buffer time index yet the satisfactory performance during 90 percent of temporal intervals may be desirable. In contrast, a cumulative distribution curve that deviates from the free-flow travel rate just above the median value and steadily increases indicates unreliable travel times due to the wide range of travel rates reported.

Travel rate distributions were also generated for each type of external event to identify the relative impact of incidents versus weather on reliability. CDF plots of weather only, incident only, and weather plus incident observations revealed that incidents had a significantly greater impact on the range of travel rates observed on the upper half of the distribution. The impact of weather on reliability should not be overlooked because the combined incident and weather distribution indicated greater variability than the incident only distribution.

Two routes were constructed from TMC segments along multiple facilities to better analyze actual travel times experienced by the user. In addition to temporal interval stitching, route travel times/rates were tabulated by stitching vehicle trajectories along the entire route starting during the temporal interval for which the route travel rate was reported. This step adjusted travel rates to reflect what actual vehicles were experience traversing the route. LOTTR and BTI were tabulated for all, flagged, and unflagged observations. Additionally, distributions were generated for all observations during each temporal analysis period. Route travel rate CDFs indicated that in general, problem spots are smoothed by the other TMC segments in the route. However, in cases were several unrelated problem spots are located along a route, the combination of such segments can have an accumulating impact on vehicles traversing the entire route.

934 incidents were reported over a total of 82,790 TMC/five-minute interval regions. Planned incidents were less frequent but of greater duration with 110 events over 14,443

time/space regions. The most common planned incident type was "night-time construction" with 58 unique events over 40,690 time/space regions. "Vehicle collision" was the most commonly reported unplanned incident, comprising 702 of the 824 unplanned incidents reported during the 2010 study year. Over 145 severe weather warnings were issued during the 2010 study year. Approximately two percent of temporal intervals reported an air temperature below 25 degrees Fahrenheit.

The TMC segments along each facility direction were ranked by both LOTTR and BTI. The difference between the rankings for each TMC was tabulated and summarized. A large difference in relative ranking could indicate that the metrics would support different reliability conclusions. For observations over all temporal intervals, the greatest average relative variation between LOTTR and BTI was 13.73, observed along the eastbound segments of I-440. The maximum difference in LOTTR and BTI ranking along this facility direction was 27. Across all four freeway facility directions, only 14 TMC segments out of approximately 200 within the study area reported an LOTTR greater than 1.5, a commonly used threshold of travel time unreliability. 12 of those 14 segments were located along I-40.

Key Conclusions

Primarily, the prototype demonstrates the feasibility of implementing a statewide reliability monitoring system in North Carolina using the data sources collected during development. Maintaining reliability data allows for facility performance analysis and creates a baseline for evaluation of reliability-focus transportation improvements. Several major takeaways from the prototype development include:

- Sufficient data sources currently exist to implement a travel time reliability monitoring system statewide in North Carolina. A real-time monitoring system would capture data in a more streamlined format tailored to reliability analysis.
- Reliability analysis identifies locations where capacity may be sufficient, but operational challenges limit performance during periods of peak travel demand.
- Metrics used to quantify travel time reliability such as LOTTR and BTI may lead the analyst to different conclusions if viewed in isolation. Visual and quantitative analysis of the entire cumulative distribution function of travel rates provide more context to the reliability of a route, facility, or TMC segment.
- Based on FHWA's 1.5 LOTTR threshold for unreliability (*1*); few of the over 100 TMC segments along I-40 and I-440 in the study area were deemed unreliable during the 2010 study year.
- Incidents have a pronounced effect on reliability compared to weather events. However, the severity thresholds used to classify both incidents and weather within the prototype were low. Additional optimization and analysis of the criteria used to classify incidents and severe weather will improve the accuracy of the monitoring system and the validity of the analysis obtained from it.

Summary

This document subsequently presents relevant literature on travel time reliability monitoring systems and associated components including travel time reliability metrics and the impact of external events such as weather and incidents on reliability. A methodology for the creation of a prototype reliability monitoring system is conveyed based on locally available data sources. The output of the monitoring prototype was analyzed, and several reliability metrics

were tabulated. Additionally, the external data input into the monitoring system was tabulated and summarized. The results of this case study of the SHRP 2 L02 reliability monitoring concepts provides a framework for the creation of an operational travel time reliability monitoring system for a regional freeway network or even an entire state.

Chapter 2: Existing Literature on Travel Time Reliability

Introduction

Fiscal and environmental constraints limit the ability of transportation agencies to address recurring congestion by adding capacity. In lieu of widening projects, travel time reliability addresses non-recurring sources of congestion that can add uncertainty to the expected trip travel time. On-time arrival is generally prioritized over total trip duration; therefore, percentiles are used to measure the travel rate or time required to achieve a certain likelihood of on-time arrival. Even when recurring congestion is unavoidable, predictability is still valuable, Users typically allocate enough time to ensure on time arrival therefore this cost is incurred regardless of the external event actually occurring.

Trip quality is generally perceived through one of two paradigms: fastest travel time and most consistent travel time. Commuters traveling the same route on a frequent basis generally value a predictable travel time over the route perceived as the quickest (*2*). If a route's fastest travel time is 15-minutes, but occasionally takes 45-minutes, users plan for and experience the cost of 45-minutes regardless of how long the trip takes each day. Depending on the trip purpose, arriving early may not reduce the time cost due to wait time until the intended arrival time.

Reliability concepts apply to many modes of transportation. Airlines measure on time arrivals, time spent waiting to takeoff/land, and maintenance of aircraft. Transit operators collect data for on-time arrival at time point stops. For vehicle drivers and passengers, the facility users, reliability is evaluated from the perspective of variation. Unlike industrial applications where a process must meet a pass/fail threshold, travel time reliability measures variance on both sides of the intended or mean travel time. Each user determines the appropriate route and departure

window based on trip purpose. For some trips, arriving five minutes late is inconsequential, for others arriving on time is paramount.

Recurring congestion is built into reliability analysis based on the use of cumulative distributions. Travel times are stochastic at high temporal and spatial resolutions, therefore, some inherent randomness within the observed data is expected. Abnormal events such as incidents, work zones, and adverse weather may cause greater travel time variation along a facility (*3*). In the context of this study, flagged/unflagged refers to the occurrence of an external event during a spatiotemporal specific region. The normal/abnormal designation references time/space observations that report a travel rate outside of two standard deviations from the mean. External event thresholds were established to qualify which events are of an adverse nature. Travel time observations were also categorized and binned by time period, day of week, and the presence of certain external events for which the mean and standard deviation can be tabulated to identify deviant observations. Travel time reliability distributions and metrics were generated and calculated for these categories.

Travel time reliability was monitored by collecting and analyzing field data and observations over time. These data could be further used to calibrate predictive models to estimate the reliability of a new facility or after improvements to existing facilities. The motivation for monitoring reliability directs the development of appropriate specifications for the monitoring system. Operations users are generally focused on shorter-time horizons, while planning practitioners take a longer view to predict and measure the impact of transportation improvements over their lifecycle. Reliability datasets used to calibrate predictive methods generally encompass multiple years' worth of data to produce probability likelihood of certain external events occurring. This thesis focuses on monitoring applications of travel time reliability

and developing a prototype to organize and process data sources that are used to generate distribution plots and tabulate reliability metrics. A nationwide research effort, Strategic Highway Research Program (SHRP) 2 included a project to study the creation of monitoring systems to capture data required to calculate reliability performance measures (*3*). A prototype model monitoring system was developed for application to North Carolina freeways by the North Carolina Department of Transportation (NCDOT).

Travel Time Reliability as a Performance Measure

Part of the new emphasis on travel time reliability stems from federal regulations requiring the collection of performance data by agencies, of which reliability is a specified measure of performance (*1*). In fact, travel time reliability was included as a performance measure in two recent transportation appropriation acts; Moving Ahead for Progress in the 21st Century Act (MAP-21) and Fixing America's Surfaces Transportation (FAST) Act. These laws require the reporting of performance measures for facilities in the National Highway System (NHS), which include freeways, US, and state routes. The Federal Highway Administration (FHWA) proposed federal regulations specifying performance measures for various areas including freight movement, congestion, emissions, and reliability (*1*). Separate metrics were established for interstate and non-interstate routes due to significant differences between uninterrupted flow and facilities with traffic control devices. Traffic control devices are generally included as a contributing factor of arterial reliability in the literature, however, this study focuses on uninterrupted flow facilities.

Several high-level reliability metrics were specified in the final regulatory document; reliable person miles traveled and Level of Travel Time Reliability (LOTTR). The percentage of person-miles traveled deemed reliable is to be calculated for both interstate and non-interstate

routes. The metrics are to be calculated using predetermined occupancy factors and other data as needed from FHWA. LOTTR is the ratio of the 80th percentile observed travel time/rate to the 50th percentile (median) percentile travel time/rate. Travel rate data are aggregated into uniform intervals no longer than 15 minutes and a cumulative distribution is used to determine specific percentile values (*1*). Observational time/space regions are deemed reliable if the calculated LOTTR ratio is less than 1.50. These analyses are to be conducted using speed/travel time vehicle probe data like the National Performance Management Research Data Set (NPMRDS). Data is to be obtained from 6 AM to 8 PM, seven days a week for the entire calendar year. Weekdays are further subdivided into morning hours from 6 AM to 10 AM, midday hours from 10 AM to 4 PM, 4 PM to 8 PM. The entire weekend day is considered one temporal study period. Metrics are to be calculated for each temporal study period; states are only required to report data every over year (*1*).

The second Strategic Highway Research Project (SHRP 2) L02: Establishing Monitoring Programs for Mobility and Travel Time Reliability conducted an exhaustive review on the development of monitoring systems that would require to collect and tabulate the data required to report system level performance measures. These systems would provide a means to capture perishable field data and observations from traffic management centers to measure the reliability of each facility. External factors can generate nonrecurring congestion, which has been cited as a cause of travel time variability (*4*). In addition to speed/travel time data, external data points including work zones, incidents, adverse weather, and abnormal demand-generating special events are collected. Monitoring events that contribute to unreliability can provide insights into methods to improve reliability at the facility level. SHRP L02 notes that freeway facilities

operating at high reliability levels should have consistent travel times regardless of the time of day, day of week, and current external conditions (*4*).

Travel times are generally normalized by distance and free flow via the travel time index, the observed travel rate divided by the facility free flow speed. For analysis, percentile travel rates are generated from the total distribution for use in specific travel time reliability metrics including, LOTTR and buffer-time index. These metrics represent ratios of various percentile values; the buffer time index is the ratio of the difference between the 95th percentile and median to the median travel. SHRP L02 concluded that no single reliability metric provides the entire reliability narrative and that the entire distribution of travel rates should be analyzed for reliability insights (*3*). These reliability metrics provide context and the ability to quantitively compare different time periods, conditions, or even different facilities.

In addition to specific percentile-based metrics, the distribution of travel times/rates can yield insight to the reliability of the facility. During normal conditions (no external events), travel time/rates are expected to be normally distributed about the mean; variation is consistent on each side of the mean. If the distribution is skewed to one side, the facility may be experiencing unreliable travel times. Skew can be measured by calculating the relative variation between the 90th and 10th percentile travel times and the mean observed travel time (*2*). Previous research has tested the presumption that travel time/rates are normally distributed and suggested other distributions may be a better characterization of travel time/rates. Alvarez and Hadi proposed that the log-normal distribution should be used, and calculated buffer-time based on the median travel time instead of the mean. Use of the 95th percentile was also questioned on grounds that facility improvements may not be able to improve the 95th percentile observed (*5*).

Managed lane facilities, also known as high-occupancy toll (HOT) lanes, provide increased travel time reliability for users willing to pay a demand-variable toll and high-occupancy vehicles. Toll rates are adjusted to maintain at least 45 mph in the managed lanes to change demand by price sensitivity. The reliability of the managed lanes on I-95 outside Miami, FL was compared to the adjacent general-purpose lanes (*5*). Speed data were captured for each lane and used to generate travel time distributions and fused with incident data to identify time periods affected by an incident. To isolate reliability under normal conditions, time periods when incidents were identified were removed from the batch of observations from which analysis was performed (*5*). Use of managed lanes are correlated to demand for the general-purpose lanes, however, demand for the tolled facility lagged the general-purpose lanes due to the toll charged to users that didn't qualify as a high-occupancy vehicle. According to Alvarez and Hadi, managed lanes were most reliable as volume approached capacity because sustained time periods below the minimum performance speed were avoided (*5*).

Researchers based in the Netherlands note that users value reliability as much or more than the quickest travel time and this trend is especially true for users that prioritize arriving on-time. Existing applications of reliability and travel time prediction typically utilize the standard deviation from the mean travel time generated using historical travel time data (*6*). Based on the normal distribution assumption approximately 70% of observations each day are within a single standard deviation of the mean. However, normally distributed travel times are generally limited to uncongested time periods, therefore the authors attempted to identify a more appropriate distribution of travel time during congested time periods by collecting observational data (*6*).

A freeway facility approximately 29 kilometers in length with five interchanges was utilized as the subject facility to collect data from 6 AM to 8 PM for an entire year. Detectors

were located every 500 meters along the facility and used on conjunction with an algorithm to calculate trajectories and speed data. Speed data was aggregated into five-minute temporal intervals and paired with traffic flow data tabulated from the detectors. The data was used to generate a probability density function plot and identify characteristics about the observed values. If the distribution was skewed to the left side of the mean, reliability was more likely to be poor depending on the utility function applicable to each type of user (*6*).

Fixed sensors such as the detectors used in the Netherlands study can also be used to generate traffic flow data in conjunction with the calculated speeds and travel times. Speed data was additionally grouped based on congestion states for further analysis and PDF generation. Speeds observed near free-flow most closely followed a normal distribution with tails tight to the mean travel time. As flow rates increased to a near capacity state, the distribution skewed to the left with a right tail further from the mean travel time. At the highest levels of congestion, the distribution returns to a symmetrical split around the mean and both the left and right tails are further away from the mean. As congestion starts to decrease from peak levels, the distribution skews back to the left. This approach requires rigid congestion states; however, the impact of congestion can be fluid with gradual shifts between congestion levels. J.W.C. van Lint at el propose that the width and skew of the observed travel time distribution may be better indicators of reliability for specific time of day and day of week combinations. The researchers also note that skew of the distribution may contribute more to the cost of unreliability than absolute variance from the mean (*6*).

For analysis at the day of week level, the characteristics of the distribution may be more important than specific percentile-based metrics because the insights are less dependent on user preferences (*6*). A probability density function (PDF) of observed travel time or rate

observations over a study period of sufficient length can be characterized by distribution width and skew about the mean/median. A freeway facility in the Netherlands was utilized to study the distribution characteristics of travel time. The study route was approximately 7 kilometers in length and the daily analysis period was the morning peak hour, 6 AM to 8 AM, in 15-minute temporal interviews. Flow state qualifiers were established to describe traffic flows as free-flow, increasing, congested, and decreasing (*6*). While data collection continues to permeate along freeways and arterials across the country, retrospective analysis of travel time reliability can be conducted using predictive modeling techniques as was performed in Florida (*7*). Florida Department of Transportation (FDOT) utilizes travel time reliability to both monitor existing facilities and drive project prioritization. At the highest-level perspective, on-time arrivals are used as a reliability metric along with binary values for the presence of external events including incidents and weather. In the absence of high-resolution data, statistical approximations can be used to generate event probabilities for each type of external event included in the analysis (*7*). For state level analysis, facilities were divided into segments ranging from nine miles in urban areas to 35 miles in rural areas. Data were calculated and tabulated based on an hourly temporal interview based on a microscopic simulation based on observational data at the macroscopic level. The impact of external events was also approximated for all external event data included in the analysis (*7*).

Incidents were classified by the probability that the incident would cause a lane closure and other variables as deemed appropriate. Rain data was used to account for weather events and was categorized into no rain, light rain (between 0.01" and 0.5" per hour), and heavy rain (greater than 0.5" per hour). The state was divided into three regions for the purpose of approximating weather patterns based on five-years of data collected for each zip code in the

three regions. Work zones were given similar weight to incidents; a three percent capacity drop was assigned to observations during the overnight period and a one percent capacity drop was assigned to daytime observations. The evening peak hour from 4 PM to 7 PM was also isolated; a narrower 5:00 PM to 6:00 PM peak hour could also be used if warranted for specific facilities. Statewide, Florida reported that 94% reliability was achieved across its highway network (*7*).

Use of Vehicle Probe Data to Calculate Travel Times

Measurement of travel time reliability is fundamentally based on collecting vehicle speed data along study facilities. Traditional methods, including fixed-base radar and inductive loops, require significant upfront expense to deploy and require ongoing maintenance. Proliferation of in-vehicle navigational units has provided the opportunity for commercial data providers to generate vehicle speed data tabulated from samples collected from each of the probes deployed in the field. With no infrastructure required for data collection, processing, and storage, private data sources are a commonly used source of travel time data. To analyze travel time reliability, the speed data and associated assembly procedures should be scrutinized as part of the data synthesis process.

One of the first efforts to measure travel time quantitatively was the Advanced Driver and Vehicle Advisory Navigation ConcEpt (ADVANCE) study conducted in suburban areas outside of Chicago, Illinois. One of the first iterations of intelligent transportation systems, the Intelligent Vehicle-Highway Systems (IVHS) was intended to collect data from the traffic stream to power systems communicating up to date information to users (*8*). Eventually, the data and insights from the vehicle data were to be used to provide data-optimized travel routes. Data from the probe-equipped vehicles was fused with data from existing sources including induction loops and video-based monitoring from. Part of the benefit for users agreeing to the terms of the study

was the capability to receive data from the rest of the group, which the system would use to inform the user of upcoming conditions and events (*8*).

Data obtained from vehicle probe systems are often referred to as floating car data because individual vehicle travel times are measured from a sample of the traffic stream. The accuracy of statistical methods based on a subset of the population rather than entire population often depends on how the sample is representative of the population. Along freeway facilities, a sample of approximately 5% can provide sufficient size. The proportion can increase up to 10% for urban arterial routes. The dataset is also impacted by the frequency with which the GPS probe measures and reports data (*9*). A variable sampling threshold was proposed to sample the user population more accurately based on current operating conditions (*9*).

Errors could result from the measurement of data by the GPS unit or the transmission of data to the central server. Therefore, the reliability of the wireless communication process was also considered in the determination of appropriate sample size thresholds. The proportion of probes that report data and the frequency with which the data was reported was considered. The minimum reporting and sample rate were set at 1% of vehicles reporting at a 10-second interval (*9*). For the purpose of transmitting the data back to a central location, observations were grouped in threes for efficient use of cellular data, however, the efficiency came with a lag the data up to 30 seconds. However, the researchers determined that the cellular data burden from the system was inconsequential to the overall cellular network. Deployment is not limited to smartphones; users could choose to use a dedicated GPS navigation unit as was common before smartphones (*9*).

Route choice optimization and other just-in-time uses ultimately utilize segment travel time data to create route travel times to display travel times to users or provide alternative routes.

However, simple addition of segments along the route may yield inaccurate route travel times because the aggregated data doesn't represent an actual vehicle trajectory. Isukapati et al. used Bluetooth data to develop a process to construct travel times and travel time distributions from component segments (*10*). Four Bluetooth readers were installed along a short segment of I-5, a freeway in Sacramento, California, to collect data for three months. On average, the Bluetooth stations were approximately two miles apart and captured data for both travel directions. Each MAC address was recorded and stored with the time and signal strength. The BluSTATS software package generated travel time data from the raw data recorded by the sensor by noting MAC address observations recorded at each Bluetooth sensor along the route. However, this methodology does not specify vehicles that made an intermediate stop between Bluetooth sensors. About 150,000 unique trips were identified from the raw Bluetooth data (*10*).

Isukapati et al. implemented a filtering process to identify trips with intermediate stops at a store for example. Software constraints limit the maximum time between sensors at 240 minutes, therefore long intermediate trips were not included in the dataset (*10*). The constructed travel times output from the software were binned into smaller groups by time period. Local maximums and minimums were used to filter out abnormally long trips relative to the other trips measured during the relatively short analysis period. External data such as incidents and weather were also collected from the PeMS data and assigned to relevant observations. Congestion thresholds were established by analyzing data that occurred without any external explanation. In lieu of using the average of observation, the minimum day average is used as a reference value. Congestion levels determined based on the assumption that travel times increase as congestion increases (*10*).

Correlation between segment travel times determined the relative ability to use one segment to predict the next. A regression analysis of 50 segments generated R-squared regression values indicative of correlation. R-squared values were lowest during peak demand time period. The values were re-grouped by congestion levels for another regression analysis and indicated an inverse relationship between R-squared values and flow rates. Monte Carlo simulation was used to generate route travel time from the underlying cumulative distributions of the segments included in the route. Alternatively, the percentile value for a given travel time can be identified and generally assigned to the entire route for which the corresponding segment percentile travel times would be used to calculate the route travel time (*10*).

Vehicle probe data collection can be supplemented by traditional flow data collected from fixed sensors and detector loops. Chase et al. compared speed data collected from vehicle probe samples with data measured by fixed-base radar sensors and conducted vehicle runs to corroborate the data from both sources. Data collection systems are frequently calibrated to maintain accuracy in the data, however, common calibration techniques only compared similar type data. The increasing availability of vehicle probe data has enabled a direct comparison between fixed sensors and vehicle probes. In the Research Triangle region of North Carolina, Traffic.com (now HERE) maintained side-fire radar stations located along freeway facilities in the region that collected speed and flow rate data at the point location of the sensor. INRIX aggregated vehicle speed data from its network of vehicle probes for all freeway facilities in the region in addition to major arterials (*11*).

Both datasets were accessed via the Regional Integrated Transportation Information System (RITIS), a central repository of real-time and historical traffic data for the I-95 Corridor Coalition states along the east coast of the US. Vehicle probe data were spatially referenced by

pre-defined directional traffic message channels (TMC), which were earlier defined by navigational companies TeleAtlas and Navteq. The average TMC was approximately one-mile in length and used to distinguish segments of the freeway between interchanges and segments within the interchanges as defined by the merge and diverge locations for each direction of travel (*11*). Speed data was available in one, five, and fifteen-minute aggregation temporal resolutions from the RITIS data archive. Some data was missing from the data returned by RITIS, including temporal gaps over 24 hours. For the purposes of comparative analysis, five-minute speed data was obtained and analyzed. If analysis yields abnormality within a five-minute interval observation, one-minute resolution data was obtained for further analysis. The INRIX data set included a historical "reference" speed based on past observations and an opaque confidence metric to indicate data confidence. However, INRIX does not provide a sample count of the data points used to generate an average speed over the specified temporal interval (*11*).

Speed data obtained from RITIS was then processed and categorized based on daily time periods for averaging and visual analysis of the distributions. Where high variation between data sources was observed, the researchers made test-vehicle runs with on-board GPS systems to capture data to calculate travel times for comparison to the larger datasets. A sample of the available freeway links was utilized to compare and evaluate variance of speed data collected from both systems. Ten fixed-based sensors were included in the mostly urban study area (*11*).

For comparison, the GPS data was used to tabulate space mean speeds near each side-fire radar station. The difference between measured speed values was averaged and standard deviation calculated for the entire dataset and the sub grouped daily time periods (*11*). Some random variation is characteristic of travel time data, therefore, a method to distinguish between the normal variation expected and abnormal deviation resulting from adverse traffic conditions.

The authors proposed an abnormality threshold of 1.5 times the standard deviation of the observed travel time on both sides of the mean. In addition, speed-flow plots were constructed using both the INRIX and Traffic.com data for comparison. Combining vehicle probe data with flow-rate data yielded a speed-flow plot that did not confirm to the Highway Capacity Model. There was a noticeable offset in the speeds reported by each source and the GPS data obtained from the test-vehicle runs more closely resembled the vehicle probe data (*11*).

Researchers at the Institute for Transportation Research and Education (ITRE) at North Carolina State University in Raleigh, North Carolina further studied the aggregated segment travel times and methods used to develop route-based travel time (*12*). A "stitching" process was developed to address instances when the reported travel time is longer than the aggregated time interval; a more prevalent occurrence at shorter aggregation intervals. The algorithm creates a specified number of synthetic trajectories that enter the segment at evenly distributed times through the entire time interval. When the temporal interval ends, all remaining trajectories that have not yet reached the end of the original spatial segment are reassigned the speed for the subsequent temporal observation for the same segment. This continues until all the trajectories started during the original temporal interval have completed traversed the spatial segment (*12*).

INRIX data from westbound I-40 in the Raleigh-Durham region were obtained from RITIS to compare the results of simultaneous and "stitched" travel times. In total, the study area comprised of 83 miles of freeway partially in urban and rural areas between I-95 to the east and I-85 to the west. Three routes were constructed from the segments in the study area to include urban, rural, and mixed routes. Data was collected over the entire year of 2010 for all segments along the study area (*12*). 97% of the observations were reported across the study period and

study area and aggregated into five and 15-minute temporal intervals. Missing data and obvious errors were removed from the dataset before the stitching algorithm was applied. An upper bound of 20 times the free-flow travel time, a TTI greater than 20, was imposed on the data. Measures of central tendency were tabulated for the entire dataset, the AM peak hours from 6:00 AM to 10 AM, and the PM peak from 4:00 PM to 8:00 PM. TTI distributions were generated for weekday peak periods, weekday off-peak, and weekends (*12*).

Variance between the two methods depended greatly on the aggregation interval; one-minute temporal intervals will require significantly more stitching than 15-minute aggregated data. In addition to the variances between observations, the profile of the distribution had different characteristics; the temporal boundaries of peak segment travel times were shifted between 20 to 30 minutes apart (*12*). However, this peak divergence was not observed along the urban freeway route. The authors noted that for the other routes, the most congested segments were located near the end of the route whereas the highest levels of congestion were observed at the beginning of the urban route. The travel time profiles are of most consequence when determining which segments are congested. A route travel time observation was labeled congested if there was at least a mile of consecutive segments experiencing congestion. The highest observed TTI was the 2.9 upper tail on the distribution of the entire day travel times. Alternative schemes to identify congested route observations were also evaluated (*12*). A TTI threshold can be used to identify observations that don't average higher than the congestion threshold speed (40 mph based on a 65-mph free-flow speed). Congestion delay, the difference between the observed travel time and the free flow time, can also be used to establish a TTI congestion threshold. Observations with a delay greater than 20% of the corresponding free-flow speed were labeled as congested (*12*).

Cellular smartphones have also been used to record travel time data by fixed point Bluetooth detection or probe-type wireless communication of location and speed data. Most smartphones utilize GPS or other locating systems to power location-based experience within smartphone applications, however, the data generated can also be aggregated into traffic stream datasets. A mobile application was created to measure and record location data, effectively turning a cellular phone into a GPS probe unit (*13*). Guido et al. used the application to obtain location data and the quality of the signals used to triangulate the reported location. Some mobile systems store and continuously update the trajectory even if the signal is lost temporarily. Location is reported at different levels of precision as indicated by the radius of the circle used to indicate the measured location. The margin of error was calculated by the circular error probability and the root mean square percentage error (*13*).

Several models of smartphones were evaluated for the accuracy of the location data recorded. Guido et al. utilized twenty test vehicles made ten trips each and generated 400 data pairs of fixed-sensor and probe data from the smartphones. An ANOVA analysis was performed on the data and determined that there was insignificant variance between the smartphone models used in the test. Variance between the probe data and fixed-sensor data was statically significant. The radius of the reported location circle was related to the root mean square percentage error at a statistically significant level. It was determined from the analysis that location radii less than 24 meters were precise (*13*). A methodology was developed to apply a corrective factor to the raw smartphone data. Variation between the corrected probe speed data and the fixed-base sensors was not statistically significant. Guido et al. noted that within the respective data sources, more variation was observed in the fixed sensor dataset. Additional field testing will be required before smartphone traffic data collection can be implemented on a larger scale (*13*).

Like conventional sensing technology, errors and gaps in the data are inevitable within a dataset of practical spatial and temporal size. Minor deficiencies in the data can be corrected to reduce the number of observations discarded. Route-based calculations are especially affected by gaps in the data; missing data for even a single segment requires all routes that traverse that time/space observations are discarded. According to Zhang et al., data cleaning requires a balance between maximizing the number of samples included in the analysis and limiting the introduction of addition error from the approximation methods (*14*). Unlike fixed sensor data that collects other data such as flow rate, vehicle probe data doesn't have another data point that could be used for comparison. High-temporal resolution data can contain "noise", minor variations in sensor data due to the measurement process rather than a change in the traffic stream. The maximum temporal gap size for correction is variable based on the data resolution and method of data collection (*14*).

Constructing Travel Time Reliability Monitoring Systems

In 2010, the authors of the SHRP 2 L02 report conducted a review of current practices used for travel time reliability monitoring systems to gauge form and functionality. Key aspects included what field data was collected, what data sources were used, how raw data is reported, how data is synthesized with external data, data error checking and correction, how the data drove performance analysis, and means of communicating real time data to users (*15*). Several agencies were already providing data to users directly to inform travel decisions. Washington State Department of Transportation (WSDOT) used data to inform a website that allowed users to generate the predicted travel time for specific origins and destinations. In Houston, predicted travel times were generated using a comparison of observed travel times to three-month historical data and displayed using a website entitled TranStar (*15*). These websites were

operated in conjunction with local traffic management centers and were not as easily accessible to the public as other communication channels. California's PeMS, INRIX, and OpenRoads were cited as major data providers. Monitoring systems typically include human monitoring from traffic management center using video cameras located along the facility; additional observations from the traffic management center can be added to the record (*15*).

Reliability monitoring systems serve a plethora of users and stakeholders with different needs depending on their role within the transportation ecosystem. Passenger vehicles are generally focused on arriving at their destination within an acceptable range of travel times, which vary depending on trip purpose. Freight operators are trying to achieve the shortest travel time; however, they must set reasonable travel windows based on the consequences of being late or arriving too early (*15*). From the policy perspective, reliability data can indicate where additional improvements are needed by way of geometric and traffic management changes. Transit agencies also depend on accurate reliability data to set achievable time tables rather than running continuously behind or incurring significant wait times at time points because too much time was allocated between stops (*15*).

Other research projects within the SHRP 2 program utilize the outputs of a monitoring system; L11 studies travel time reliability improvement methods, L13 evaluates data archival practices to capture and store perishable data that would be difficult to recover, and L14 details communication protocols used to inform users at all phases of a trip (*15*). Reliability observations and expectations were a central theme to the aforementioned SHRP 2 research projects and useful in understanding how users understand and process reliability. Interviews with users reinforced the wide-held belief that acceptable levels of deviation depend on the purpose, frequency, and ability to plan ahead. Freight operators noted that while overall travel

time remains important to their business model, there were significant cost factors to meeting the arrival window. The value of reliability depended greatly on what and for whom freight was being moved. At the time, operators were utilizing personal experiences to guide itinerary and route choice decisions, although navigation systems and asset tracking systems are becoming more prevalent (*15*).

Agencies that implement monitoring systems can use the data as part of the planning process to identify possible improvement projects and prioritize them. Consistent monitoring of travel time data facilitated before and after comparisons for improvements and cost/benefit analysis. High-level policy makers can use system wide data to quantify the performance of the transportation agency (*15*). At the operational level, traffic management centers both collect and utilize data obtained from the monitoring system. Primarily, these centers utilize dynamic message signs and incident response to improve conditions along the facility. While collisions cannot be entirely prevented, an incident response program can accelerate clearing incidents and returning the facility to full capacity. The data collected can better inform operators on the most effective incident management protocols (*15*).

SHRP 2 L02 also identifies use cases for a monitoring system that incorporate all of the potential stakeholders and their needs. Beyond measuring travel times, monitoring systems also need data for contributory factors including incidents, weather, and abnormal demand-events. Analysis of those data points yield more information about the reliability of the facility. Reliability quantitative metrics should be available for individual highway projects and utilized to guide future decisions on reliability-motivated projects including managed lanes (*15*). Users should have the ability to view travel time information before departure and along their route;

depending on the trip purpose, users should be able to identify the best travel windows to utilize (*15*).

After studying the current state of practice regarding travel time reliability monitoring systems, L02 researchers identify best practices of monitoring systems moving forward (*16*). Conceptually, TTRMS include a data management protocol, computational processes, and a means to report analytical results. Raw data is collected from various sensors, public, and commercial sources and processed into a uniform time/space region; many data sources utilized by TTRMS were actually deployed for other purposes and do not output data in a format useful to reliability analysis. A computation engine utilizes the processed data to generate PDF and CDF plots from which quantitative metrics can be generated. The system also needs to present the results of the analysis to the end users in a clear manner (*16*).

Inductive loop detection remains ubiquitous throughout the US, however, newer technologies such as Bluetooth and vehicle probe data are also used (*16*). Vehicles equipped with automatic vehicle identification devices can also provide travel time samples. Regardless of the data source, the data management component converts the raw data into a usable format for reliability and addresses gaps in the data. External data, including incident and weather, must also be retained by the data manager to avoid the need to reconstruct data from archived sources (*16*). Travel rates normalize travel times by the distance over which they are measured, facilitating comparison of different route paths and have an inverse relationship with travel times; as travel rates increase, travel times decrease and vice versa. Sample-based speed data may be advantageous for reliability monitoring due to sampling actual vehicle trajectories achieved by vehicles rather than aggregation across the traffic stream (*16*). Unlike traditional density metrics, reliability focuses on user travel times/rates as they would be expected to occur

in the field. Multiple segments of speed data can be combined to perform route level analysis (*16*).

Sensors of all types remain prone to errors and gaps in the reported data. In some cases, the data collected by the sensor is not considered precise enough to be reported in the raw data or the sensor malfunctions and collects no data. Spatial and temporal gaps can disrupt analysis of reliability due to missed observations, which could introduce error into the data. Therefore, the data management module accounts for minor gaps and errors in the data, however, major spatial and temporal gaps cannot be adjusted without increasing the error in the data (*17*).

At a minimum, incident data should include location and duration data such that incidents can be located along the same segmentation used to measure speed/travel time. Additional data points such as the crash type, severity, and number of lanes impacted further enhance incident-related analysis (*17*). If planned work zones are reported in the same dataset as collisions, the planned and unplanned incidents should be distinguished for the purpose of reliability analysis. Atmospheric observational data is available from the National Weather Service (NWS) from automated surface observation systems (ASOS) maintained by the FAA and located on airfields across the country and automated weather observation systems (AWOS) dispersed throughout the country. Historical weather data may be available from the National Climatic Data Center (NCDC). Both the NWS and NCDC are part of the larger National Oceanic and Atmospheric Administration (NOAA). Abnormal demand-generating events cause demand far greater than typically observed directly attributable to large public events such as fairs, concerts, and sporting events. Temporary electronic signing may be deployed to alert the general public of the unusual traffic flow conditions (*17*).

Several different approaches have been used to locate data sensors along freeway facility and have implications on the use of data collected from these sensors (*18*). In California, sensors are spaced every half-mile on average, however, one mile spacing is more typical across the country. Along limited access freeway facilities, sensors can be deployed to capture data at event locations including interchanges, changes in the number of lanes, and other locations where flow and/or speeds could be affected. If such a method is employed, some sensors should be located in areas with periods of uncongested flow to establish baseline average travel times/rates for a facility. Travel time/rate data should be tabulated based on space-mean-speeds, the harmonic mean of observed speeds, and aggregated into intervals no longer than five minutes (*18*).

Analysis of vehicle probe data overcomes several issues with the geolocation of the data and the data itself. Commercial data providers provide scarce information about how the data was generated and how many vehicles were sampled during the five-minute intervals. The mix of vehicle types within the sample could bias the data up or down depending on the proportion of heavy vehicles in the traffic stream (*19*). Travel times/rates for each segment for which speed data was collected can be combined for route level analysis. Route level analysis can be used to identify correlation between individual segments; when evaluated within the context of an entire route, the problematic segment can be distinguished from the upstream TMC segments impacted by an event that didn't occur within those segments (*19*).

Analysis of the fused data obtained by the monitoring system focuses on developing PDFs and CDFs for both normal conditions and relevant combinations of external events. Data is also broken into temporal analysis periods of various days of week and time of day. After identifying observational regions in time and space that match the user-specified condition, PDFs

and CDF are calculated for the subsets of travel rate data (*19*). Abnormal observational regions were identified if the travel rates are more than two-standard deviations away from the mean travel rate for the spatial and temporal study area. Additionally, observations with high flow rates are flagged. CDFs are utilized to compare the impact of external factors by observing the right skew in the distribution (*19*).

Travel time/rate data can be used as inputs into Advanced Traveler Information Systems (ATIS) to before informing the users and limit uncertainty. Caceres, Hwang, and He utilized data from an interstate freeway facility in Buffalo, NY to evaluate the impact of external factors such as weather, incidents, and demand, on travel time reliability (*20*). The facility selected in Buffalo was divided into 99 segments to geolocate captured toll transponder data; the facility was not tolled, however, toll facilities in the region utilize electronic toll collection and many vehicles were equipped with toll transponders. Incident data was obtained for the county in which the facility is located and used to locate incidents along the facility using GIS and Microsoft Access. Based on verification by Google Maps, at least one incident was recorded in 95% of the segments along the study facility (*20*). A binary incident flag indicated the presence of an incident during that observation and excluded incidents deemed minor Weather data was obtained from a weather station located at a nearby airport and used to generate a table of occurrence likelihood for weather events (*20*).

Unlike the methodology proposed in SHRP 2 L02, Caceres, Hwang, and He created speed bands to group the observations. The resulting distribution was a probability mass function instead of the continuous probability density function. Route-based travel times were calculated using a Monte Carlo simulation algorithm by selecting segments between origin and destination and segments that could influence direct route segments. Caceres, Hwang, and He.

hypothesized that incidents could be attributed to the other external variables and therefore shouldn't be included in the analysis. The observed impact of weather was significant for snow and variable based on the level of congestion (*20*).

Monitoring systems inform analytical decision making, therefore, the sources of unreliability need to be distinguished. In addition to identification, it is useful to approximate the relative contribution of each factor to the observed unreliability. Kwon et al. utilized data from the PeMS for a 30-mile northbound segment of I-880, a freeway facility near San Francisco (*21*). Morning, midday, and evening peak hours were identified and used as a temporal filter to identify relevant observations. The highest peak volumes were observed during the evening peak hour; however, travel time reliability was poorest in the morning peak hour due to residual effects from a major interchange between freeways located near the study segment. Demand rates weren't included in the analysis because the authors suggested that the impact of demand would be captured in the other variables. Observational periods without a notable external event or other abnormality were isolated to generate baseline conditions reflecting recurring congestion along the corridor. Observations occurring during holidays were excluded from the dataset as well (*21*).

Linear regression and optimization techniques indicated the relative contribution to travel time reliability (*21*). Most of the variables had statistical significance, indicated by a p-value less than 0.5. The constant demand term had the highest impacts and corresponded to incident frequencies that were highest during the AM and PM peak hours. Weather was found to have little impact on the model, however, the authors note that the impact of individual weather events could be larger (*21*).

SHRP 2 L38 commissioned case studies on the use of travel time reliability analysis products including the travel time reliability monitoring framework proposed by SHRP 2 LO2. A reliability case study was conducted along portions of I-5 and I-210 in southern California (new source). A prototype monitoring system was developed using desktop database software to organize and process the data. Due to computational limitations, a separate database was created for each facility direction to contain data over a single year. Travel times were created using trajectories starting at the beginning of each temporal interval. More detailed analyses were performed after exporting query output into a spreadsheet (*22*). Analysis data were tabulated over all weekdays in their entirety.

Traffic and external event data gathered as inputs into the prototype were used to distinguish between recurring and non-recurring congestion. Non-recurring congestion caused by external events such as weather, road construction, and/or other incidents along the freeway contributes to travel time unreliability. These external factors represent possible causes of unreliability that can be identified, analyzed, and possibly mitigated. Incident records were obtained from the California Highway Patrol. Categorical weather data were included as part of these records. All planned lane closures were categorized as a special event, as were abnormally high demand-generating events such as concerts and major sporting events. Professional sports venues in Anaheim were located to the north of the I-5 segments included in the spatial analysis area of the prototype. Flow data were obtained along the facilities and classified as abnormal if outside of two standard deviations from the time of day mean flow rate. Researchers noted that weather was a significant contributor to unreliability and that the impact of special events was greatest during periods of low demand rather than peak periods. Additionally, the process of

labeling observations with the appropriate travel rate, flow rate, and/or external event label was time-intensive (*22*).

Chapter 3: Methodology for a Prototype Travel Time Reliability Monitoring System

SHRP 2 L02 presents a framework for creating reliability monitoring systems that measure current levels of reliability using locally available data sources. The prototype developed for NCDOT demonstrates the feasibility of using existing data sources and identifies gaps in the data that can be addressed before an operational monitoring system is implemented. The methodology was modified to include the Level of Travel Time Reliability (LOTTR) metric included in recent federal rulemaking documents from FHWA (1). While the concepts of travel time reliability can be applied to arterials, the prototype focuses on limited-access freeway applications.

Freeways in the Research Triangle region of North Carolina were selected as the study area in part due to the availability of volume data from side-fire radar stations deployed in the region. However, the prototype can be deployed without flow data if such data is unavailable for a facility. The size of the datasets necessitated limiting the study duration to a single calendar year; 2010 was selected due to the absence of major construction projects and the availability of valid data from local sources. An operational implementation of the methodology utilized by the prototype should be able to incorporate multiple years of data to increase the samples for each distribution and compare specific time periods around special events to previous years.

Data sources were compiled and evaluated for inclusion into the monitoring system. Consideration was given to data accessibility and ease of use given the statewide application of the prototype. The following data sources were included in the prototype:

- *Vehicle probe data*– vehicle speed data were obtained from INRIX via the I-95 corridor coalition aggregated into five-minute temporal intervals for the entire 2010 study year.

- *Side-fire radar volume data* – five-minute volume counts measured from over 60 radar stations throughout the freeway network within the study area; HERE maintained and tabulated data from these sensors. Data were accessed from a repository of sensor data maintained by ITRE.
- *Incident records* – all incidents reported in the Traveler Information Management System (TIMS) maintained by NCDOT. These records include both unplanned vehicle collisions and planned work zones.
- *Observational weather data* – air temperature and hourly precipitation rates were obtained via the NC State Climate Office from five weather stations spatially distributed across the study area.
- *National Weather Service warnings* – spatiotemporal data for active warnings issued by the Raleigh forecasting office of the NWS during the 2010 study year; accessed from an online repository maintained by Iowa State University.
- *Abnormal demand generating events* – internet sources were queried for events that likely generated extreme demand along at least part of the freeway network.

Travel time data generated from raw vehicle speed observations enabled high-level analysis of the entire facility during all operating conditions over the study period, typically at least a year. External factors and events that materially impact reliability allow more refined analysis of travel times and rates during observational intervals without external influencing events. Analysis of observational intervals during external event occurrences identifies possible operational deficiencies and evaluates the benefit of potential improvements. Therefore, a monitoring system needs to capture data on these external events in addition to travel time data.

To minimize cost and accelerate deployment, existing data sources are utilized and optimized for inclusion into the monitoring system. After capturing the data, the monitoring system produces relevant performance metrics such as the LOTTR and buffer time index. Probability density functions (PDFs) and cumulative density functions (CDFs) are also generated for relevant segments and routes.

Spatial and Temporal Study Area

Research Triangle freeways comprised the study area due to the availability of quality data sources as shown in **Figure 1**. Travel time data were available statewide via the Regional Intelligent Transportation Information System (RITIS) via the University of Maryland CATT Lab and the I-95 Corridor Coalition. Side-fire radar stations were deployed along freeways mainly in the Research Triangle region and maintained by HERE. These stations are no longer operational. In addition to the interstates in the region during 2010, a limited-access connecter, the Wade Avenue Extension, was included due to its importance in the region providing connectivity between I-40 and RTP to west and Raleigh to the east. Vehicle speed data provided by INRIX were segmented into traffic message channels (TMC) of one-mile average length. The TMC segmentation was used to spatially locate the other data points to create a common time/space region for all data sets.

I-440, included in its entirety, forms the northern portion of a beltline route around downtown Raleigh. This 17-mile facility serves as the western, northern, and eastern quadrants of the beltline; I-40 comprises the southern portion of the beltline passing several miles south of downtown Raleigh. At its southwest terminus, I-440 provides a direct connection to US 1/US 64, a freeway into the Town of Cary, a major population center in the region. Further access is provided to the NC State Fairgrounds, PNC Arena, Crabtree Valley Mall, North Hills, and

Capital Blvd. (US 1). Two large hospitals are located near each facility terminus; UNC Rex Health Care, and WakeMed Raleigh. I-440 shares concurrency with US 1 between its intersection north of Raleigh and the southwestern terminus of I-440. I-440 is concurrent with US 64 and I-87 southeast of Raleigh. From its southeast terminus to the Wade Avenue interchange, I-440 maintains at least a six-lane cross-section and a 60-mph speed limit. From Wade Avenue to the southeastern terminus at I-40, I-440 has a four-lane cross section and a 55-mph speed limit.

I-540, the partially complete outer loop around Raleigh, provides connectivity between north Raleigh and the town of Wake Forest and I-40, Research Triangle Park (RTP), and Raleigh-Durham International Airport (RDU). The portion of the outer loop south of I-40 has

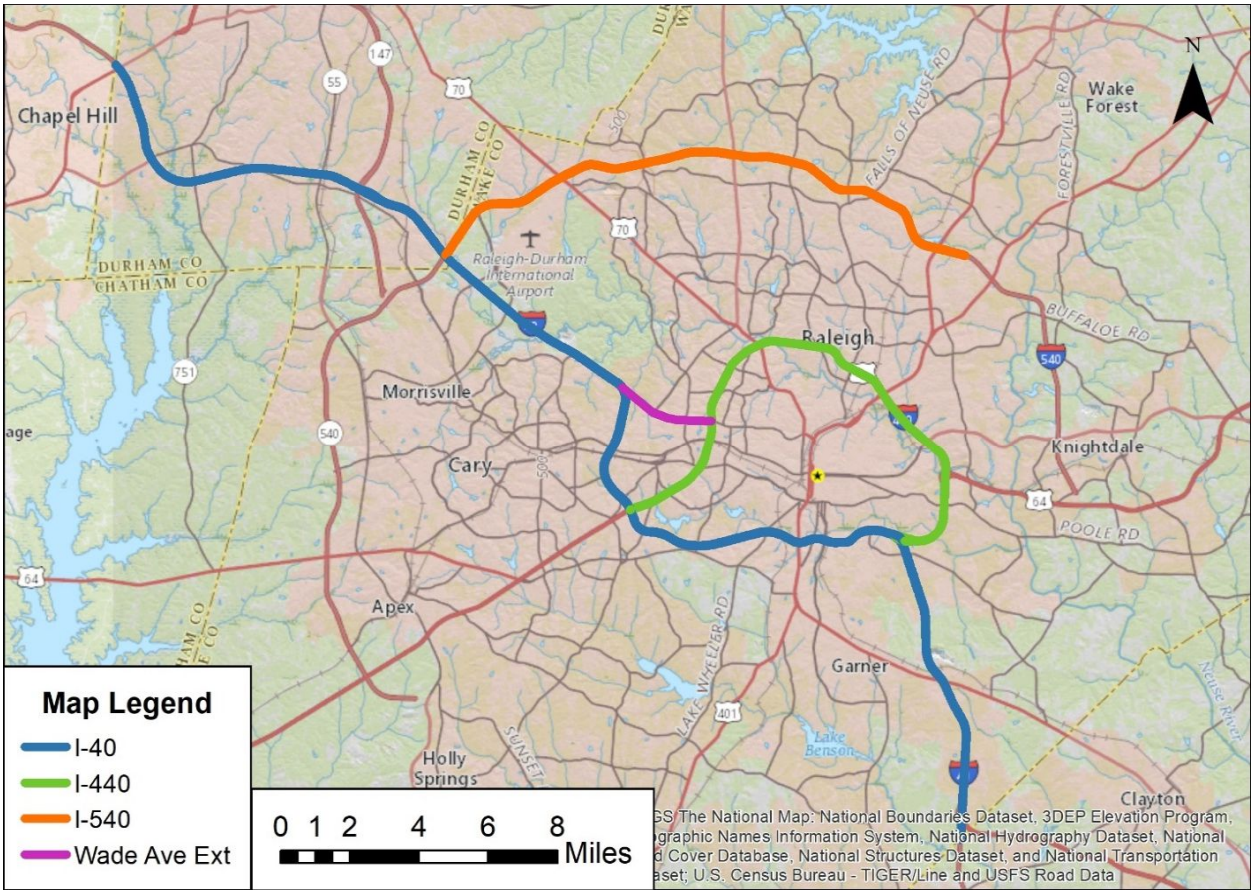

Figure 1: Vicinity map of the study region, the Research Triangle region of North Carolina, showing freeway facilities for which travel time reliability was measured.

been constructed as a tolled facility signed NC 540; the tolled segments were not included in this analysis. I-540 is currently open from I-40 near RDU to US 64/I-87 to the east of Raleigh, however, traffic flow data were not available east of the US 1 interchange. Therefore, only the TMC segments totaling 16 miles in length between US 1 and I-40 were included in the prototype. Six thru lanes are maintained along the study portion of I-540 and the speed limit is 70 mph. Ramp meters are currently installed at several interchanges within the study area, however, the meters were not present during the study period.

In North Carolina, I-40 serves as a major east-west interstate that connects the coastal regions, the Research Triangle, and the mountainous region to the west. Within the region, I-40 connects communities in Johnson, Durham, and Wake counties and is heavily used by commuting traffic. A 45-mile study segment of I-40 from the US 70 Bypass in Johnson County in the east to the Durham/Orange county line in the west. A four-lane cross-section expands to six several miles from the eastern terminus and again to eight lanes along the portion of the facility that forms the southern portion of Raleigh's beltline route. At least six thru lanes are continued to the western extent of the study area along I-40, however, the cross-section narrows to four-lanes near the western end of the study area. This portion of I-40 provides connectivity to Alamance County to the west; the resulting westbound bottleneck could impact adjacent study segments.

Temporal observations correspond to all five-minute intervals in 2010; a total of 105,120 five-minute observation periods were defined for each dataset. Each observation period was further classified by the day of week and time of day so that the analyst can customize the days of week and time periods to be analyzed. For prototype evaluation purposes, various combinations of day and time were defined. Four time periods were established for all-day

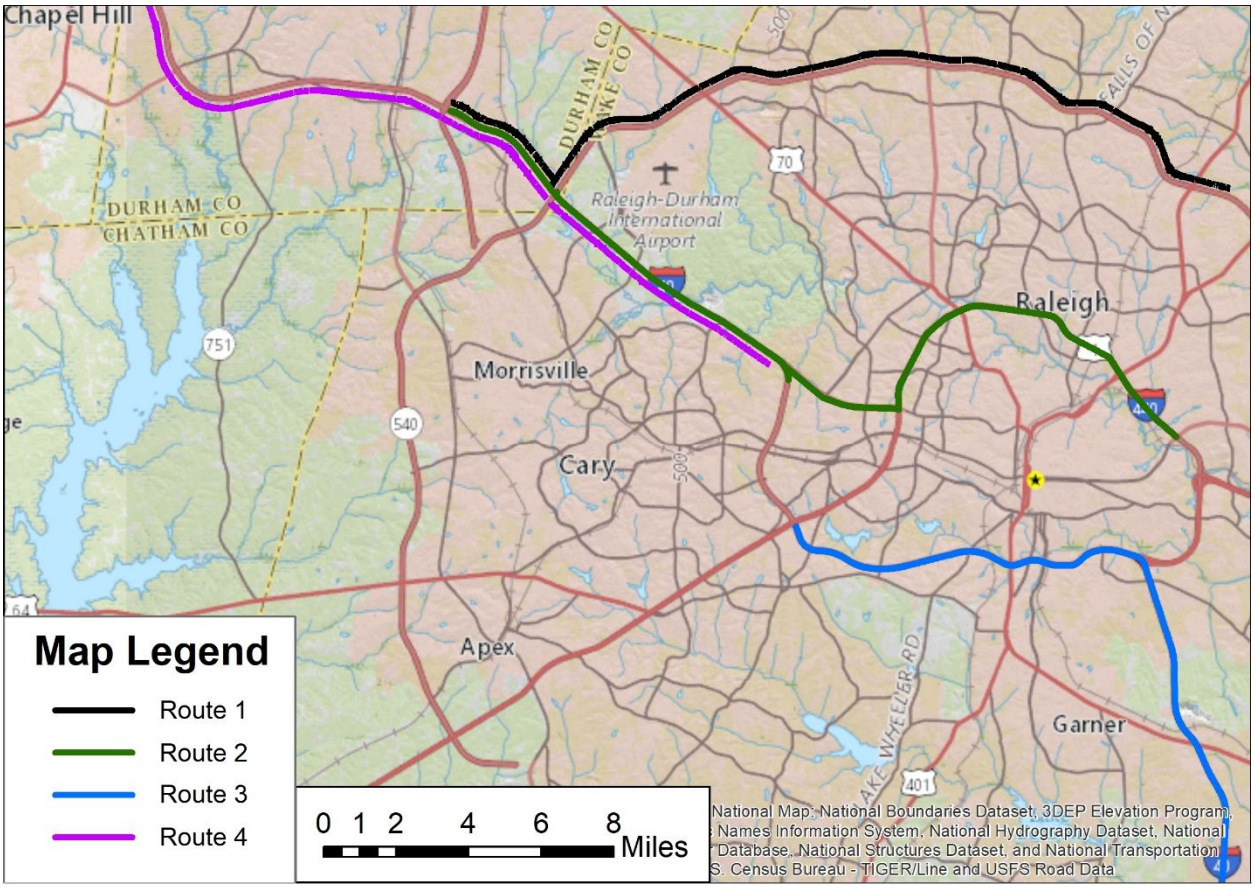

Figure 2: Routes constructed from TMC segments along the freeway facilities included in the study.

analysis; 6 AM to 10 AM, 10 AM to 4 PM, 4 PM to 8 PM, and 8 PM to 6 AM (+ 1 day).

To demonstrate the route-based analysis capability of the monitoring system, two routes were constructed along the study facilities and included at least two different facility directions. Multiple routes were designed and the two selected encompass most the freeway network included in the study and are common commuter routes as shown in **Figure 2**. To keep the data set reasonable, only two routes were analyzed in both directions. Route-based analysis provides insight into the reliability of trips along popular routes such as heavy commuting routes or routes near major demand generators. Route 1 starts at the US 1 (Capital Blvd.) and I-540 interchange and ends at Exit 280 on I-40 at Davis Drive and near Research Triangle Park. This route captures employees commuting to RTP from Wake Forest and the northernmost neighborhoods

in Raleigh. Route 2 starts at the US 64 Business interchange with I-440 and also ends at Exit 280 near RTP. Commuters from towns east of Raleigh and most of Raleigh utilize I-440, Wade Avenue Extension, and I-40 to commute to/from offices located in or near RTP and the airport.

Vehicle Speed Data Collection

Unlike traditional density-based measures of effectiveness based on low resolution data such as Annual Average Daily Traffic (AADT), travel time reliability measures depend on data with much higher temporal resolution. Vehicle speed data can be sourced from both fixed-based sensors and proprietary data providers such as INRIX and Here. Fixed-based sensors include technologies such as side-fire radar, acoustical sensors, Bluetooth readers, and inductive loops (both single and double loop applications). Proprietary data providers generate speed and travel time data from sample readings from in-vehicle GPS tracking and navigation units typically deployed in fleet vehicles. Federal Highway Administration (FHWA) sponsored the National Performance Management Research Data Set (NPMRDS), a repository of travel time data collected from vehicle probes and aggregated into five-minute intervals for performance analysis. The NPMRDS includes all facilities within the National Highway System (NHS) and was the first large scale collection of travel time data nationwide. The data used in this analysis was similar in nature to the NPMRDS, but not from that dataset.

As a member of the I-95 Corridor Coalition, a cooperative alliance of states along I-95, the major north-south interstate on the east coast, NCDOT accesses speed and travel time data sourced by INRIX during the 2010 study year and accessed via the Vehicle Probe Project (VPP) within the Regional Integrated Transportation Information System (RITIS) (23). INRIX traffic data was spatially segmented into Traffic Message Channels (TMCs), a directional spatial segmentation protocol created by navigation companies Navteq and TomTom. TMC segments

are either internal or external to interchanges; segmentation changes at entry and exit ramps. While the monitoring prototype will only analyze mainline freeway data, INRIX collects data along arterials, ramps, and other surface streets. RITIS includes a database real-time traffic data and historical archives of congestion, travel time, and incident data. The RITIS platform provides a graphical user interface (GUI) to select the specific spatial and temporal extents of travel time for download from the database. The spatial extent can be selected by facility or by traffic message channel (TMC) and the temporal extent by specifying the data range and hours of the day to be included in the downloaded dataset. Raw probe data is aggregated into average values over one, five, and 15-minute intervals for download from RITIS. The prototype monitoring system utilizes 5-minute aggregation intervals to account for subtle variations within the traffic stream while collecting a sufficient number of vehicle samples.

Other Datasets Included in the Monitoring Decision

During 2010, the study year for the prototype system, 60 side-fire radar sensors were actively deployed across the Research Triangle interstates, I-40, I-440, and I-540. Here.com administered data collection from these units and compiled datasets of speed, volume, and occupancy for each lane. Data from these sensors were obtained from ITRE's archive of side-fire radar data and aggregated into five-minute intervals; the sensors have since been removed and data are no longer warehoused by Here.com. While flow rate data is not a required component of a reliability monitoring system, the data can further enhance analysis of the travel time data.

Data for the following external factors were collected: Incidents, weather, and special demand-generating events. Incident data from Durham and Wake counties were obtained from NCDOT's Traveler Information Management System (TIMS) database for 2010. TIMS provides

real-time information to users of the freeways and major arterial routes across the state. Incidents reported in TIMS include unplanned events such as vehicle collisions and breakdowns as well as planned work zones and special event detours. Each unique incident is assigned an ID number and the record includes the start and end time, milepost locations, geography coordinates, the number of lanes blocked, type of incident, and a general description of the event. This information comes from the Statewide Operations Center (STOC), a traffic management center with access to public safety communication channels and video feeds from cameras located throughout the network. Incident data was utilized rather than crash report data from the North Carolina Division of Motor Vehicles due to the focus on traveler impact; TIMS only included incident events deemed to impact the traffic stream, while crash reports are generated for every event, regardless of severity or impact to other vehicles using the facility.

Two types of weather data were obtained during the study period; observational data from local weather stations adjacent to the freeway facilities and adverse weather warnings issued by the National Weather Service, specifically, the NWS forecasting office in Raleigh (*24*). Shapefiles containing spatial, temporal, and categorical data for warnings issued by the NWS were obtained from the Iowa Environmental Mesonet center at Iowa State University (*24*). Data from five weather stations across the study area were obtained from the State of North Carolina Climate Office, a governmental agency that provides climate data to other state agencies, educational, and commercial users (*26*). Selected weather stations were located in Clayton, NC, at Lake Wheeler south of Raleigh, at the Reedy Creek Research Station in Raleigh, at Raleigh-Durham International Airport (KRDU) and at the Horace Williams Airport in Chapel Hill NC.

Special-demand generating events address time periods when a facility experiences significantly above normal demand resulting from an event such as an athletic event, concert,

fair, etc. These types of events occur infrequently enough such that the adjacent roadway network is not designed to accommodate the extra demand and the motoring public not accustomed to the increased delay. Within the Research Triangle region, PNC Arena and Carter-Findley Stadium offer examples of what may or may not constitute special demand-generating events. PNC Arena is a multipurpose arena with an approximately 19,000-person capacity that serves as the home venue for North Carolina State University's men's basketball team and a professional hockey franchise in addition to numerous concerts and other one-off events. Located adjacent to I-40, I-440, and Wade Avenue, arena traffic is generally absorbed by those freeway facilities and traffic impacts limited to the adjacent arterials connecting the arena to the freeways.

Carter-Findley Stadium hosts home games for NCSU's football program and has a capacity of approximately 55,000 persons. Occasionally, once every couple years, outdoor concerts will be held at the stadium drawing approximately 40,000 people. Most college football games at the stadium are hosted on Saturday afternoons, when background demand is low compared to weekday traffic flows. Like PNC traffic, Saturday football traffic is generally absorbed by the adjacent freeways with local facilities experiencing the most significant traffic impact. However, most concerts and an occasional football game occur on a weeknight and attendees are traveling to the stadium during the evening peak hour when background demand is at its highest. Traffic congestion from the additional traffic can materially affect conditions on the adjacent freeways and have transient effects on the regional network. The concerts and weekday football games would be classified as special-demand generating events, whereas the arena events and Saturday football games would not.

Travel Time Data Processing

Vehicle speed data were post-processed from the raw data collected from the vehicle probes as part of the RITIS query and data download. However, the data included in the downloaded zip file still requires significant processing and manipulation into a format useable in travel time reliability applications.

Vehicle speed data downloaded from the RITIS database comes in a comma separated file (CSV) with one record (row) corresponding to each time and TMC combination. Due to the number of five-minute intervals during the study period, the resulting comma separated file exceeded the number of rows in a standard spreadsheet and could not be opened directly. Microsoft Excel Pivot Tables were utilized to convert the csv file from RITIS into a table of temporal observations (rows) by TMC segments (columns). Two types of errors were typically present in the data; missing speed data for some TMC segments and missing time intervals altogether. Missing temporal intervals were added to the dataset and linear interpolation was utilized to fill gaps of two or fewer temporal observations, 10 minutes in total, for both types of data errors. Temporal gaps less than 10 minutes were interpolated between adjacent temporal observations for the same TMC segment to maximize the number of time/space observations included in the generated distributions; gaps greater than 10 minutes were not addressed to avoid introducing additional error into the dataset. Temporal interpolation was favored over spatial interpolation due to computational limitation.

The length of each TMC was extracted from a separate CSV file containing information about the TMC segments included in the dataset. Location data was provided in start/end geographic coordinates and the length of each TMC was provided in miles. Due to frequent changes to TMC segmentation to account for new interchanges, ramps, etc., the location data

from the characteristics file were used to develop a shapefile of TMC segments which spatially assigns other datasets to the TMC-based segmentation. Initially, a shapefile of INRIX TMC segments provided by NCDOT was utilized for spatial assignment, however, differences were discovered between the shapefile and the TMC identification CSV files output from RITIS. TMC segmentation is updated to account for new interchanges and other geometric changes in the field. Maintenance of updated segmentation spatial data is imperative to the success of a real-time travel time reliability system. If possible, TMC segmentation should be used to spatially identify other external variables directly during data collection, rather than depending on ex-post facto spatial assignment.

Stitching algorithms were deployed based on earlier research presented by Chase et al. to account for spatial and temporal boundary conditions (*12*). TMC segments serve as virtual boundaries to facilitate georeferenced data collection of vehicle speed data, however, no such delineations exist in the field and drivers have no concept of segmentation while traversing the facility. Therefore, the vehicle speed data needs to be adjusted to reflect that vehicle trajectories are continuous from segment to segment along the route. At the TMC analysis level, temporal stitching accounts for vehicles that traverse a TMC segment during more than one temporal interval by constructing virtual vehicle sample trajectories entering the segment at equal temporal increments during the five-minute interval. The prototype generates trajectories for ten hypothetical vehicles that enter the TMC facility every 30 seconds during the observational interval. Using the aggregated speed value reported by RITIS, an algorithm determines if the vehicle will reach the end of the TMC segment by the end of the five-minute observational period and tabulate the travel time to traverse the segment. If the vehicle would completely traverse the spatial segment within the observational period, the travel rate is tabulated using the

travel time and the length of the TMC. However, if the trajectory would not reach the end of the TMC, the trajectory speed is updated to the reported average speed for the next temporal interval and continues to be adjusted for subsequent intervals until the vehicle crosses the end of the TMC. The travel time for such vehicles to traverse the TMC is then divided by the length of the TMC to determine the travel rate. All ten travel rates generated by the synthetic vehicle trajectories are then averaged to arrive at a spatially congruent travel rate that can be compared to other TMC segments, regardless of length (*12*).

Spatial and temporal stitching addresses continuity when calculating the travel time and rate for routes comprised of multiple TMC segments. After TMC segments are temporally stitched, another stitching algorithm simulates 10 synthetic vehicle trajectories that enter the first TMC at the beginning of the route and traverse the entire route. All ten vehicles enter the starting segment during the observational interval at equally spaced intervals, however, the route may not be completed within the observational interval. Therefore, the reported route travel rates for a given observation interval are based on vehicles starting the route during that interval, even if the vehicle doesn't complete the entire route. A new vehicle trajectory begins every 30 seconds within the subject observational interval. If the trajectory crosses into another TMC during the current five-minute interval, the trajectory is updated to the speed reported in the following TMC during the same time interval. If the current five-minute interval ends before a trajectory reaches a TMC boundary, the trajectory is updated using the reported average speed for the next temporal observation, but same TMC segment. The speed of each trajectory is updated each time a temporal or spatial boundary is crossed so that the trajectory always reflects current temporal and spatial conditions. Travel times from each synthetic trajectory are averaged and

divided by the length of the route to calculate the average route travel rate during the subject observational interval.

The mean and standard deviation of travel rates reported during all operating conditions and temporal interval was used to establish a range of travel rates within two standard deviations of the mean. Reported travel rates outside of this range were deemed abnormal. The purpose of this designation was to identify specific time/space observations reporting poor travel rates to facilitate comparison with flow rates and external variables.

Flow Rate Data Processing

Lane-by-lane traffic flow data collected from the HERE side-fire radar sensors were aggregated into five-minute total directional volumes. Flow rate data, measured at a point location, were assigned to TMC segments based on spatial proximity based on the geographic coordinates provided along with the flow rate data and visual assignment to the TMC segments along the facility. For limited-access freeway facilities, flow continuity was assumed between interchanges, allowing for the application of point data to entire freeway segments. Generally, at least one sensor was located within each interchange and between all interchanges. If a single sensor was located within a TMC segment, the volumes measured by that sensor were assigned to that segment. If more than one sensor was located within a TMC segment, all sensors were averaged into a value assigned to the TMC. If a sensor is not located along a TMC segment, the nearest sensors up and downstream of the segment were averaged and assigned to the TMC.

A 2% heavy vehicles factor was applied to the counts to convert vehicle counts into passenger car equivalent counts. Each five-minute directional volume was multiplied by 12 to calculate the hourly flow rate observed during the five-minute interval. To normalize the flow rates to the number of lanes, the flow rates were then divided by the number of mainline lanes

along each TMC segment. Passenger car per hour per lane flow rates could then be compared among TMC segments with different cross-sections.

Key percentiles of flow rates were tabulated for each facility direction; the 95th percentile of the 95th percentile flow rates for each TMC was tabulated and used as the effective capacity along the facility direction. 50 mph was designated as the critical speed; thus 1.2 min/mi was the critical rate. Observations with flow rates below capacity and rates greater than 1.2 min/mi were deemed oversaturated and deemed abnormal. For all facility directions, the effective capacity was less than 2,000 pc/hr/ln, therefore, any recorded flow rates greater than 2,000 pc/hr/ln was deemed abnormal.

Abnormal flow rates were cross-referenced with abnormal travel rates without external event flags to identify observations for which the travel rate reported was unnormal, but no abnormal flow rate or external event was observed. Ideally, the data utilized by the monitoring system minimizes the number of observations reporting abnormal travel rates without an explanatory abnormality or event. If the number of such observations is low, the analysis can infer that travel rate abnormalities not attributable to an external event are the result of abnormal flow rates. This conclusion can be useful if flow rate data is not available for a given facility.

Incident Data Processing

Travel time reliability monitoring protocols generally distinguish between planned and unplanned incidents. Drivers can adjust their travel itinerary based on information about upcoming work zones and any associated lane closures. While facility operators broadcast information about collisions or emergency road repairs via VMS, the web, and local media, users generally don't receive such information pre-trip and are forced to adapt mid-route after encountering the resulting congestion. Both types of incidents are reported in TIMS to maintain

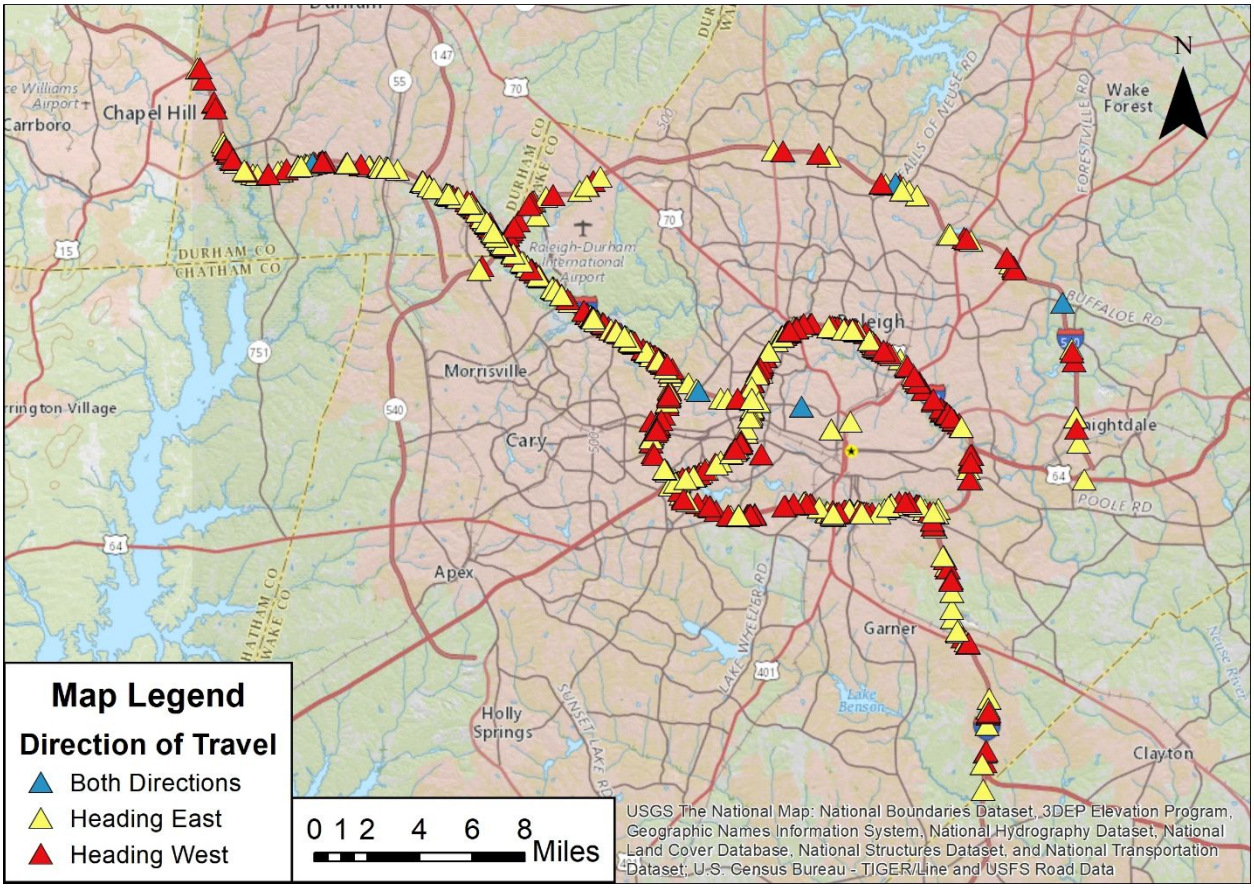

Figure 3: Plot of incidents reported to TIMS during 2010 located by latitude and longitude.

a central source for information about events that adversely impact traffic. For the purposes of the monitoring system, vehicle collisions and breakdowns were classified as unplanned and road construction events were classified as planned. **Figure 3** shows the location of incidents reported during the study year. The analyst can further refine the incident definition to for example, isolate incidents with lane closures or select only collisions. Analysis included in this report aggregates planned and unplanned incidents due to the relatively small sample size generated within a single year.

Incident data included both latitude/longitude and statewide milepost spatial extents of the incident location. However, only one set of geographic coordinates were reported for each incident. Vehicle-based incidents were spatially assigned to TMC segments based on the

coordinate data; the spatial extent of these incident types was most commonly one segment. However, planned work zones may stretch over many miles and TMC segments. Therefore, the starting and ending mileposts were utilized to spatially locate these incidents to TMC segments.

Mileage-based exit numbering schemes number interchanges based on the nearest state milepost ingrain the mileage reference in the user vernacular. In general, State mileposts start at the western or southern border and increase until the next state border or facility terminus. Auxiliary loop and spur routes within the interstate system such as I-440 and I-540 start mile posting from the southern or western terminus. As a tool to inform the public, TIMS used the state mileposts to local incidents. However, road characteristic data provided by NCDOT utilized a county-based milepost referencing system. Therefore, spatial data for the location of each milepost sign, provided in a shapefile from NCDOT, were utilized to assign TMC segments to incidents with a spatial extent beyond one TMC. Several mileposts were missing, therefore visual estimation was used to locate incidents at terminated at a milepost not included in the dataset.

Weather Data Processing

Two types of weather data were included in the prototype; observational weather data collected from local weather stations and NWS-issued weather warnings, indicating that a severe event is imminent. One or both types of weather data may be utilized within the monitoring system. Development of the prototype required an ex-post facto analysis of conditions; therefore, the sources of historical data may not reflect available real-time data sources. Weather Underground currently maintains a network of crowd-sourced weather stations that provide much higher resolution, however, this data was proprietary and not easily accessed. At RDU, the NWS maintains an Automated Surface Observation System (ASOS) weather station that records

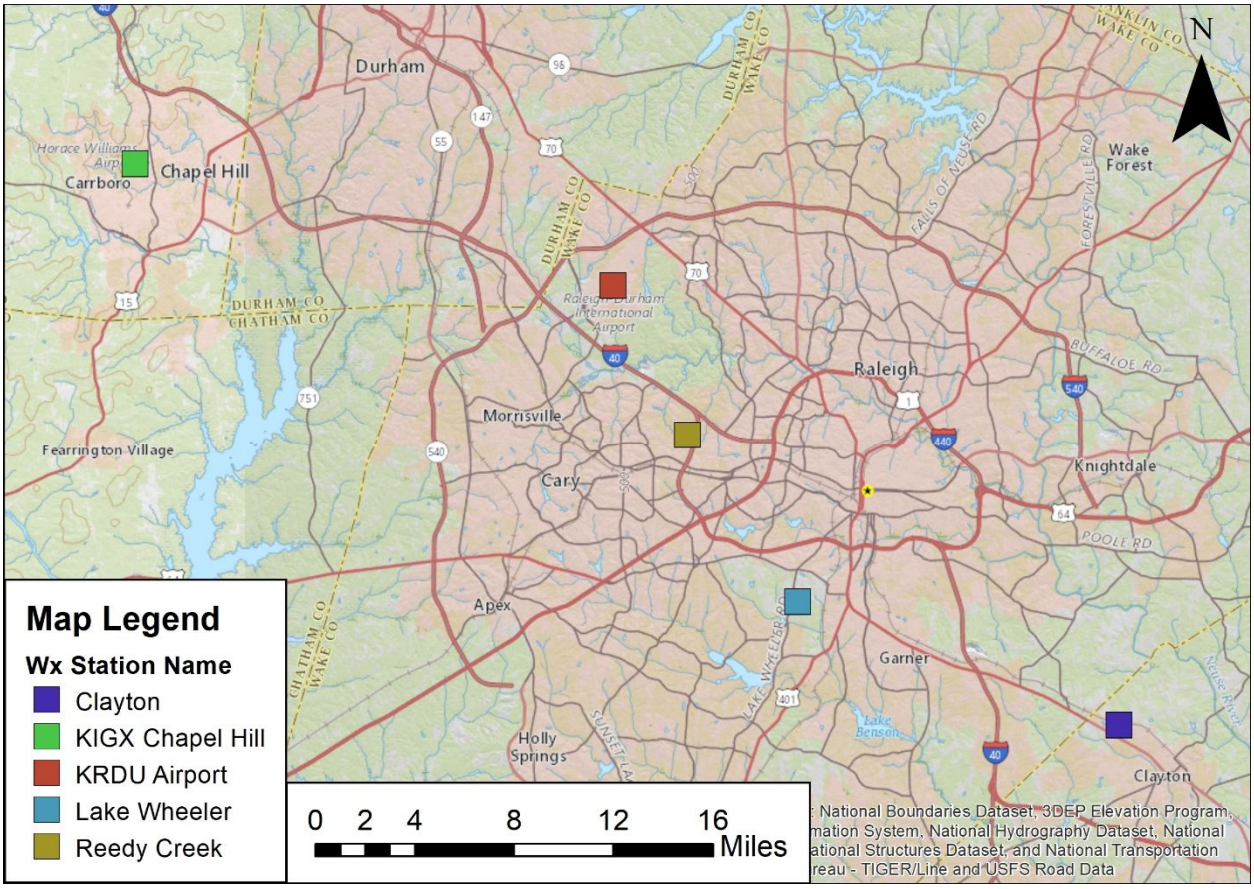

Figure 4: Location of weather stations used to obtain air temperatures and hourly precipitation rates.

air temperature, dew point, visibility, pressure, wind direction/speed, and precipitation. Air temperature and precipitation are measured and recorded every minute. Raw data is communicated using the METAR format for transmission to pilots and other users. An ASOS station was located at Horace Williams Airport, KIGX, in Chapel Hill. The other weather stations were part of the North Carolina Environment Climate Observing Network (ECOnet), a program that provides weather and climate data to agricultural users. Unlike aviation-oriented weather sensors, the ECOnet stations did not collect visibility data, while collecting data on soil conditions (*26*).

Unlike air temperature, which experiences only minor spatial variation, hourly precipitation rates are susceptible to high spatial variation beyond the immediate proximity of the weather station. The five weather stations selected improve the spatial coverage, but still assume uniform conditions across the area over which the data is assigned. An intentional decision was made to favor increased spatial resolution by including data from the ECOnet stations over temporal resolution provided by the ASOS stations as shown in **Figure 4**. TMC segments were assigned to the closest weather station as determined by a visual analysis of radii around each weather station. Analysis was conducted to measure the variation of weather data between the weather stations to determine the significance of weather station assignment.

The sixth edition of the *Highway Capacity Manual* established precipitation thresholds to apply corrective factors in the predictive freeway travel time reliability. Moderate or medium intensity rain is characterized by precipitation rates between 0.1 and 0.25 inches per hour. Precipitation rates greater than a quarter of an inch per hour are considered heavy rain (*27*). If the measured air temperature was below freezing, 32° F (0° C), while precipitation was recorded, the precipitation is noted as freezing; the type of freezing precipitation cannot be determined directly from the precipitation and air temperature data. Snow events in the region are so infrequent that reliability during accumulating snowfall may not be expected by users and measures to improve reliability may be economically infeasible for the seasonal average snowfall amounts observed in the region.

Warnings are generally disseminated via local Emergency Alert System (EAS), a Federal Communication Commission (FCC) program that requires almost all audiovisual broadcasting outlets, including radio and television stations, to display warning information. These warnings inform motorists already on the road that action may be required to maintain safety. Warnings

observed elsewhere may encourage users to delay or reschedule a trip rather than start a trip during the warned (*28*). For the purpose of developing the prototype, all warnings were weighted equally, whereas in reality, user response to warnings vary by warning type. Tornado, Severe Thunderstorm, and Flash Flood warnings are of primary concern due to the sudden onset of unsafe conditions. Freeze and excessive heat warnings are far more forecastable; the warning designation for these categories signifies the high likelihood of occurrence rather than the timeliness of such conditions.

Analysis Scenario Generation

Each five-minute interval/TMC segment combination is referred to as an observation. Observations for which an incident and/or weather event occurs were labeled as flagged observations, while observations without an external event flag were deemed unflagged. Due to the number of valid travel rate samples in the 2010 dataset, there were insufficient sample observations to categorize observations by both temporal analysis period and external event flag. All temporal intervals were included in analysis was performed for all conditions, unflagged, and flagged observations. All observation types were included in analysis for the AM peak period, PM peak period, and weekend temporal analysis period. Flow rates were considered to be related to travel rates and thus not treated as an external factor.

External Event Analysis

Summary data and breakdowns of external event frequencies were tabulated for each event type. Incidents were broken down into planned and unplanned incident types. Planned incident types included construction, maintenance, night-time construction, and special events. Unplanned incident types include congestion, disabled vehicles, fire, other, road obstruction, and vehicle collision. Only congestion reported by employees at the state traffic management center

was included; congestion incidents recorded automatically based on traffic data were excluded from the prototype because travel rates are already accounting for this type of event.

Observational weather data from each weather station were summarized and TMC segments assigned to each weather station. The variation between weather stations was tabulated to quantify the benefit of increased spatial resolution. Five-minute data were not easily obtainable from the KRDU ASOS station, therefore temporal variation could not be compared. Historical weather radar data was explored as a possible source of weather data due to the high resolution of available imagery and high spatial accuracy. However, the processing required to process and interpret the images was deemed to be outside the scope of this prototype development.

The NC State football game held on a Thursday night was further analyzed as an abnormal demand generating event by comparing travel rates and external events during the affected hours that day to typical data for the time of day and day of week. 12 TMC segments adjacent to the football stadium were selected for analysis. A plot of travel rates during the event and the typical travel rates for the day of week and time of day was created.

Facility-Wide Analysis

Use of travel rates instead of travel times allowed for comparison between different TMC segments with similar free-flow speeds or speed limits. Facilities with different effective free-flow speed can still be visually compared and analyzed qualitatively using travel rate CDF plots. The LOTTR and BTI for all intervals were tabulated for all TMC segments along each facility direction. The TMC segment with the highest LOTTR and BTI are included in a table with average and maximum values for each metric. A plot of LOTTR for all TMCs for each facility direction was also generated. Stitched travel rates were converted back into speeds to generate a

distribution of speeds and tabulate the number of observations that report a speed less than 60 mph for each temporal analysis period (AM, PM, and weekend).

Travel rate CDFs were generated for several TMC segments spatially distributed along the facility. The buffer time index, the ratio of the difference of the 95th percentile and 50th percentile travel rate to the 50th percentile travel rate, was also generated for each TMC segment and temporal analysis period to facilitate comparison with other reliability studies. BTI indicates the proportion of extra time required before the intended arrival time to achieve a 95% on-time arrival rate. LOTTR, the ratio of the 80th percentile to the 50th percentile travel rate, was also tabulated and compared to BTI. TMC segments along each facility direction were ranked by BTI and LOTTR. The difference in rank between metric was tabulated to affirm the principle that no single reliability metric should be used to draw conclusions about travel time reliability. The average and maximum spread in rankings were tabulated and reported for each facility direction. To reduce the influence of outliers in the travel rate datasets, the median travel rate is utilized instead of the mean travel rate.

Route-Based Analysis

Analysis of routes typically traversed by users provides metrics in a more relevant spatial context for the traveling public. Route travel rate analyses were distinguished from individual TMC segments by the spatial and temporal stitching algorithm that aggregates TMC travel rates along a route composed of multiple and consecutive TMC segments. Like the stitching algorithm used to generate TMC travel rates, the route stitching algorithm used synthetic trajectories entering the first TMC in the route at equal temporal increments during the initial five-minute temporal interval. The algorithm updates each synthetic trajectory with the correct speed as it crosses each spatial and temporal boundary until the end of the route is reached. The

travel rates tabulated over the entire route for each synthetic trajectory were averaged to determine the average travel rate for the route over the original five-minute interval. Note that the routes generally span at least several temporal intervals. Route-based travel rates smooth out TMC-level variation and the correlation of adjacent TMC segments.

Several routes traversed multiple facilities to reflect actual commuter trends; while agency stakeholders may think in terms of facilities, users generally view trips from the perspective of the entire routes. If one facility along a route exhibits poor reliability, users may view the entire trip negatively. Ramp and auxiliary alignment data were not collected and are ignored within the context of route analysis. As the use of travel time data becomes ubiquitous, data collection along ramps may allow inclusion of such data. Temporal intervals (only one route travel rate reported per temporal interval) were designated unflagged if no more than four TMC segments were flagged for incidents and/or weather, and designated flagged otherwise. Speed histograms were compiled for the routes in addition to cumulative distributions for normal and abnormal external events. For routes, the aggregated travel rates represent an average over the entire route, which extend over at least several temporal intervals. Therefore, the route rates may smooth areas of poor performance along the route while the travel time tabulated as sum of the travel time tabulated for each observation utilized by the route stitching algorithm.

Special Demand-Generating Event Data Processing

Certain high-demand generating events can produce significant congestion with the resulting vehicle demand is significantly greater than would normally be expected for the day of the week and time of day. Such events should occur with a frequency low enough such that the adjacent freeway network is not designed to handle event-generated demand. Due to rarity with which these events occur, special events should be used as a diagnostic tool for suspect

observations without an external event flag. Public information sources were searched to generate a list of potential demand-generating events. During the 2010 study year, two potentially demand altering events were discovered; a Thursday night football at Carter Finley Stadium on 9/16/2010, and the North Carolina State Fair held from October 14th to October 24th (29,30). The football game officially started at 7:30 PM, however fans arrive at the stadium early for pre-game tailgating, the traffic impacts likely started around 4:00 PM and continued through the evening peak period ending at 8 PM. In 2010, the State Fair ran for 10 days and drew the most visitors on the two Saturdays. On 10/16/2010, the first Saturday of the fair, attendance reached 131,669. Qualitative impacts from these events may explain abnormal travel times and flow rates.

Chapter 4: External Event Data Summary and Analysis

Data from external sources including incidents and weather events were analyzed to identify trends and other patterns in the data. Detailed metrics for each external variable distinguishes a reliability monitoring system from predictive methods to determine travel time reliability. These external events cannot be entirely prevented, however, modifications to both geometric design and response protocols can improve reliability and should be a focus of facility operators evaluating possible reliability improvement projects. Data collection methods were also analyzed to identify possible inefficiencies in the prototype monitoring system. **Table 1** indicates the number of TMC segments and length of each facility direction.

Incident Data Summary and Analysis

Incident records stored in TIMS assigned an incident type to each incident in addition to other metrics including the number of lanes closed and duration. For each facility, the number of collisions of each type and the number of time/space regions for which a collision of such type was active. In addition, incidents were classified as either unplanned or planned. Unplanned incidents included disabled vehicles, vehicle collisions, road obstructions, vehicle fires, and other incidents lacking an incident type classification. Congestion incidents included in the data set were TIMS entries by a controller in the Traffic Management Center. Congestion records in TIMS generated automatically were not included in the incident dataset. Planned incidents included construction, maintenance, and special events.

Table 1 contains aggregated incident data by facility direction. **Table 2** lists the number of time and space observations for which each incident type was active by each facility direction. **Table 3** shows a breakdown of observations with active incidents by incident type and aggregated planned and unplanned incidents.

Table 1: Number of TMC Segments and Total Length of Each Facility Direction.

	I-40 EB	I-40 WB	I-440 EB	I-440 WB	I-540 EB	I-540 WB	Wade EB	Wade WB	All
# of TMC Segments	51	51	30	30	16	16	6	6	206
Total Length (mi)	40.56	40.86	15.06	15.71	16.08	15.98	2.33	2.28	148.86

Table 2: Incidents Recorded in TIMS by Incident Type and Facility Direction.

Incident Type	I-40 EB	I-40 WB	I-440 EB	I-440 WB	I-540 EB	I-540 WB	Wade EB	Wade WB	Total
Congestion	14	13	4	1	0	1	0	0	33
Construction	2	9	0	0	0	0	0	0	11
Disabled Vehicle	20	22	6	12	3	1	1	1	66
Fire	3	8	1	1	2	0	0	0	15
Maintenance	8	11	9	8	0	0	1	0	37
Night Time Construction	30	28	0	0	0	0	0	0	58
Other	1	1	0	0	0	0	0	0	2
Road Obstruction	2	2	1	1	0	0	0	0	6
Special Event	0	0	1	1	0	0	1	1	4
Vehicle Collision	263	196	90	116	16	0	5	1	702
Planned	40	48	10	9	0	0	2	1	110
Unplanned	303	242	102	131	21	17	6	2	824

Table 3: Number of Active Time/Space Observations by Incident Type and Facility Direction.

Incident Type	I-40 EB	I-40 WB	I-440 EB	I-440 WB	I-540 EB	I-540 WB	Wade EB	Wade WB	Total
Congestion	800	717	188	10	0	39	0	0	1834
Construction	1500	6721	0	0	0	0	0	0	8221
Disabled Vehicle	95	203	47	86	36	6	12	6	491
Fire	25	55	6	12	29	0	0	0	127
Maintenance	918	12021	599	5368	0		13	0	18919
Night Time Construction	23077	17613	0	0	0	0	0	0	40690
Other	287	287	0	0	0	0	0	0	574
Road Obstruction	54	29	12	18	0	0	0	0	113
Special Event	0	0	109	109	0		150	149	517
Vehicle Collision	3345	4674	885	1795	238	307	60	0	11304
Planned	25495	36355	708	5477	0	0	163	149	68347
Unplanned	4686	5965	1138	1921	303	352	72	6	14443

During the 2010 study year, 1,636 incidents were reported to and stored in the RITIS database across all facility directions in the study area. Incidents were active for 94,094 time/space observations over 206 spatial segments and 105,120 temporal observation intervals. Unplanned incidents represented 88% of all reported incidents but only 17.45% of time/space observations with an active incident. Among unplanned incident types, vehicle collisions were the most common, representing 43% of all reported incidents. Nighttime construction was the most commonly reported planned incident type at 3.55% of reported incidents and attributed to 43% of all time/space observations with an active incident.

No planned incidents were reported along I-540 in both directions, likely attributable to its relatively recent construction. I-40 EB reported the highest number of reported incidents per TMC segment; I-440 WB reported the highest number of accidents per mile. I-40 WB had the highest number of incident active time/space observations both per TMC and per mile. These numbers are not adjusted for vehicle exposure, therefore, the higher incident totals for I-40 EB and WB can likely be attributed to higher vehicle miles traveled.

Observational Weather Data

Reliability monitoring requires temporal and spatial assignment of adverse weather events to facility segmentation, a use case that may not be considered by weather agencies collecting data. Facility specific weather data collection was sparse and presented a challenge for prototype development. Most sources of weather data are focused on public information, forecasting, research, and/or aviation, therefore, data collected for other purposes was used to complete the spatiotemporal assignment of significant weather events likely to adversely impact the reliability of travel times along specific facilities.

Obtaining the high-resolution data records proved to be difficult because the data was not widely disseminated to users. During 2010, ASOS stations were operational at Raleigh-Durham International Airport (KRDU) and Horace Williams Airport (KIGX) in Chapel Hill, NC. However, KIGX has since closed and the ASOS at that facility is no longer operational.

The North Carolina State Climate Office maintains weather stations across the state to collect climate data primarily in support of agriculture uses. Within the Research Triangle, ECONet stations were more spatially distributed across the study area. Only hourly observation data were available from these stations. Therefore, the importance and benefit of temporal resolution verse spatial resolution. During development of the prototype, spatial resolution was prioritized due to the spatial variation inherent with intense precipitation, especially during severe thunderstorms.

Table 4 indicates the number of TMC assignments assigned to each weather station by facility direction. Only one year of travel time data were collected, therefore, sufficient observations were not available to perform reliability analysis based on each permutation of weather conditions. However, statistical data were tabulated for air temperature and precipitation data collected from the various weather stations in the study area to determine the relative significance of spatial resolution compared to the reporting temporal frequency.

Table 4: Number of TMC segments assigned to each weather station by facility direction.

	CLAY	LAKE	REED	KRDU	KIGX
I-40 EB	2	16	8	17	8
I-40 WB	3	16	8	17	7
I-440 EB	0	10	20	0	0
I-440 WB	0	10	20	0	0
I-540 EB	0	0	3	13	0
I-540 WB	0	0	3	13	0
Wade EB	0	0	6	0	0
Wade WB	0	0	6	0	0
TOTAL:	**5**	**52**	**74**	**60**	**15**

Hourly temperature data in degrees Fahrenheit were extrapolated into five-minute observational intervals during the corresponding hour for the five weather stations identified in the study area. For the purposes of reliability analysis, the low temperature threshold was set at 32° F and time-space observations were flagged for weather if the air temperature was below the threshold. As part of the analysis of the weather data, statistics were tabulated for temperatures below 30° F and 25° F. The former captures intervals more than one standard deviation below the freezing temperature, while the later captures intervals with air temperatures significantly below freezing that indicate a higher likelihood of ice formation or snow/ice precipitation.

For each of the weather stations, only about 2% of intervals reported invalid air temperature data. The KIGX ASOS station had the highest percentage of invalid interval observation, while the LAKE weather station had the lowest percentage of invalid intervals. **Table 5** shows the number of intervals with at least one station reporting an air temperature below the corresponding threshold temperature and the standard deviation among the five stations when at least one station meets the threshold.

Table 5: Statistical Information from five weather stations in the study region.

	CLAY	**LAKE**	**REED**	**KRDU**	**KIGX**	**S.D.**
Station Type	ECONet	ECONet	ECONet	ASOS	ASOS	N/A
Number of valid observations	105,085 (99.97%)	105,001 (99.89%)	105,073 (99.96%)	104,917 (99.81%)	103,321 (98329%)	1.34°
Number of intervals w/ air temp < 32° F	7,884 (7.50%)	8,604 (8.19%)	8,736 (8.31%)	8,292 (7.90%)	8,808 (8.52%)	1.22°
Number of intervals w/ air temp < 30° F	5,328 (5.07%)	6,096 (5.81%)	6,336 (6.03%)	5,784 (5.51%)	6,240 (6.04%)	1.18°
Number of intervals w/ air temp < 25° F	1,704 (1.62%)	2,160 (2.06%)	2,292 (2.18%)	2,184 (2.08%)	2,268 (2.20%)	1.24°

The tabulated standard deviation among the weather stations was actually lower when a low temperature threshold was reported by at least one station. Air temperature observations are averaged over the hour-long interval; therefore, minute temporal variation has been smoothed out in the hourly data. Spatially, major deviations were not observed and were generally in line with expected temporal variation. Among temporal intervals reporting at least one station with an air temperature below the threshold, the average number of weather stations reporting a temperature below the threshold was approximately four. These results suggest that air temperature observations are not sensitive to temporal and spatial resolution.

Low air temperature can be a proxy for adverse weather due to the increased risk for ice formation and snow/sleet precipitation, which can adversely impact user safety and travel time reliability. For these effects to manifest, temperatures may need to be below freezing for extended periods of time. Therefore, the station data were analyzed to measure the number of temporal intervals for which a certain number of preceding intervals also meet the temperature threshold. To capture possible winter precipitation, air temperatures of at least two hours were compared with hourly precipitation rates.

Table 6 contains the number of temporal observations grouped by the number of stations reporting an air temperature below the corresponding temperature threshold. Slightly more than 10% of the temporal intervals reported at least one station with an air temperature below 32°, 7.5% reported at least one station below 30°, and 2.70% reported at least one station below 25°.

Table 6: Number of temporal intervals meeting the low temperature thresholds by the number of stations reporting an air temperature below the threshold.

Number of Stations	Air Temp < 32° F	Air Temp < 30° F	Air Temp < 25° F
0	1296	1248	444
1	924	900	384
2	864	636	192
3	972	852	300
4	6540	4284	1524
5	1296	1248	444

Table 7 contains the results from the duration analysis. Air temperature thresholds were 32° F and 25° F. Durations of two, six, and 12 hours were used and included 24, 72, and 144 temporal intervals respectively. For each station and temporal interview, the preceding intervals were checked against the threshold temperature value and the number of stations for which all of the reviewed intervals reported an air temperature below the threshold was recorded. For the durations for which the air temperature was less than 32°, the average number of stations meeting the threshold criteria was about four. For durations with an air temperature less than 25° F, the average number of stations meeting the criteria was closer to 3.5.

Table 7: Breakdown of temporal intervals by temperature threshold, duration, and the number of stations that meet the applicable category requirements.

Number of Stations	Air Temp < 32° F			Air Temp < 25° F		
	2 hours	6 hours	12 hours	2 hours	6 hours	12 hours
0	96,457	99,337	102,217	102,961	103,885	104,593
1	1,128	708	276	324	204	96
2	684	396	216	276	192	48
3	648	348	192	144	48	24
4	780	684	516	252	168	36
5	5,400	3,576	1,560	1,140	552	180
Average Number of Stations	4	4.05	4.04	3.75	3.58	3.41
Percent of Intervals with > 0 stations	8.24%	5.50%	2.76%	2.05%	1.17%	0.50%

The results of the duration analysis are aligned with earlier analysis indicating the relative unimportance of spatial and temporal resolution with regard to air temperature. Approximately 90% of the observations with at least one station reporting an air temperature below freezing were preceded by at least two hours of freezing air temperatures. It should be concluded that resolution of air temperature data is not a critical component of a reliability monitoring prototype.

Observations from the precipitation gauges at each weather station were aggregated to develop the hourly average precipitation rate which was assigned to corresponding temporal intervals within the hour. Because most of the observed precipitation rates were 0, standard deviations were only tabulated for intervals during which measurable precipitation was observed. **Table 8** shows the number of intervals for which the hourly precipitation rate was measurable, greater than 0.1 inch/hour, and 0.25 inch/hour.

Table 8: Number of intervals that meet each hourly precipitation threshold for each weather station and the average standard deviation between the weather stations for intervals with at least one station meeting the threshold.

	CLAY	LAKE	REED	KRDU	KIGX	Avg. S.D. (in/hr)
Hourly Precip > 0"	5,424	5,400	6,960	9,960	10,728	0.034
Hourly Precip > 0.1"	1,344	1,164	1,548	1,212	864	0.135
Hourly Precip > 0.25"	516	372	432	384	180	0.241

Approximately 17% of the temporal intervals reported at least one station with an hourly precipitation rate above the intensity threshold, while only 3.14% of intervals reported an hourly precipitation rate above 0.1 inch/hour. Due to the hourly averaging of precipitation by each weather station, it is possible that short periods of higher intensity precipitation were hidden within the average rate. The average standard deviation among stations when at least one station reported measurable precipitation was 0.034 inch/hour. Among temporal intervals with at least one station reporting an hourly precipitation rate greater than 0.1 inch/hour, the average standard deviation was 0.135 inch/hour, greater than the HCM threshold for moderate rain (27). If one station reported an hourly precipitation rate higher than 0.25 inch/hour, the average standard deviation was 0.241 inch/hour.

These average standard deviations indicate widespread spatial variation between the five weather stations in the study area. The additional weather stations were added to the data collection methodology to improve the spatial variation, yet spatial resolution is still less than desirable. Due to the hourly nature of the data obtained for the development of the prototype, temporal analysis was not feasible on these weather datasets, however, high temporal variation in precipitation rates, especially at high intensities, is common in the study region.

The frequency of accumulating snow and ice events is such that reliability of these facilities under such conditions is not a high priority in the region. Users do not expect reliability when snow or ice has accumulated on the road surface. However, the data collected may inform on the rare occasions such precipitation occurs. 888 temporal intervals reported at least one station with a temperature below 32° for at least two hours and a measurable amount of precipitation. Only 48 intervals had a station report an air temperature below 32° for at least two hours and an hourly precipitation rate greater than 0.1 inch/hour. 24 temporal intervals reported at least one station with an air temperature below freezing for at least the preceding two hours and precipitation greater than 0.25 inch/hour.

The high-level objective of weather data within the monitoring system is to identify spatiotemporal areas experiences adverse weather. This can be approached through several means; observational data, NWS forecast office qualitative information, inclusion of weather data within incident reports, and observations made from traffic management centers. Our prototype utilized both observational data and spatial data on warnings issued by the local NWS office in Raleigh. Other possible sources of higher resolution weather data include historical radar/satellite imagery and predictive models that use input observational data to approximate conditions at a much higher resolution.

The extent to which weather data collection is useful within a monitoring system depends on the use cases of the reliability data. If the primary focus of weather analysis is to reduce incidents that occur as a result of or during adverse weather, increased reporting of weather conditions as part of incident data collection and retention may enough. Adverse weather conditions that severely limit driver visibility and prevent vehicles from safely operating at the

posted speed limit would also be corroborated by vehicle probe data and/or fixed-based radar data.

National Weather Service Warnings

During the course of prototype development, other weather data sources were sought out to improve the precision of the monitoring system. NWS warnings generally mean that an adverse event is imminent, and action may be required. These data points cover areas not represented by the observation weather data and thus provide additional coverage of the study region. The NWS local forecast office issues warnings to entire counties and predesigned polygon areas at the sub-county spatial resolution. In NWS jargon, weather event types are referred to as phenomena. **Table 9** lists the present NWS warning codes and associated definitions quoted directly from NWS (31).

Table 9: NWS warning definitions for warning types issued in the study region during 2010.

Code	Phenomena	NWS Definition
EH	Excessive Heat	"Issued within 12 hours of the onset of the following criteria: heat index of at least 105°F for more than 3 hours per day for 2 consecutive days, or heat index more than 115°F for any period of time." (*31*)
FA	Areal Flood	"issued for flooding that develops more gradually, usually from prolonged and persistent moderate to heavy rainfall" (*32*)
FF	Flash Flood	"Issued to inform the public, emergency management, and other cooperating agencies that flash flooding is in progress, imminent, or highly likely." (*31*)
FL	Flood	"(FLW) In hydrologic terms, a release by the NWS to inform the public of flooding along larger streams in which there is a serious threat to life or property. A flood warning will usually contain river stage (level) forecasts." (*31*)
FZ	Freeze	"(FLW) In hydrologic terms, a release by the NWS to inform the public of flooding along larger streams in which there is a serious threat to life or property. A flood warning will usually contain river stage (level) forecasts." (*31*)
HW	High Wind	"This product is issued by the National Weather Service when high wind speeds may pose a hazard or is life threatening. The criteria for this warning varies from state to state. In Michigan, the criteria is sustained non-convective (not related to thunderstorms) winds greater than or equal to 40 mph lasting for one hour or longer, or winds greater than or equal to 58 mph for any duration." (*31*)
SV	Severe Thunderstorm	"issued when either a severe thunderstorm is indicated by the WSR-88D radar or a spotter reports a thunderstorm producing hail 3/4 inch or larger in diameter and/or winds equal or exceed 58 miles an hour" (*31*)
TO	Tornado	"issued when a tornado is indicated by the WSR-88D radar or sighted by spotters" (*31*)
WS	Winter Storm	"issued by the National Weather Service when a winter storm is producing or is forecast to produce heavy snow or significant ice accumulation" (*31*)

Table 10 indicates the total duration of the issued warnings over the study region during 2010 and **Table 11** breaks down the number of warnings issued countywide and in the sub-county polygon zones.

Table 10: Duration and event-type frequency across the study region in 2010.

Code	Duration (hr)	Duration (5-min intervals)	Number of Events	Average Duration (hr)	Average Duration (5-min intervals)
EH	24	288	3	8	96
FA	11	132	3	3.67	44
FF	67	804	27	2.48	30
FL	210	2520	6	35	420
FZ	6	72	1	6	72
HW	14	168	1	14	168
SV	113	1356	145	0.78	9
TO	2	24	4	0.5	6
WS	89	1068	5	17.8	214

Table 11: Breakdown of warnings issued countywide or in sub-county polygons by event type.

Code	County	Polygon	Code	County	Polygon
EH	3	0	**HW**	1	0
FA	3	0	**SV**	101	44
FF	15	12	**TO**	4	0
FL	6	0	**WS**	5	0
FZ	1	0			

Severe thunderstorm warnings were the most frequent event type and also had the long duration during 2010. Thunderstorms can produce short periods of very high intensity rain than limit driver visibility sufficiently to slow the traffic stream but are difficult to capture using observational weather data. The precision of observational data will increase as the network of weather stations continue to grow. By a ratio of approximately 2:1, severe thunderstorm warnings were issued county-wide rather than using the higher resolution sub-county polygon

areas. The lack of spatial resolution proses a significant challenge to the usefulness of this data to the monitoring system.

Chapter 5: Facility-Level Travel Time Reliability Analysis

TMC segments are the smallest spatial unit of the monitoring system, however, agencies and other stakeholders commonly refer to freeways by facility and direction. Therefore, analysis of the TMC segments in the study region were grouped by facility direction. TMC-level specificity allows for greater spatial resolution and ability to pinpoint problem areas. However, study of TMC segments in isolation does not account for boundary effects from adjacent TMC segments. This shortcoming will be addressed in route-based analysis in the following chapter. During prototype development, both directions of I-440 and I-40 within the study area were analyzed.

Both freeway facilities adhere to conventional TMC directional protocols; eastbound segments include either a minus sign or the letter N, and westbound segments either have a plus sign or the letter P in the TMC code. Note that TMC codes with and plus or minus sign are generally located between interchanges, while codes with a letter are located within interchanges. TMC segments located within an interchange are shorter than segments located between interchanges. TMC segmentation corresponding to collector-distributor facilities and ramps were not included in the analysis. It is important to reiterate that TMC codes and segmentation are subject to change and the TMC segments referenced in this analysis were current as of 2010, the year during which the data was collected. A critical component of an operational monitoring system in an up-to-date spatial reference.

LOTTR and BTI were tabulated and ranked among TMC segments along each facility direction to evaluate the difference in results produced by each metric. Average and maximum values were recorded for both reliability measures and the difference in relative ranking. Calculations were completed on all observations, flagged observations, and unflagged

observation for all time intervals. Metrics were also tabulated for all observations during each temporal analysis period. The most severe peak period was identified from this analysis and CDF plots were generated for that peak period.

For each facility-direction, three TMC segments spatially distributed along the entire corridor included in the analysis, data on all TMC segments is located in corresponding appendices. In addition to all observations, metrics and plots were generated for both unflagged and flagged conditions. Analysis by time of day and day of week evaluated performance during weekday peak periods and weekends in addition to the entire 24-hour dataset. For the selected TMC segments, CDF plots were generated for the 24-hour travel rate dataset and the most severe peak hour. Analysis by incident condition facilitates evaluation of the impact of various event combinations on reliability.

All facilities except both directions of I-540 follow conventional TMC segmentation. Eastbound TMC segments contain a "-" or "N" in the name of the segment; westbound TMC segments have a "+" or "P". I-540 segmentation is reversed; plus, and P TMC segments are eastbound. TMC segment labels containing a plus or minus sign are generally between interchanges, N or P TMC segments are located within interchanges. TMC segmentation data was obtained directly from the output files of the RITIS database.

For each TMC segment included in the report analysis, external variables were further summarized by facility direction and sub grouped by time of day analysis periods; 24-hours, AM, PM, and weekends. Missing time/space travel rate observations were tabulated for each TMC and temporal analysis period. Stitched travel rates were used to generate a distribution of average vehicle speeds to identify the number of observations for which the average travel speed was less than 60 mph, a performance threshold considered by FHWA. Note that all graphs were

constructed using Microsoft Excel's spline tool to plot a contiguous line through the data points for the travel time distribution. For the cumulative distribution functions (CDFs) this can create the erroneous impression that the CDF backs up in the values of the random variable. It would have been much better to use the piecewise linear plotting function.

I-40 Eastbound Facility Analysis

50 TMC segments were located along I-40 EB in Wake and Durham Counties, the effective extents of the study regions. LOTTR values greater than 1.5 were only reported for the PM peak hour, and then only seven segments reported such LOTTR values. Weekend observations produced the largest spread between the rank of the segments by BTI and LOTTR. **Table 12** contains facility-level reliability data for I-40 EB. For each analysis time period, different TMC segments reported the highest BTI and LOTTR.

Table 12: Facility-wide BTI and LOTTR data for I-40 EB.

	All Intervals	AM Peak	PM Peak	Weekends
TMC w/ highest BTI	125-04589	125-04869	125-04860	125N04858
TMC w/ highest LOTTR	125N04858	125N04856	125-04857	125N04872
Average BTI	0.252	0.098	0.970	0.083
Max BTI	1.385	0.213	3.817	0.432
Average LOTTR	1.034	1.032	1.256	1.009
Max LOTTR	1.103	1.050	2.834	1.044
Average Rank Spread	6.96	6.64	4.76	15.76
Max Rank Spread	24	20	19	48
Number of TMC segments w/ LOTTR > 1.5	0	0	7	0

Figure 5 displays a plot of LOTTR values for each I-40 EB TMC and each temporal analysis period. LOTTR values above 1.5, the FHWA specified reliability threshold, were only found during the PM Peak period. Most of the deviant TMC segments were located in the

central part of the facility between the airport and US 1 interchange. Smaller blips were observed near RTP and near Jones Sausage Rd. to the east.

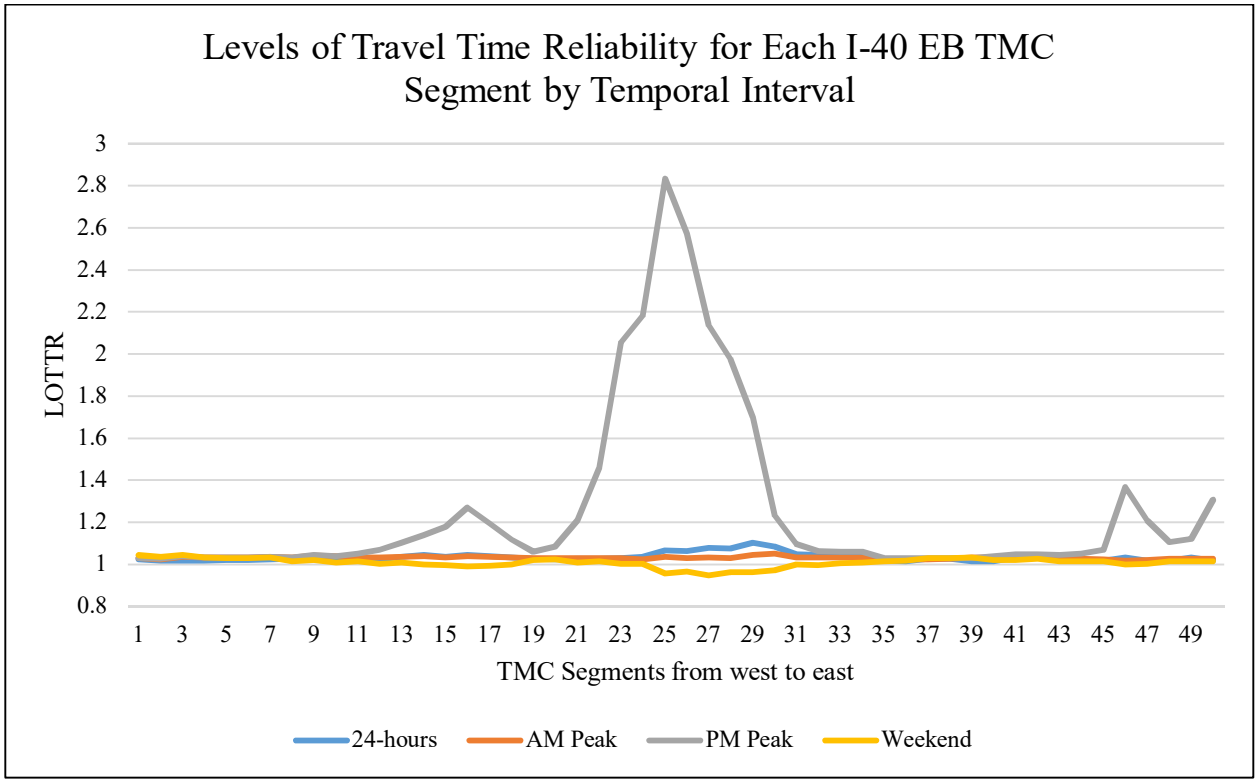

Figure 5: Plot of LOTTR for each I-40 EB TMC by temporal analysis period.

Of 50 TMC segments along I-40 EB within the study area, I25-04870, 125-04857, and 125N04836 were highlighted in more detail, information on other TMC segments can be found in **Appendix B**. 125-04870 is a three-lane segment adjacent to the NC 751 interchange in western Durham County at exit 274, 125-04857 has three through lanes and is located near the Cary Towne Blvd / Farm Gate Rd. at exit 291. 125N04836, a two-lane segment, is located at the US 70 Business interchange in southwestern Wake County. **Table 13** contains summary data for each of the highlighted TMC segments.

Table 13: Description of selected TMC segments along I-40 EB.

	125-04870	125-04857	125N04836
Number of Lanes	3	3	2
Length (mi)	0.9495	0.3782	0.7516
Nearest Interchange	NC 751	Cary Towne Blvd.	US 70 Business
County	Durham	Wake	Wake
Number of Invalid Time/Space Travel Rates	1,721	1,682	1,684
Median Travel Rate (min/mi)	0.9193	1.0086	0.9592
Buffer Time Index (All)	0.0611	0.3303	0.1346
BTI Rank (All)	48	7	23
LOTTR (All)	1.017	1.085	1.016
LOTTR Rank (All)	46	2	47
Rank Difference	2	5	24

Table 14 includes the speed distribution for 125-04870, 125-04857, 125N04836, and all I-40 EB TMC segments. Distributions were generated for all temporal analysis periods and speeds are in miles per hour. Ranges are inclusive of the lower end of the range. 125-04857 reported significant variation, especially during the PM peak period. Only about 30% of reported travel speeds were greater than 60 mph during that temporal analysis period. 125-04870 had the highest number of reported travel speeds greater than 60 mph for all temporal analysis periods, likely to the lane addition just upstream of this TMC segment. In general, more variation was observed during the PM peak period than the AM peak period.

Table 14: Travel speed distributions for the entire facility and three selected TMC segments over all temporal analysis periods. Speeds are in miles per hour.

24-hour (all times)	125-04870	125-04857	125N04836	Facility
60+	97.51%	72.29%	93.94%	92.19%
55 - 60	1.53%	15.09%	2.07%	3.82%
45 - 55	0.43%	8.46%	1.09%	1.57%
40 - 45	0.10%	1.55%	0.47%	0.42%
30 – 40	0.15%	1.04%	1.12%	0.73%
15 - 30	0.16%	1.17%	1.12%	0.97%
0 - 15	0.12%	0.41%	0.20%	0.29%
AM Peak Period	**125-04870**	**125-04857**	**125N04836**	**Facility**
60+	96.73%	78.88%	98.75%	95.37%
55 - 60	1.20%	15.68%	1.03%	2.85%
45 - 55	0.43%	3.51%	0.17%	0.89%
40 - 45	0.19%	0.46%	0.02%	0.19%
30 – 40	0.39%	0.62%	0.01%	0.26%
15 - 30	0.63%	0.57%	0.01%	0.28%
0 - 15	0.43%	0.28%	0.02%	0.15%
PM Peak Period	**125-04870**	**125-04857**	**125N04836**	**Facility**
60+	96.17%	29.75%	72.77%	77.85%
55 - 60	2.29%	25.57%	4.63%	6.59%
45 - 55	0.63%	32.68%	4.81%	4.62%
40 - 45	0.11%	7.26%	2.78%	1.63%
30 – 40	0.19%	3.07%	6.76%	3.33%
15 - 30	0.32%	1.40%	7.06%	4.90%
0 - 15	0.29%	0.27%	1.19%	1.08%
Weekday Off Peak	**125-04870**	**125-04857**	**125N04836**	**Facility**
60+	97.56%	83.02%	96.65%	94.97%
55 - 60	1.45%	9.55%	2.15%	2.99%
45 - 55	0.56%	4.96%	0.61%	1.02%
40 - 45	0.15%	0.50%	0.12%	0.26%
30 – 40	0.15%	0.53%	0.22%	0.32%
15 - 30	0.07%	1.17%	0.21%	0.30%
0 - 15	0.06%	0.27%	0.04%	0.14%

Table 14 (Continued).

Weekend (Sat. / Sun.)	125-04870	125-04857	125N04836	Facility
60+	97.33%	81.90%	96.81%	94.54%
55 - 60	1.54%	10.46%	1.91%	3.17%
45 - 55	0.64%	5.15%	0.72%	1.17%
40 - 45	0.15%	0.57%	0.11%	0.29%
30 – 40	0.20%	0.67%	0.27%	0.39%
15 - 30	0.09%	1.03%	0.16%	0.31%
0 - 15	0.04%	0.22%	0.03%	0.12%

Table 15 includes key percentiles of travel rates based on the distribution of all observations regardless of the occurrence of an external event, all observations without an external event flag, and all observations with at least one external event flag reported. These distributions were used to generate CDF distribution plots for each TMC and condition.

Table 15: Key travel rate percentiles for selected I-40 EB TMC segments over all time intervals.

	Travel Rates in Min/Mi		
Percentile	**125-04870**	**125-04857**	**125N04836**
All Observations			
0.05	0.8247	0.8824	0.8404
0.25	0.8722	0.9231	0.8859
0.502	0.9099	0.9455	0.9230
0.75	0.9231	1.0000	0.9315
0.80	0.9319	1.0239	0.9381
0.95	0.9807	1.3274	1.0479
Unflagged			
0.05	0.8385	0.8799	0.8428
0.25	0.8824	0.9231	0.8885
0.50	0.9165	0.9434	0.9228
0.75	0.9234	1.0	0.9330
0.80	0.9316	1.0169	0.9404
0.95	0.9725	1.2550	1.0471

Table 15 (Continued).

Flagged	125-04870	125-04857	125N04836
0.05	0.8386	0.8798	0.8383
0.25	0.8893	0.9231	0.8899
0.50	0.9231	0.9375	0.9231
0.75	0.9257	0.9836	0.9331
0.80	0.9351	0.9917	0.9375
0.95	0.9992	1.1538	1.0343

Figure 6 shows the CDF curves for all observations regardless of external event flag, **Figure 7** displays CDF curves for observations without any external event flags, and **Figure 8** includes the CDF curves for observations with any external event flag. Among the three selected TMC segments, 125-04857 experienced the worse reliability based on the general slope of the CDF. The upper end of the distribution is spread over a wider range of travel rates; thus, the user could experience a wider range of travel times. For these TMC segments, external events may not significantly influence reliability based on a visual comparison of observation type distributions.

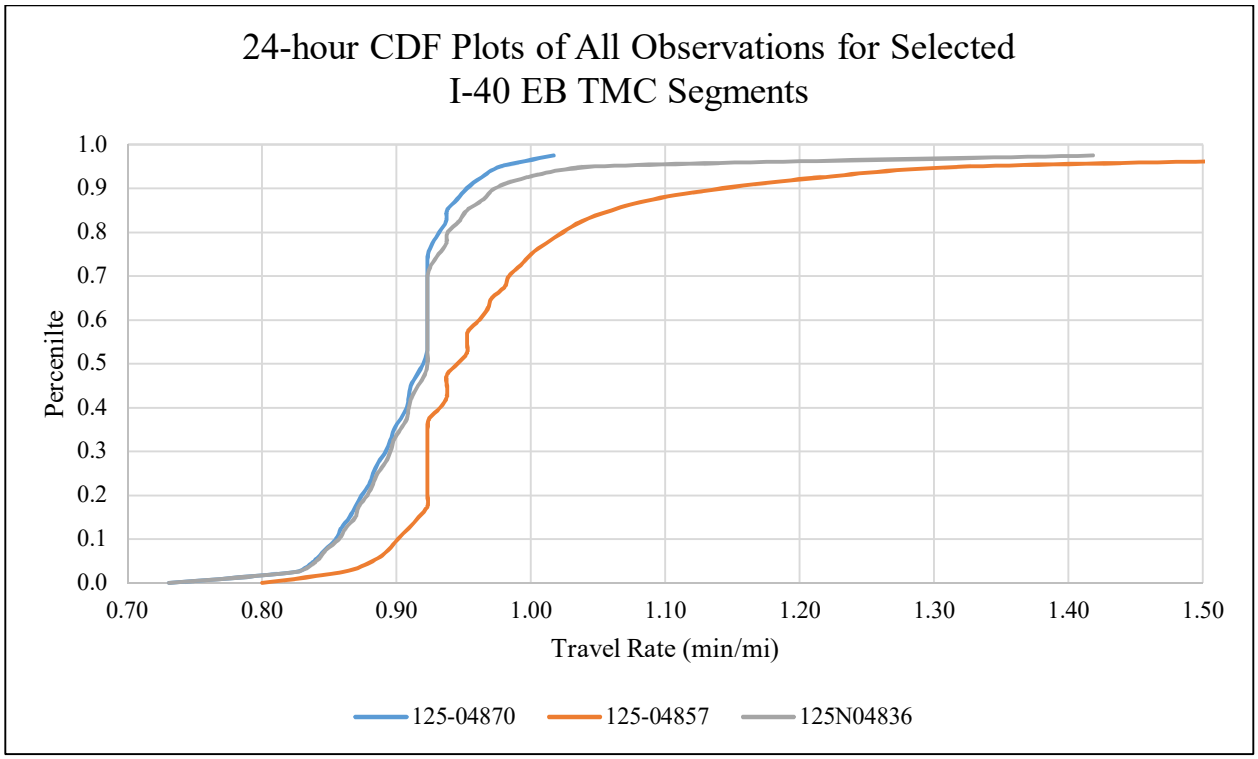

Figure 6: CDF plots for all observations regardless of external events for selected I-40 EB TMC segments.

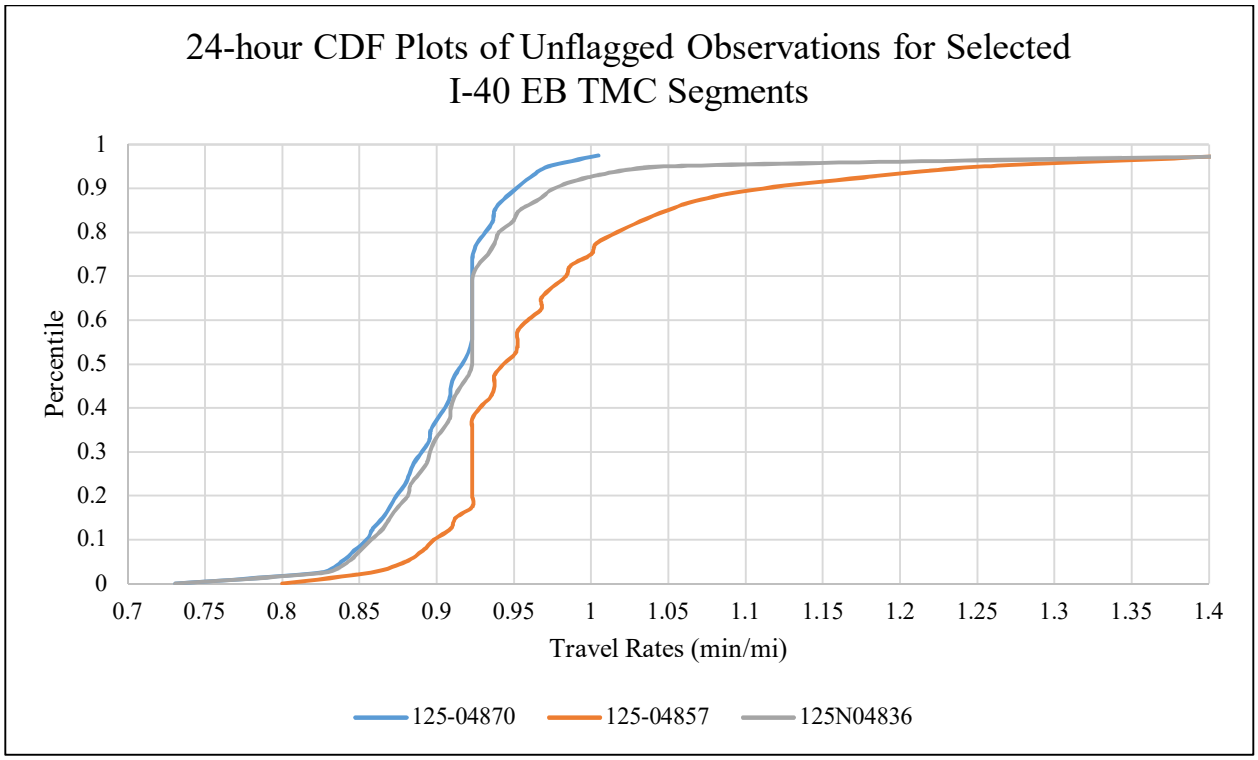

Figure 7: CDF plots of normal travel rates for selected I-40 EB TMC segments over all time periods.

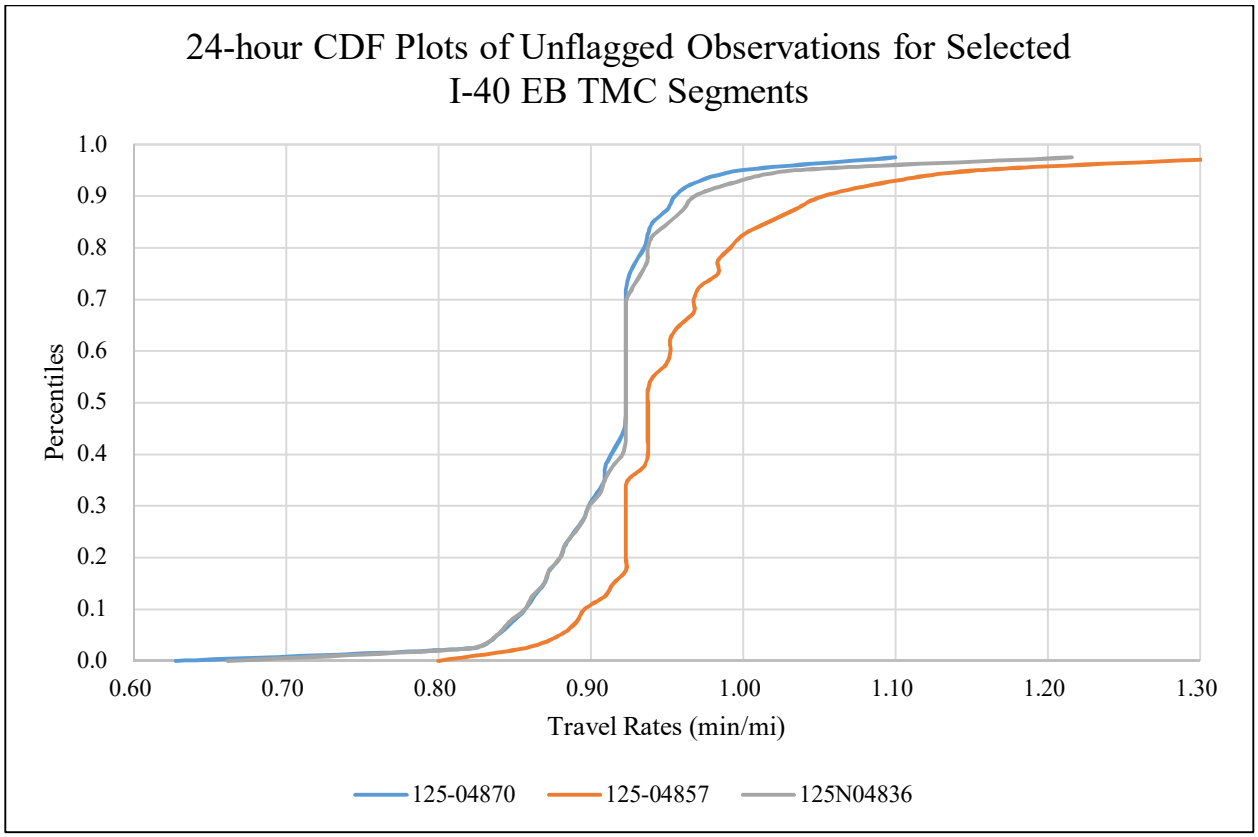

Figure 8: CDF plots of abnormal travel observations for selected I-40 EB TMC Segments.

Based on the facility-wide LOTTR analysis, the PM peak period was selected for more in -depth analysis. **Table 16** shows key percentiles for each selected TMC during the PM peak period for all observations regardless of external event flag, all observations without an external flag, and all observations with at least one external flag. The highest travel rates were observed in 125N04836 near the eastern end of the facility.

Table 16: Key percentiles for selected TMC segments during the PM peak hour.

	Travel Rates in Min/Mi		
Percentile	**125-04870**	**125-04857**	**125N04836**
All Observations			
0.05	0.8239	0.9091	0.8316
0.25	0.8640	0.9836	0.8728
0.50	0.8954	1.0655	0.9166
0.75	0.9231	1.2148	1.0331
0.80	0.9319	1.2521	1.2001
0.95	0.9832	1.4898	2.4032
Unflagged			
0.05	0.8242	0.8915	0.8317
0.25	0.8684	0.9585	0.8761
0.50	0.9032	1.0144	0.9187
0.75	0.9285	1.1507	0.9653
0.80	0.9368	1.2000	1.0043
0.95	0.9815	1.4296	2.1106
Flagged			
0.05	0.8279	0.9012	0.8354
0.25	0.8702	0.9524	0.8847
0.50	0.9075	1.0169	0.9231
0.75	0.9358	1.1690	1.0230
0.80	0.9425	1.2455	1.1144
0.95	1.0809	1.5084	2.8553

Figure 9 shows the CDF plots for all PM peak observations regardless of the occurrence of external events, **Figure 10** depicts the CDFs for all PM peak observations without an external event, and **Figure 11** includes the CDFs for all PM peak observations with at least one external event flag. These figures indicate the travel rate profiles associated with higher LOTTR values.

125-04857 has the highest travel rates of the three selected TMC segments until the 80th percentile, at which point 125N04836 begins to report the highest travel rates for percentiles above the 80th. Graphically, reliability is identified by the slope of the CDF, which is generally follows a "S" shape. The flatter the curve, the lower the reliability because the user experiences

as wider range of possible travel rates. This example demonstrates how different reliability metrics can produce different conclusions.

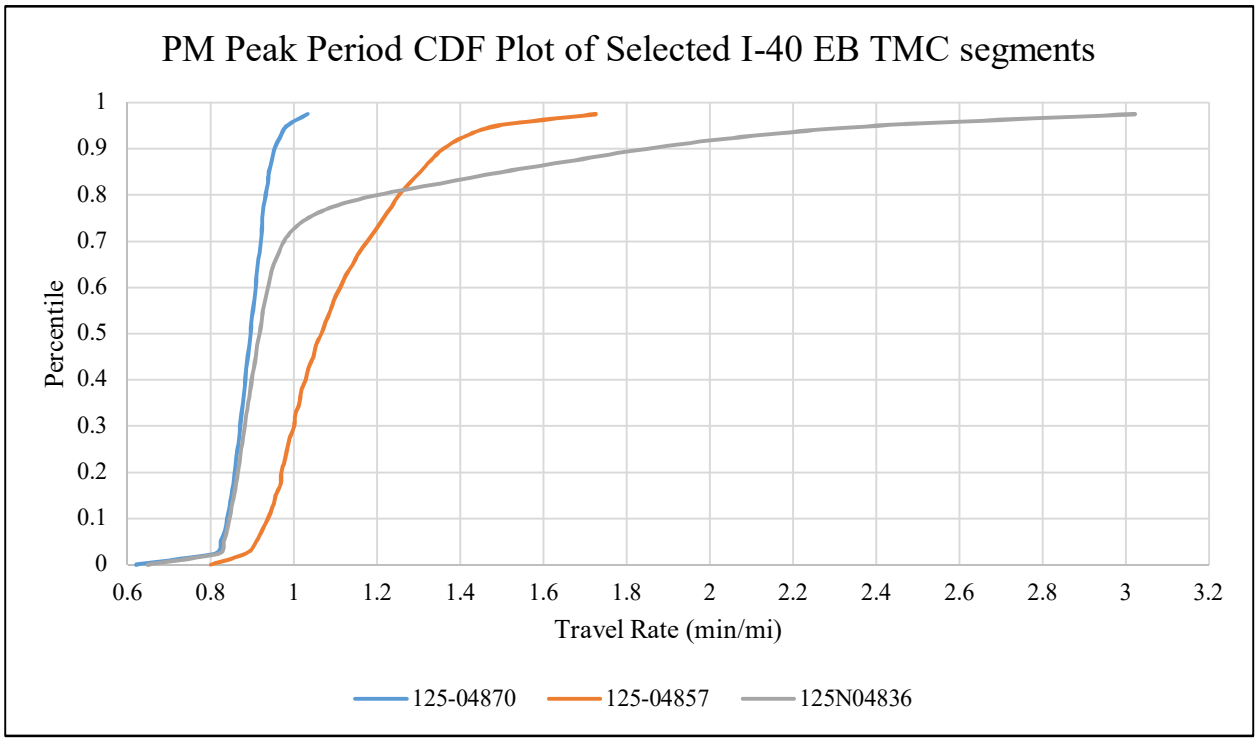

Figure 9: PM Peak Period Travel Rate CDF Plots for Selected I-40 EB TMC Segments.

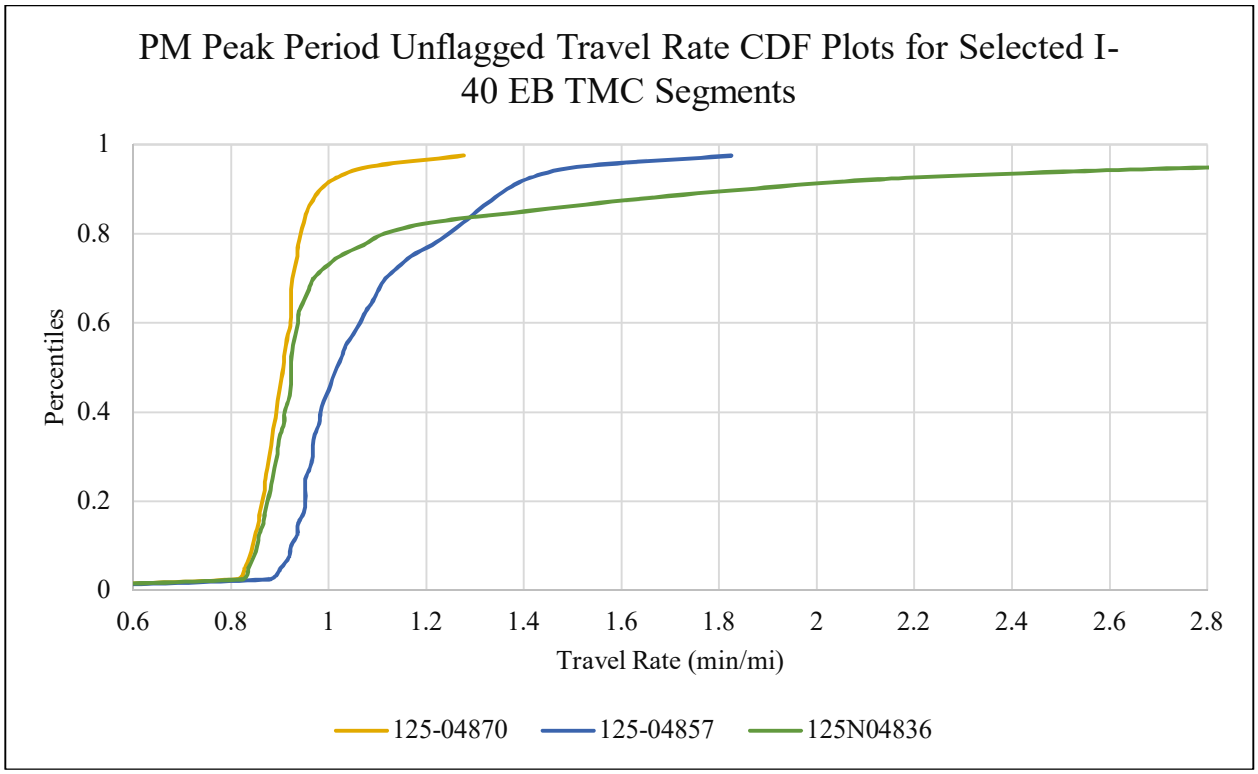

Figure 10: PM Peak Period Unflagged Travel Rate CDF Plots for Selected I-40 EB TMC Segments.

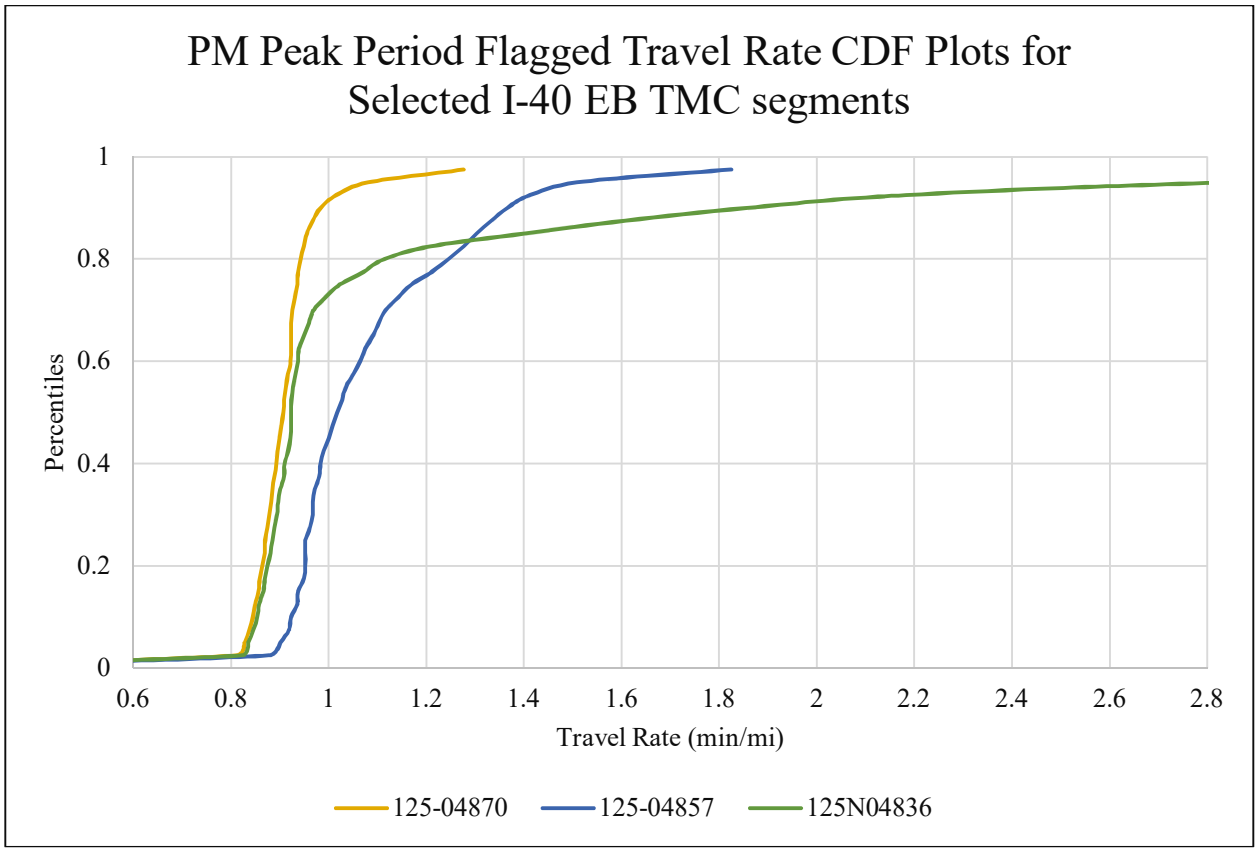

Figure 11: PM Peak Period Flagged Travel Rate CDF Plots for Selected I-40 EB TMC segments.

Table 17 includes the frequency of external event combinations for the three selected I-40 EB TMC segments. Unplanned and planned incidents are differentiated in the frequency table but grouped together in the external event travel rate distributions due to the limited sample size.

Table 18 includes the number of observations with abnormally high flow rates and/or an abnormal travel rate outside two standard deviations from the mean of unflagged observations. The 95th percentile of the 95th percentile values tabulated for each TMC was 1796 pc/hr/ln and used as the approximated observed capacity for the facility direction. 1.2 min/mile was the critical travel rate and corresponds to 50 miles per hour. If the reported flow rate was less than

1796 pc/hr/ln and travel rate greater than 1.2 min/mi, the flow flag was applied. If the flow rate was greater than 2000 pc/hr/ln, the flow flag was also applied.

Table 17: Temporal frequency of external events for selected I-40 EB TMC Segments.

	125-04870	125-04857	125N04836
Temporal intervals with an active unplanned incident			
All Intervals	57	40	63
AM Peak Period	32	9	0
PM Peak Period	16	18	40
Weekends	0	0	4
Temporal intervals with an active planned incident			
All Intervals	181	0	0
AM Peak Period	0	0	0
PM Peak Period	0	0	0
Weekends	181	0	0
Temporal intervals with an active weather event			
All Intervals	10751	11,645	10,658
AM Peak Period	0	122	99
PM Peak Period	0	2	2
Weekends	3415	3800	3545

Table 18: Temporal frequency of abnormal flow and/or travel rates for selected I-40 EB TMC segments.

	125-04870	125-04857	125N04836
All temporal intervals with an abnormal flow rate			
All Intervals	765	7487	3258
AM Peak Period	225	338	13
PM Peak Period	211	4154	2868
Weekends	226	1147	255
All temporal intervals with abnormal flow and travel rates			
All Intervals	516	2211	1773
AM Peak Period	196	147	3
PM Peak Period	132	453	1627
Weekends	126	489	98

Table 18 (Continued).

All temporal intervals with only an abnormal travel rate			
All Intervals	1908	2112	2212
AM Peak Period	207	233	159
PM Peak Period	297	286	644
Weekends	798	845	775
Unflagged temporal intervals with abnormal flow and travel rates			
All Intervals	373	2123	1646
AM Peak Period	144	139	3
PM Peak Period	112	423	1510
Weekends	72	472	88

Due to the use of multiple data sources and measures for the weather flag, the weather flag was applied to significantly more time/space observations than either the incidents or flow flag. Observations without an external event flag or abnormal flow flag that report an abnormal travel rate are anomalies for which a diagnosis cannot be reached using the information collected by the monitoring system. For I-40 EB, no such observations were reported.

Table 19 shows key flow rate percentiles for each selected TMC over all temporal intervals. The 50th percentile travel rate for all observations was multiplied by 1.5 to determine the travel rate above which travel time is unreliable as determined by LOTTR. For TMC segments 125-04870, 125-04857, and 125N04836, the abnormal flow travel rate percentiles closest to the highest possible reliable rate were 0.35, 0.575, and 0.3 respectively. This analysis suggest that travel time reliability is poor during periods of high congestion. The lack of observations with an abnormal travel rate but no other flags may indicate that high travel rates without an active incident and/or weather event are the result of congestion.

Table 19: Key travel rate percentiles for abnormal flow observations during all temporal intervals for selected I-40 EB TMC segments.

	125-04870	125-04857	125N04836
0.05	0.9056	1.2058	0.8859
0.25	1.2956	1.2661	1.3035
0.5	1.6216	1.3645	1.6954
0.75	2.6467	1.8192	2.3278
0.80	3.1529	2.1225	2.5553
0.95	7.4567	4.2360	4.3136

Table 20 shows key percentiles for incident only, weather only, and incident plus weather flagged conditions over all temporal intervals for the selected TMC segment. The sample size was not sufficient to break down these conditions by temporal analysis period. **Figure 12** shows the CDF plots for each combination of external event flags for 125-04857. This was the only TMC segment with enough samples of weather plus incident observations.

Table 20: Key Percentiles for Incident Only, Weather Only, and Incident + Weather Observations.

Incidents Only	**125-04870**	**125-04857**	**125N04836**
0.05	0.8333	1.0909	0.8783
0.25	0.9002	1.3563	1.1816
0.5	0.9237	2.1033	1.9939
0.75	1.2706	3.5547	4.6745
0.80	2.2383	3.6571	5.0454
0.95	4.4497	9.9396	7.0008
Weather Only	**125-04870**	**125-04857**	**125N04836**
0.05	0.8416	0.8792	0.8385
0.25	0.8945	0.9231	0.8899
0.5	0.9231	0.9375	0.9231
0.75	0.9264	0.9809	0.9319
0.80	0.9369	0.9901	0.9375
0.95	0.9985	1.1450	1.0251

Table 20 (Continued).

Incident + Weather	125-04870	125-04857	125N04836
0.05	N/A	0.4381	N/A
0.25	N/A	2.1903	N/A
0.5	N/A	4.3807	N/A
0.75	N/A	6.5710	N/A
0.80	N/A	7.0090	N/A
0.95	N/A	8.3232	N/A

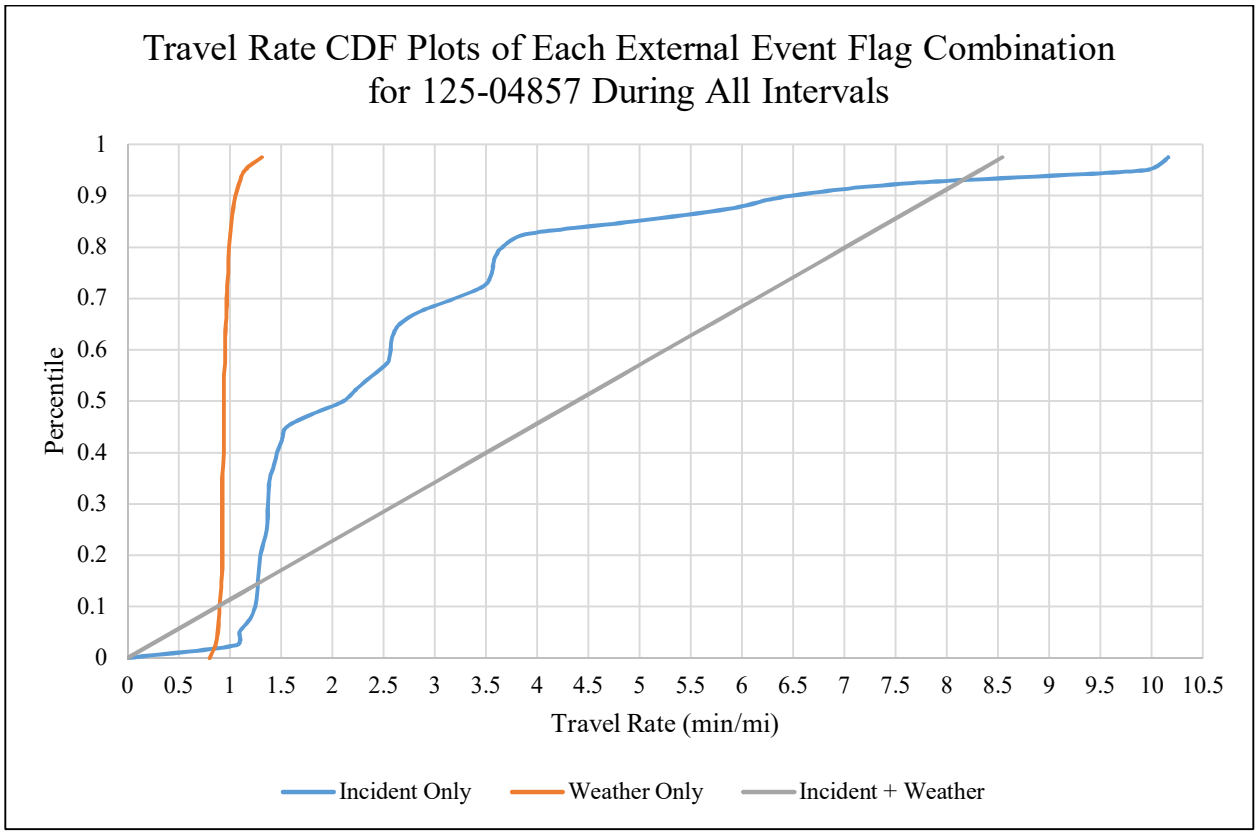

Figure 12: Travel Rate CDF plots for each external event(s) combination for the 125-04857 TMC Segment During All Temporal Intervals.

The travel rate distributions corresponding to each combination of external event flags confirm the conclusion that incidents have a greater impact on travel rates than weather events. The combined distribution indicates that the impacts of each type of external event are generally additive in that the combined distribution was flatter than the incident only distribution.

I-40 Westbound Facility Analysis

Along I-40 WB, 51 TMC segments were located in the study region. Five TMC segments reported LOTTR higher than 1.5 during the PM peak period. None of the other temporal analysis periods reported a TMC with a LOTTR above 1.5. Like the eastbound direction, the largest average and maximum spread between BTI and LOTTR rank was observed during the weekend analysis period. **Table 21** includes facility-level reliability data for I-40 WB. Different TMC segments had the highest BTI and LOTT for each temporal analysis period.

Table 21: I-40 WB BTI and LOTTR data.

	24-hours	AM Peak	PM Peak	Weekends
TMC w/ highest BTI	125P04856	125P04856	125P04872	125P04858
TMC w/ highest LOTTR	125P04858	125P04966	125+04966	125P04860
Average BTI	0.203	0.552	0.273	0.083
Max BTI	1.234	4.23	2.616	0.407
Average LOTTR	1.029	1.211	1.042	1.025
Max LOTTR	1.069	3.435	1.095	1.040
Average Rank Spread	7.118	3.588	4.549	11.373
Max Rank Spread	24	11	20	40
Number of TMC segments w/ LOTTR > 1.5	0	5	0	0

Figure 13 shows a plot of the LOTTR for all I-40 WB TMC segments for each temporal analysis period. Per FHWA, LOTTR values greater than 1.5 are deemed unreliable.

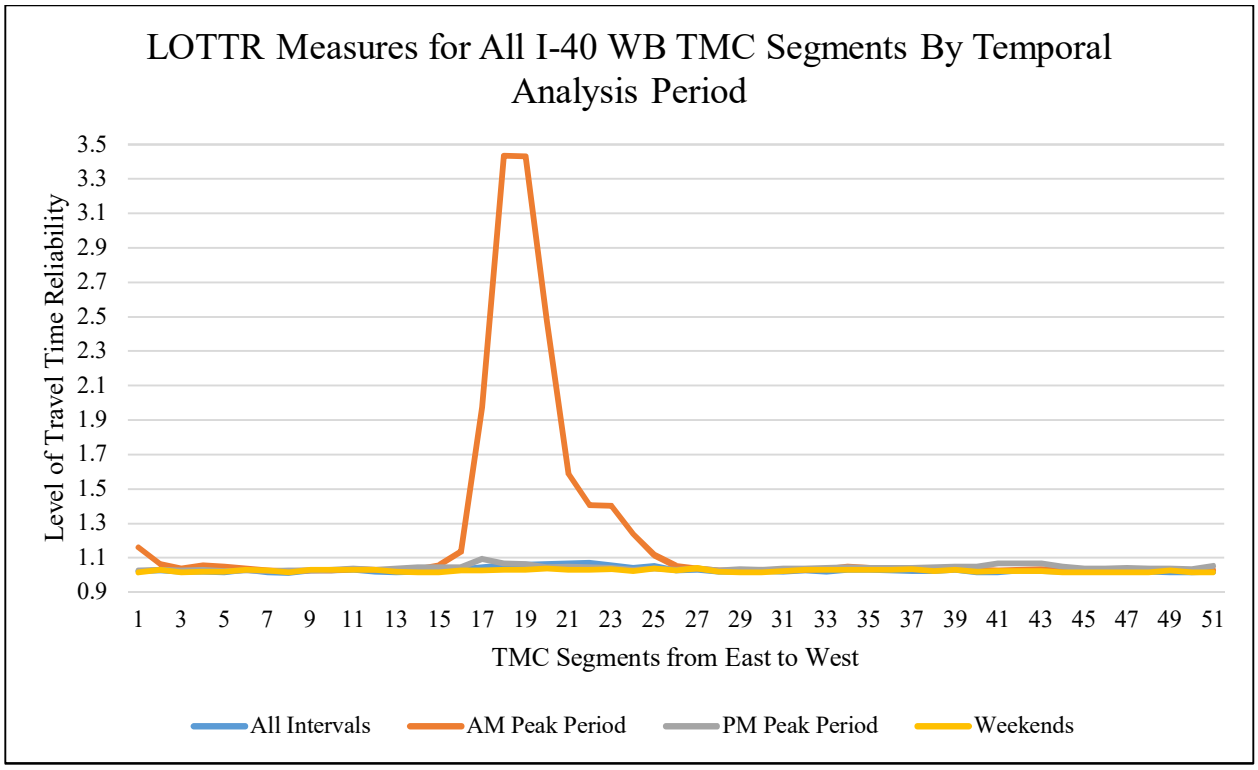

Figure 13: I-40 WB LOTTR for each TMC by temporal analysis period.

Detailed analysis for three TMC segments selected along I-40 WB within the study region is included in this section. Data on the other TMC segments can be found in **Appendix C**. 125+04837 is a three-lane segment located near Jones Sausage Rd. in southwestern Wake County at Exit 303. 125+04857 has a three-lane cross-section and is located adjacent to the Cary Town Blvd. and Farm Gate Rd. interchange at Exit 291. 125P04871, a three-lane segment, is located near the NC 54 interchange at Exit 273 near the Durham/Orange county line. **Table 22** includes summary metrics and details for the selected TMC segments.

Table 22: Description of selected TMC segments for I-40 WB.

	125+04837	125+04857	125P04871
Number of Lanes	3	3	2
Length (mi)	1.3324	0.6841	0.5385
Nearest Interchange	NC 54	Cary Towne Blvd.	Jones Sausage Rd.
County	Durham	Wake	Wake
Number of Invalid Time/Space Travel Rates	1,694	1,683	1,682
Mean Travel Rate (min/mi)	0.9025	1.0758	0.9190
Buffer Time Index (All)	0.077	1.232	0.0752
BTI Rank (All)	38	2	43
LOTTR (All)	1.020	1.064	1.017
LOTTR Rank (All)	33	3	44
Rank Difference	5	1	1

Table 23 lists the speed distributions for the three TMC segments highlighted and facility wide for all temporal analysis periods. Facility wide, the AM peak period experienced greater travel time variation, however, higher variation was observed along 125P04871 during the PM peak period. 125+04857 was the most heavily impacted of the highlighted segments during the AM peak period, when only 40% of temporal intervals had average speeds above 60 miles per hour.

Table 23: Travel speed distributions for the entire and three selected TMC segments over all temporal analysis periods for I-40 WB.

24-hour (all times)	125+04837	125+04857	125P04871	Facility
60+	97.58%	83.91%	96.69%	93.87%
55 - 60	1.32%	6.45%	2.18%	3.21%
45 - 55	0.56%	2.24%	0.60%	1.19%
40 - 45	0.17%	0.71%	0.12%	0.33%
30 – 40	0.24%	1.83%	0.16%	0.49%
15 - 30	0.11%	4.19%	0.19%	0.65%
0 - 15	0.03%	0.67%	0.06%	0.26%
AM Peak Period	**125+04837**	**125+04857**	**125P04871**	**Facility**
60+	90.68%	39.90%	96.82%	86.56%
55 - 60	2.91%	9.91%	2.36%	4.24%
45 - 55	2.83%	5.15%	0.64%	2.93%
40 - 45	0.95%	2.24%	0.09%	1.02%
30 – 40	1.57%	10.26%	0.08%	1.67%
15 - 30	0.85%	29.27%	0.01%	2.64%
0 - 15	0.21%	3.27%	0.00%	0.94%
PM Peak Period	**125+04837**	**125+04857**	**125P04871**	**Facility**
60+	99.32%	85.97%	93.71%	91.67%
55 - 60	0.54%	8.03%	3.13%	3.88%
45 - 55	0.09%	2.39%	1.33%	1.71%
40 - 45	0.02%	0.71%	0.23%	0.47%
30 – 40	0.01%	1.09%	0.41%	0.83%
15 - 30	0.01%	1.33%	0.90%	1.04%
0 - 15	0.01%	0.48%	0.29%	0.40%
Weekday Off Peak	**125+04837**	**125+04857**	**125P04871**	**Facility**
60+	98.64%	89.40%	97.65%	95.66%
55 - 60	1.17%	6.46%	1.83%	2.95%
45 - 55	0.15%	1.91%	0.28%	0.72%
40 - 45	0.02%	0.39%	0.04%	0.12%
30 – 40	0.01%	0.70%	0.09%	0.18%
15 - 30	0.01%	0.84%	0.08%	0.24%
0 - 15	0.01%	0.31%	0.02%	0.13%

Table 23 (Continued).

Weekend (Sat. / Sun.)	125+04837	125+04857	125P04871	Facility
60+	97.76%	91.92%	96.49%	95.08%
55 - 60	1.36%	4.50%	2.28%	2.94%
45 - 55	0.53%	1.56%	0.71%	0.99%
40 - 45	0.16%	0.51%	0.21%	0.29%
30 – 40	0.17%	0.57%	0.19%	0.32%
15 - 30	0.02%	0.65%	0.07%	0.26%
0 - 15	0.00%	0.28%	0.04%	0.12%

Table 24 lists key percentile values each highlighted TMC for all, unflagged, and flagged observations. 125+04857 experienced the highest mean travel rate and standard deviation, which was approximately half of the mean travel rate.

Table 24: Key travel rate percentiles for selected I-40 EB TMC segments over all time intervals.

	Travel Rates in Min/Mi		
Percentile	**125+04837**	**125+04857**	**125P04871**
All Observations			
0.05	0.8311	0.8701	0.8383
0.25	0.8703	0.9229	0.8853
0.5	0.9079	0.9284	0.9231
0.75	0.9231	0.9677	0.9375
0.80	0.9231	0.9836	0.9388
0.95	0.9746	2.0631	0.9925
Unflagged Observations			
0.05	0.8296	0.8677	0.8383
0.25	0.8696	0.9171	0.8850
0.5	0.9046	0.9244	0.9231
0.75	0.9231	0.9613	0.9375
0.80	0.9231	0.9724	0.9389
0.95	0.9655	1.6528	0.9868

Table 24 (Continued).

Flagged Observations	125+04837	125+04857	125P04871
0.05	0.8368	0.8779	0.8451
0.25	0.8853	0.9231	0.8983
0.5	0.9231	0.9250	0.9231
0.75	0.9242	0.9677	0.9375
0.80	0.9356	0.9842	0.9434
0.95	1.0526	2.2408	1.0095

Figure 14 shows CDF plots of all observations over all temporal intervals for the three selected TMC segments. **Figure 15** displays CDF plots of all observations lacking weather and/or incident flags over all temporal intervals for selected TMC segment. **Figure 16** shows CDF plots for all observations with an incident and/or weather flag during all temporal observations.

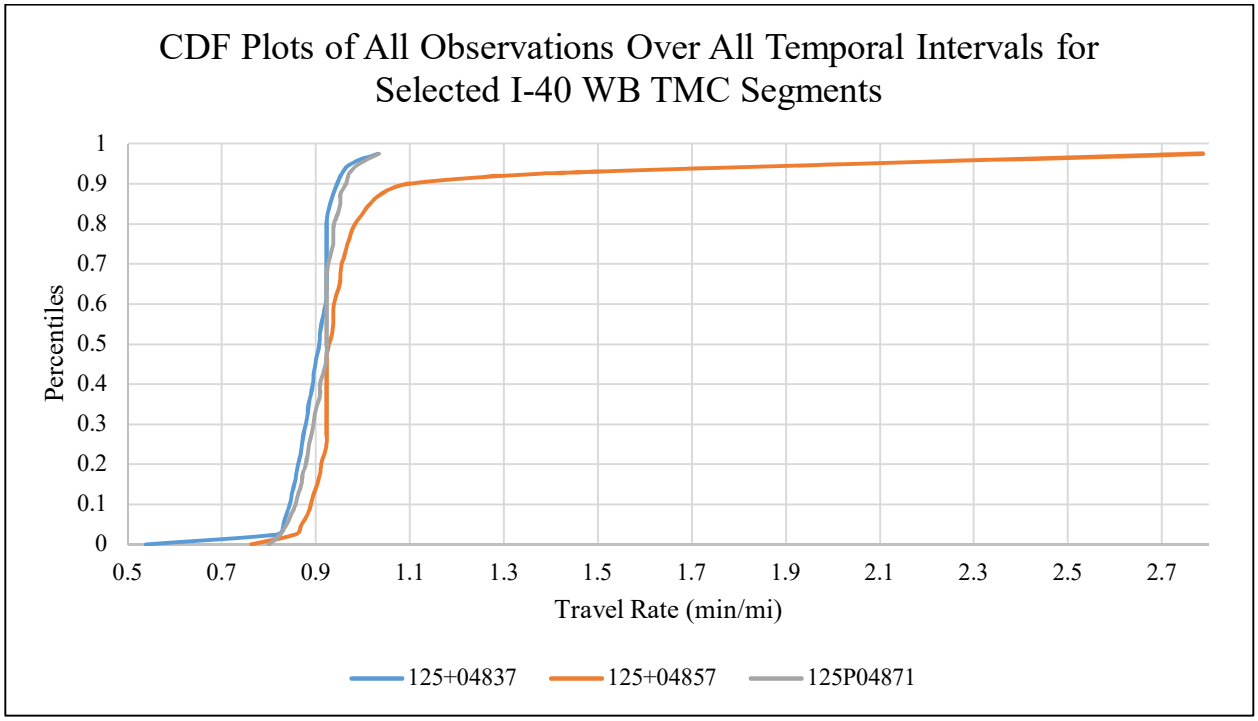

Figure 14: CDF plots for all observations during all temporal intervals for selected I-40 WB TMC segments.

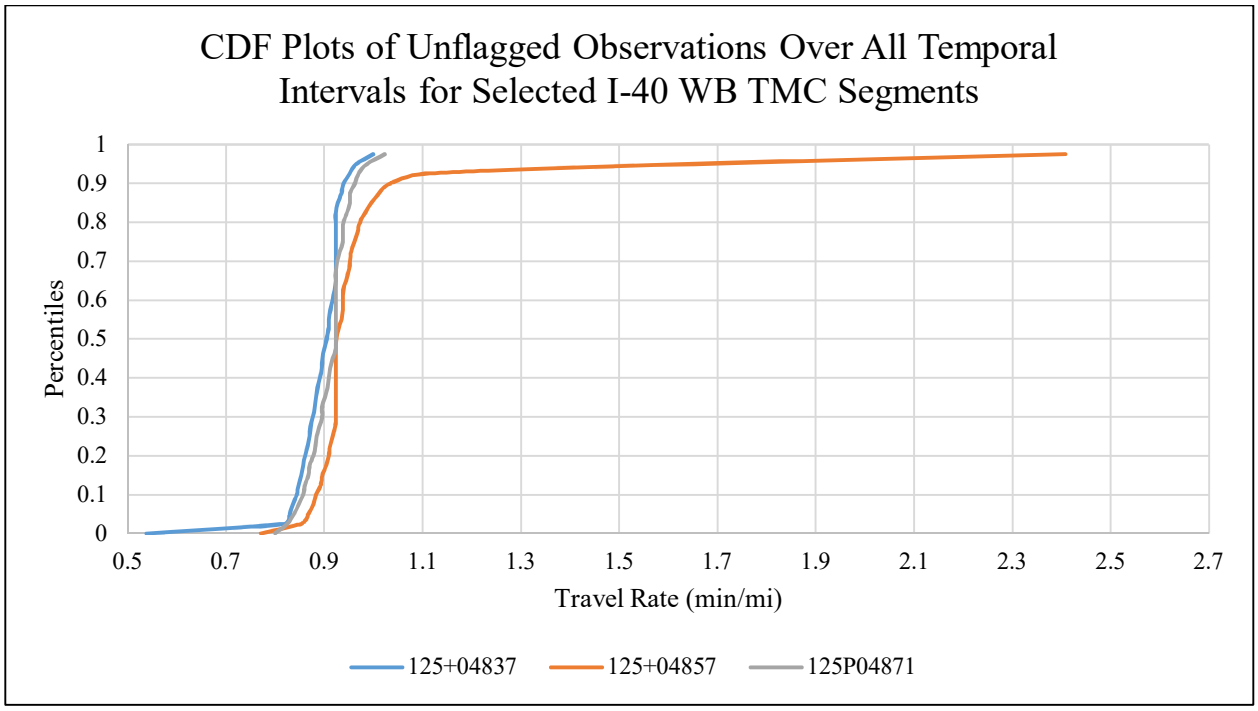

Figure 15: CDF plots of normal travel rates for selected I-40 WB TMC segments for all temporal intervals.

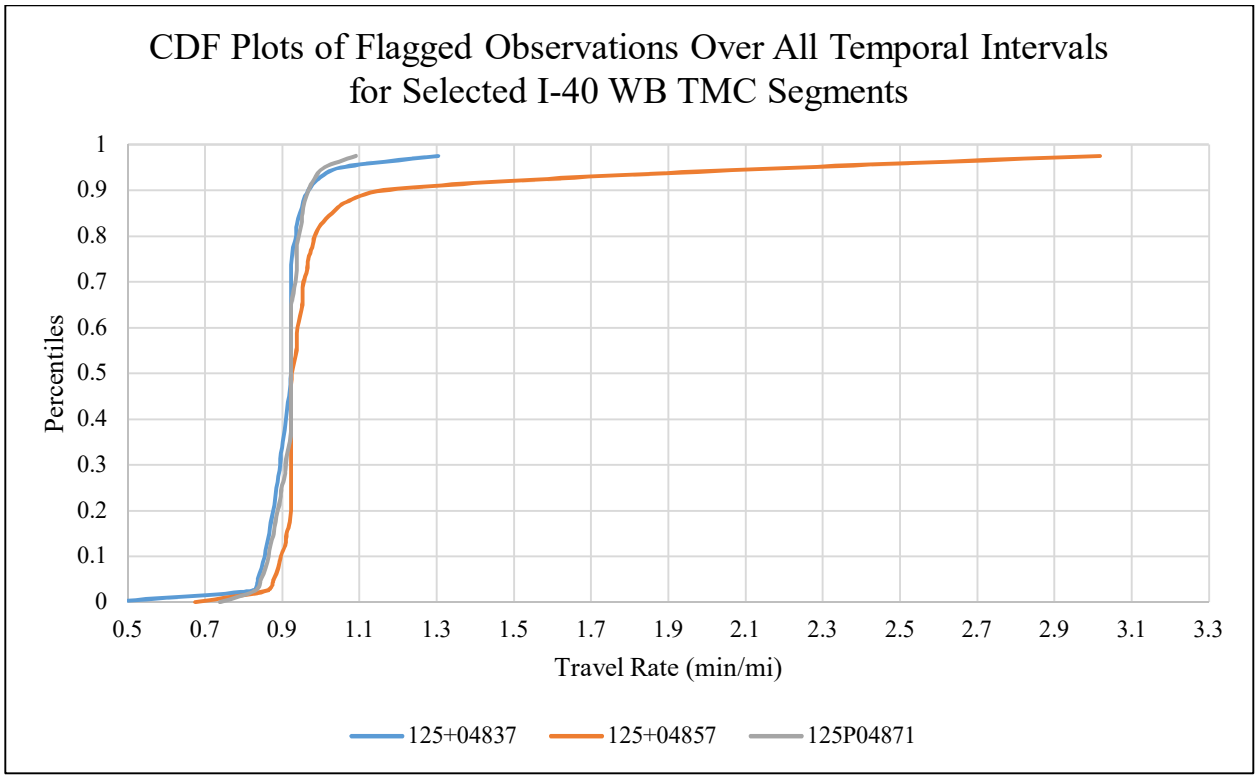

Figure 16: CDF plots of abnormal travel rates for selected I-40 WB TMC segments for all temporal intervals.

Based on the previously noted speed distribution data for I-40 WB, variability was greater during the AM peak period. Therefore, this temporal analysis period was selected for additional summary. **Table 25** indicates major percentile values for the AM peak period. **Figure 17** depicts CDF plots for all observations during AM peak period intervals for selected I-40 WB TMC segments. **Figure 18** displays CDF plots for normal observations during the AM peak period. **Figure 19** shows the CDF plots for abnormal observations during the AM peak period. For normal observations 125+04837, 125+04857, and 125P04871 reported the 17th, 4th, and 37th highest buffer time index during the AM peak period. 125P04856, located upstream of 125+04857, had the highest buffer time index during the analysis period. Among abnormal conditions the TMC segments experienced the 12th, 3rd, and 43rd highest buffer time indices out of 51 TMC segments along I-40 WB.

Table 25: Key travel rate percentiles for observations during AM peak period temporal intervals for selected I-40 WB TMC segments.

	Travel Rates in Min/Mi		
Percentile	**125+04837**	**125+04857**	**125P04871**
All Observations			
0.05	0.8333	0.8839	0.8287
0.25	0.8629	0.9514	0.8676
0.5	0.8861	1.0950	0.8957
0.75	0.9172	2.2542	0.9261
0.80	0.9264	2.4330	0.9374
0.95	1.1880	3.5378	0.9832
Unflagged Observations			
0.05	0.8324	0.8781	0.8310
0.25	0.8642	0.9293	0.8722
0.5	0.8908	0.9815	0.9065
0.75	0.9231	1.9433	0.9375
0.80	0.9275	2.1686	0.9375
0.95	1.0290	3.1587	0.9770
Flagged Observations			
0.05	0.8346	0.0.8683	0.8333
0.25	0.8734	0.9189	0.8824
0.5	0.9038	0.9522	0.9123
0.75	0.9375	1.1970	0.9375
0.80	0.9492	1.7552	0.9434
0.95	1.5096	3.5729	1.0120

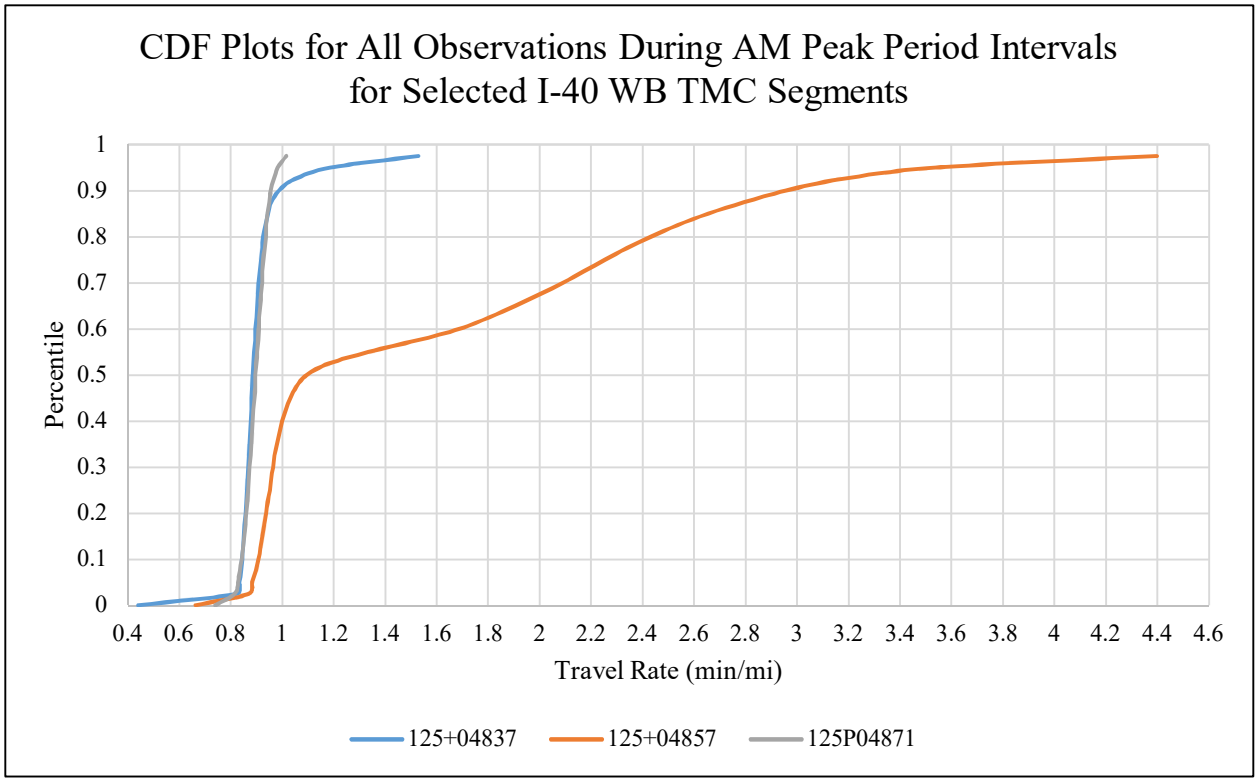

Figure 17: CDF plots for all observations during AM Peak Period intervals for selected I-40 WB TMC Segments.

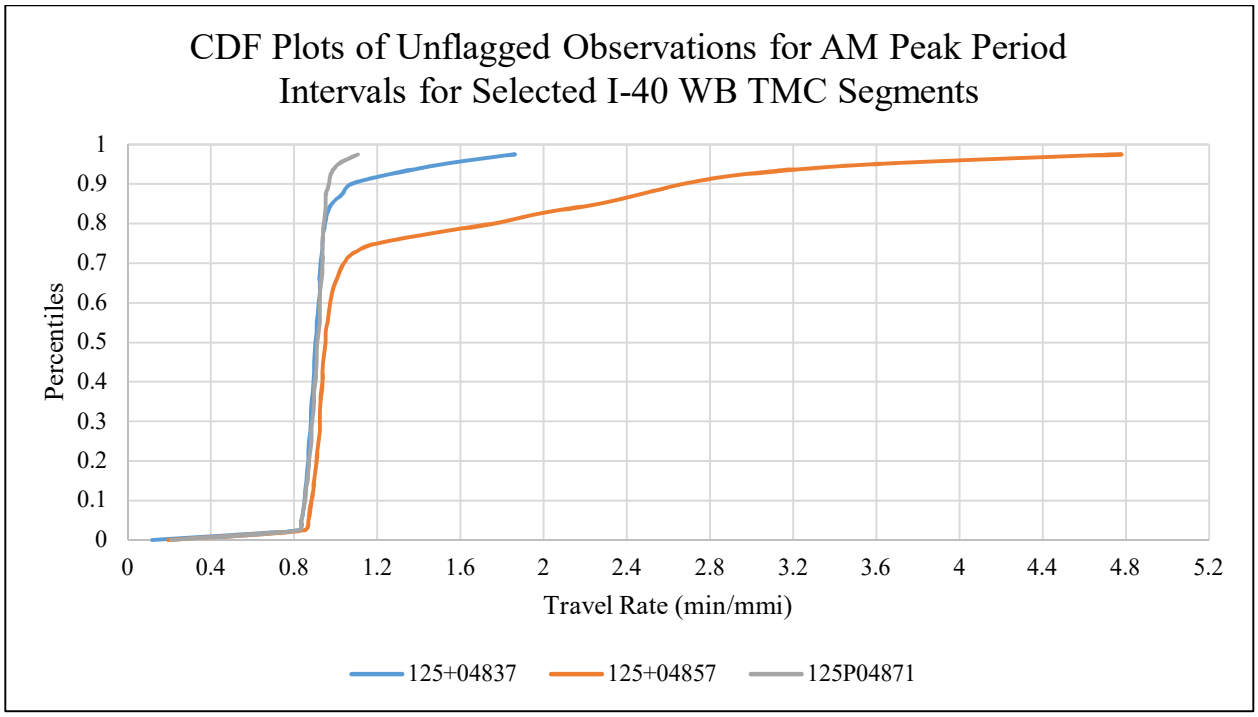

Figure 18: CDF plots of normal travel rates for selected I-40 WB TMC segments during the AM peak period.

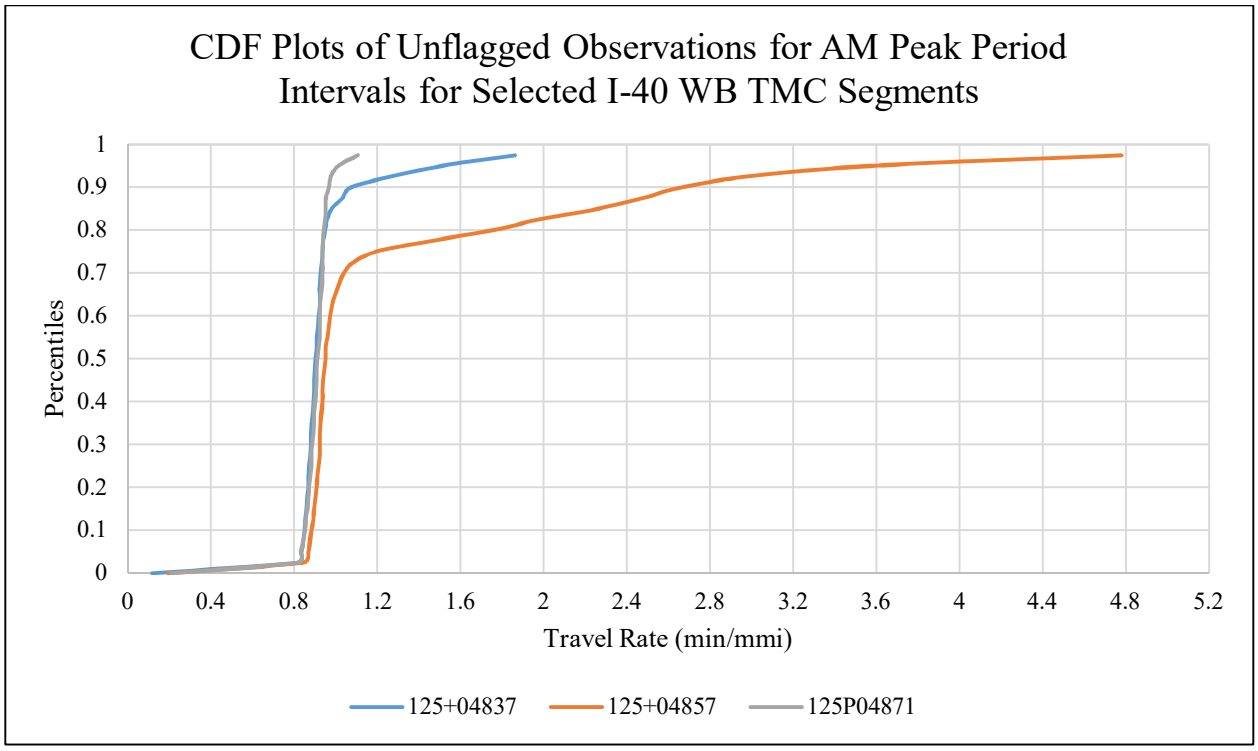

Figure 19: CDF plots of abnormal travel rates for the selected I-40 WB TMC segments during AM peak period.

During the AM peak period, 125+04857 exhibits the most travel rate variation, especially in the uppermost quartile. Measurable variably was observed along 125+04837 above the 90th percentile, while 125P04871 did not show material variation from the free-flow travel rate up to the 97.5th percentile. Between the 60th and 70th percentiles more variation was observed for 125+04857 during the normal operating conditions than abnormal. This could be caused by differences in the sample size of the normal and abnormal time/space observation set. Additionally, the CDF plots suggest segment 125+04857 experiences significant levels of recurring congestion not accounted for by external events.

Table 26 indicates the frequency of external events by temporal analysis period for selected TMC segments along I-40 WB. Incident events are broken down into planned and unplanned types for frequency but were aggregated when generating the travel rate distribution

for incident flagged observations. **Table 27** shows the temporal frequency of abnormal flow and/or travel rates. Unflagged abnormal flow and travel rates are also identified. Only 125+04837 reported unflagged observations with only abnormal travel rates. Additional investigation of these observations may yield a diagnosis of the abnormality.

Table 28 contains travel rate percentiles for abnormal flow rate observations during all temporal intervals. percentiles. The effective capacity along I-40 WB was 1958 pc/hr/ln. Observations with flow rates greater than 2,000 pc/hr/ln were deemed abnormal and observations with a travel rate greater than 1.2 min/mi and a flow rate less than the effective capacity were deemed abnormal.

Table 26: Temporal frequency of external events for selected I-40 WB TMC segments.

	125+04837	**125+04857**	**125P04871**
Temporal intervals with an active <u>unplanned</u> incident			
All Intervals	21	278	64
AM Peak Period	21	186	11
PM Peak Period	0	58	49
Weekends	0	4	0
Temporal intervals with an active <u>planned</u> incident			
All Intervals	0	100	181
AM Peak Period	0	1	0
PM Peak Period	0	0	0
Weekends	0	0	181
Temporal intervals with an active weather event			
All Intervals	10658	11645	10751
AM Peak Period	1636	1752	1497
PM Peak Period	639	743	787
Weekends	3545	3800	3415

Table 27: Temporal Frequency of Abnormal Flow and/or Travel Rates for selected I-40 WB TMC segments.

	125+04837	125+04857	125P04871
Temporal intervals with an abnormal flow rate			
All Intervals	1729	8634	777
AM Peak Period	1493	5828	41
PM Peak Period	9	673	348
Weekends	188	770	243
Temporal intervals with abnormal flow and travel rates			
All Intervals	829	4187	776
AM Peak Period	593	3257	41
PM Peak Period	9	227	347
Weekends	188	239	243
Temporal intervals with only an abnormal travel rate			
All Intervals	2131	1683	1682
AM Peak Period	370	177	176
PM Peak Period	252	210	210
Weekends	849	753	753
Unflagged temporal intervals with abnormal flow and travel rates			
All Intervals	495	3587	581
AM Peak Period	402	2737	25
PM Peak Period	9	188	331
Weekends	54	225	93
Unflagged temporal intervals with only abnormal travel rates			
All Intervals	315	0	0
AM Peak Period	158	0	0
PM Peak Period	35	0	0
Weekends	44	0	0

Table 28: Key travel rate percentiles for abnormal flow observations during all temporal intervals for selected I-40 WB TMC segments.

	125+04837	125+04857	125P04871
0.05	0.8702	1.2500	1.2244
0.25	0.8994	1.6596	1.3107
0.5	1.0005	2.1821	1.5822
0.75	1.4517	2.8005	2.3170
0.80	1.5454	3.0042	2.6306
0.95	2.3298	4.7377	4.5469

CDF distributions were also generated for external event combinations for all temporal intervals. Distributions were generated for time/space observations with incidents only, weather flags only, and both an incident and weather flag. **Table 29** shows critical percentiles and other metrics for all three external event distributions. Valid data were not available for the incident and weather external event scenario for 125+04837 and 125P04871, therefore, buffer time indices were not tabulated for those TMC segments. Buffer time indices generated for the incident-only dataset had significantly higher travel rates than the other external event distributions.

125+04837 experienced higher travel rates than 125 + 04857 across all major percentiles, which suggests a major incident significantly impacted 125+04837. Due to the inflated travel rates across the distribution, 125+04837 actually had the lowest buffer time index of the three TMC segments. 125P04871 had the highest buffer time index among all three selected TMC segments. 125+04837, 125+04857, and 125P04871 reported the 41st, 22nd, and 12th highest buffer time indices for incident only observations and had the 24th, 3rd, and 44th highest buffer time indices for the weather only observations. For the incident only distribution, 125P04872 experienced the highest buffer time index, 10.1736. For the weather only distribution, 125P04856 reported the highest buffer time index, 1.1272. Due to lack of valid data for many

TMC segments during incident and weather condition, buffer time index rankings were not tabulated. **Figure 20** shows the CDF plots for each external event and selected I-40 WB TMC.

Table 29: Key percentile values and buffer time index tabulations for incident only, weather only, and weather plus incident observations over selected I-40 WB TMC segments.

Incidents Only	**125+04837**	**125+04857**	**125P04871**
0.05	2.3874	0.9227	0.8573
0.25	5.5407	0.9559	0.9218
0.5	6.9177	2.2270	0.9375
0.75	7.7148	4.0935	1.0003
0.80	7.7516	4.7494	1.1179
0.95	9.2573	7.9101	4.5116
Weather Only	**125+04837**	**125+04857**	**125P04871**
0.05	0.8368	0.8771	0.8476
0.25	0.8851	0.9231	0.9052
0.5	0.9231	0.9237	0.9231
0.75	0.9240	0.9671	0.9375
0.80	0.9553	0.9821	0.9437
0.95	1.0482	1.8124	1.0087
Incident + Weather	**125+04837**	**125+04857**	**125P04871**
0.05	N/A	1.6106	N/A
0.25	N/A	1.9117	N/A
0.5	N/A	2.4792	N/A
0.75	N/A	2.7428	N/A
0.80	N/A	2.8582	N/A
0.95	N/A	4.9179	N/A

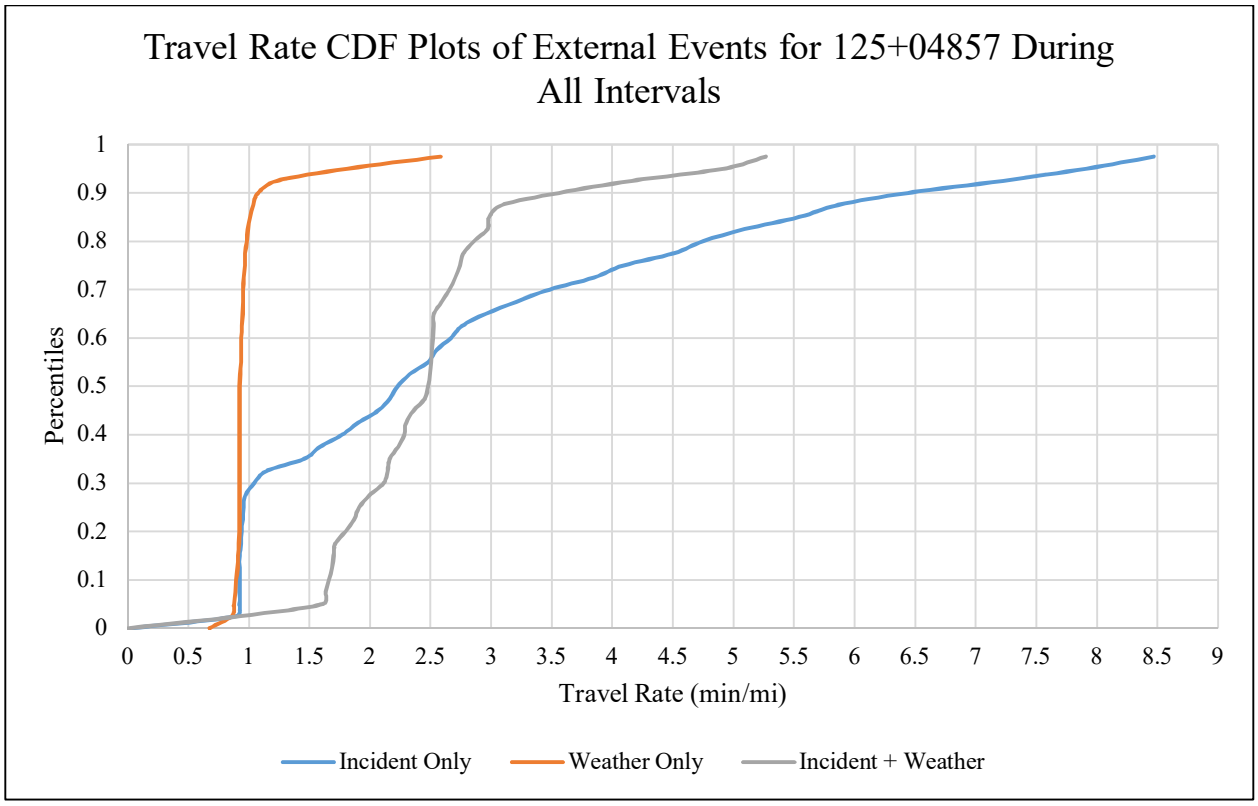

Figure 20: Travel rate CDF plots of external event operating conditions during all time intervals for 125+04857.

I-440 Eastbound Facility Analysis

I-440 EB had 30 TMC segments located entirely within Wake County. LOTTR values greater than 1.5 were not reported during any temporal analysis period. The highest LOTTR value was recorded for 125N04984 during the AM peak period. Additionally, the highest BTI was reported for 125-04984 during the AM peak period. These segments are located near the western terminus of I-440, where there are only two lanes in each direction. A bottleneck exists between US 1/ US 64 to the south and segments of I-440 EB with more lanes to the east. The highest spread between LOTTR and BTI was observed over all temporal intervals rather than a peak period. The spread between these metrics was actually the smallest during the AM peak period, when poor performance was most frequently observed. **Table 30** displays facility level data for all I-440 EB TMC segments. **Figure 21** displays a plot of LOTTR values for each I-440 EB TMC by temporal analysis periods.

Table 30: Facility-wide BTI and LOTTR data for I-440 EB.

	All Intervals	AM Peak	PM Peak	Weekends
TMC w/ highest BTI	125-04984	125-04984	125N04979	125N04904
TMC w/ highest LOTTR	125N04987, 125-04986	125N04984	125-04980	125-04980
Average BTI	0.1419	0.2412	0.2018	0.1710
Max BTI	0.2302	1.4213	0.6831	0.5379
Average LOTTR	1.0558	1.0656	1.0517	1.0390
Max LOTTR	1.0833	1.2448	1.0828	1.0702
Average Rank Spread	13.7333	1.4	2.8667	6.9333
Max Rank Spread	27	7	15	23
Number of TMC segments w/ LOTTR > 1.5	0	0	0	0

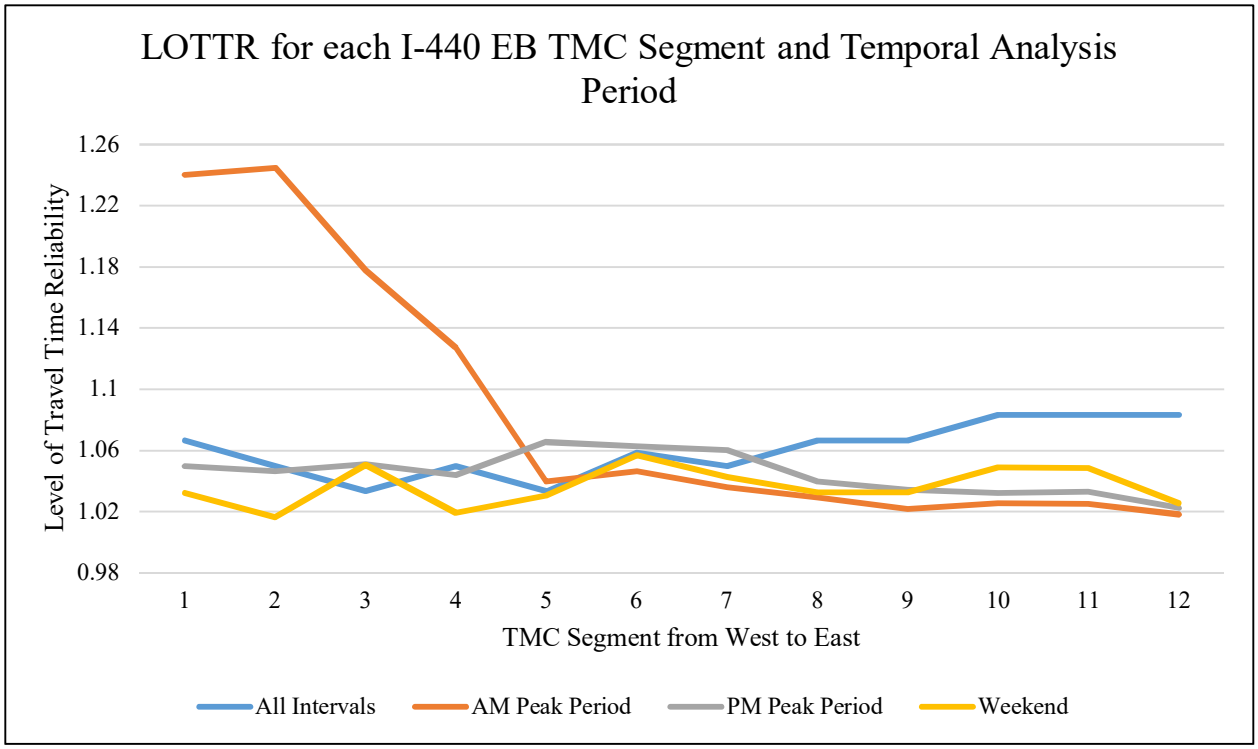

Figure 21: Plot of LOTTR for each I-440 EB TMC by temporal analysis period.

Three TMC segments were selected from 30 TMC segments along I-440 EB; the entire facility is located within the study area therefore the three TMC segments are spatially distributed along the entire directional facility. Data on the other TMC segments can be found in **Appendix D**. 125-04983 is a two-lane directional segment located near the partial interchange with Melbourne Rd. at Exit 1 near the western terminus of I-440 at I-40/US 1/US 64. 125-04991, a three-lane directional facility, is located near the I-440 and US 70 / Glenwood Avenue interchange at Exit 7. The easternmost TMC selected is 125-04904, a four-lane directional segment located near the Poole Rd. interchange at Exit 15. US 64 and I-87 are concurrent with I-440 along this segment. **Table 31** contains summary data and details for the selected TMC segments.

Table 31: Descriptions of selected TMC segments along I-440 EB and metrics for all temporal intervals.

	125-04983	125-04991	125-04904
Number of Lanes	2	3	4
Length (mi)	0.6243	0.0541	0.2073
Nearest Interchange	Melbourne Rd.	Glenwood Ave.	Poole Rd.
County	Wake	Wake	Wake
Number of Invalid Time/Space Travel Rates	1,682	1849	1,683
Mean Travel Rate (min/mi)	1.0202	0.9661	0.9509
Median Travel Rate (min/mi)	0.9677	0.9445	0.9375
Buffer Time Index	0.1783	0.1550	0.0951
BTI Rank	5	11	29
LOTTR	1.0333	1.0587	1.0667
LOTTR Rank	22	16	9
Rank Difference	17	5	20

Table 32: Travel speed distributions for the entire facility and three selected TMC segments over all temporal analysis periods for I-440 EB. Speeds are in miles per hour.

24-hour (all times)	125-04983	125-04991	125-04904	Facility
60+	69.67%	81.93%	89.04%	80.44%
55 - 60	24.64%	14.27%	9.26%	15.59%
45 - 55	3.36%	2.88%	1.13%	2.89%
40 - 45	0.65%	0.37%	0.17%	0.34%
30 – 40	1.00%	0.39%	0.20%	0.40%
15 - 30	0.55%	0.17%	0.15%	0.27%
0 - 15	0.15%	0.01%	0.04%	0.08%
AM Peak Period	**125-04983**	**125-04991**	**125-04904**	**Facility**
60+	45.83%	81.14%	93.34%	76.07%
55 - 60	27.59%	14.72%	5.73%	15.77%
45 - 55	13.34%	3.26%	0.84%	5.59%
40 - 45	3.88%	0.36%	0.04%	0.86%
30 – 40	6.38%	0.31%	0.04%	1.05%
15 - 30	2.80%	0.21%	0.01%	0.59%
0 - 15	0.18%	0.00%	0.00%	0.07%

Table 32 (Continued).

PM Peak Period	125-04983	125-04991	125-04904	Facility
60+	84.54%	78.57%	97.05%	85.68%
55 - 60	5.95%	8.96%	1.32%	5.78%
45 - 55	5.94%	8.95%	1.32%	5.78%
40 - 45	0.92%	1.33%	0.13%	0.70%
30 – 40	1.11%	1.42%	0.09%	0.87%
15 - 30	0.97%	0.74%	0.08%	0.85%
0 - 15	0.57%	0.04%	0.01%	0.34%
Weekday Off Peak	**125-04983**	**125-04991**	**125-04904**	**Facility**
60+	78.29%	87.33%	89.34%	83.92%
55 - 60	19.37%	10.59%	9.75%	13.81%
45 - 55	1.79%	1.73%	0.75%	1.88%
40 - 45	0.09%	0.15%	0.07%	0.13%
30 – 40	0.13%	0.13%	0.05%	0.13%
15 - 30	0.20%	0.06%	0.02%	0.09%
0 - 15	0.14%	0.00%	0.02%	0.04%
Weekend (Sat. / Sun.)	**125-04983**	**125-04991**	**125-04904**	**Facility**
60+	70.64%	81.05%	87.12%	80.29%
55 - 60	27.79%	16.22%	9.48%	16.57%
45 - 55	1.13%	1.99%	1.82%	2.25%
40 - 45	0.16%	0.31%	0.42%	0.30%
30 – 40	0.21%	0.38%	0.57%	0.38%
15 - 30	0.07%	0.06%	0.48%	0.19%
0 - 15	0.01%	0.00%	0.12%	0.03%

Table 32 contains the speed distributions for each of the TMC segments highlighted along I-440 EB for each temporal analysis interval. Ranges are exclusive of the lower bound. The AM peak period experienced the greatest variability in vehicle speeds, especially along 125-04983, the most variable TMC of the segments highlighted in this analysis. During the PM peak hour, 125-04991 experiences the greatest speed variation. Facility-wide just over 80% of vehicle speed observations were greater than 60 mph. The posted speed limit among 125-04983 is only

55 mph and only 60 mph along 125-04991 and 125-04904. However, the free flow speeds are much higher when observed in the field.

Table 33 contains critical percentile values for the highlighted TMC segments for all, unflagged, and flagged observations from all temporal analysis intervals. With the exception of 125-04904, higher buffer time indices were observed during normal conditions rather than abnormal. This is likely attributed to higher median travel rates at the 50th percentile. During normal operating conditions, 125-04983, 125-04991, and 125-04904 reported the 6th, 11th, and 29th highest travel time indices. The highest buffer time index occurred at the westernmost TMC segment, 125-04984. This section of I-440 is only two lanes in each direction and forms a bottleneck between US 1/US 64 south of I-40 and downstream segments of I-440 EB that have more than three lanes. This segment is part of a route from office parks in north Raleigh to residential communities in Cary and Apex to the south.

During flagged operating conditions 125-04983, 125-04991, and 125-04904 reported the 4th, 11th, and 27th highest buffer time indices among 30 TMC segments along I-440 EB. The highest buffer time index was reported by 125N0984, immediately downstream of 125-04984.

Table 33: Key percentiles for selected I-440 EB TMC segments for all temporal intervals by observation type.

Percentile	**Travel Rates in Min/Mi**		
All Observations	**125-04983**	**125-04991**	**125-04904**
0.05	0.9088	**0.8818**	**0.8798**
0.25	0.9677	0.9231	0.9346
0.5	0.9677	0.9436	0.9375
0.75	1.0007	0.9836	0.9649
0.80	1.0169	0.9982	0.9677
0.95	1.403	1.0909	1.0267

Table 33 (Continued).

Unflagged	125-04983	125-04991	125-04904
0.05	0.9059	0.8792	0.8750
0.25	0.9643	0.9231	0.9288
0.5	0.9677	0.9445	0.9375
0.75	1.0007	0.9836	0.9615
0.80	1.0169	0.9990	0.9677
0.95	1.1321	1.0836	1.0209
Flagged	**125-04983**	**125-04991**	**125-04904**
0.05	0.9132	0.8905	0.8955
0.25	0.9677	0.9231	0.9375
0.5	0.9677	0.9416	0.9524
0.75	1.0031	0.9836	0.9717
0.80	1.0169	0.9947	0.9836
0.95	1.1538	1.1088	1.0633

Figure 22 shows travel rate CDF plots of all observations over all temporal intervals. **Figure 23** displays CDF plots of unflagged observations for each selected TMC segment over all temporal intervals. **Figure 24** includes CDF plots for flagged conditions during all temporal analysis periods. These plots indicate little variation between the normal observation distributions and the abnormal distributions. 125-04991 and 125-04904 track closely through the 50^{th} percentile, however, 125-04491 starts experiencing greater variation in the upper portion of the distributions. 125-04983 report travel rates higher than the other TMC segments throughout the entire distribution likely due to the two-lane cross-section.

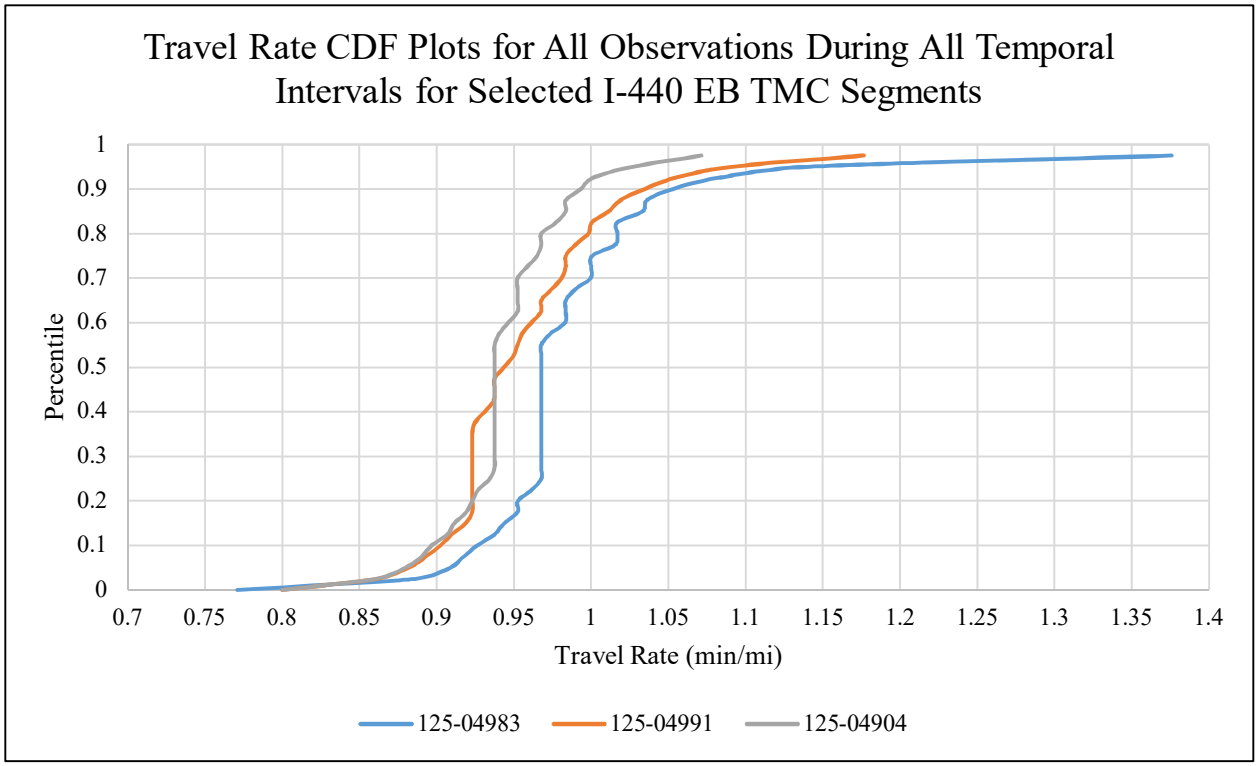

Figure 22: Travel rate CDF plots for all observations for selected I-440 EB TMC segments over all temporal intervals.

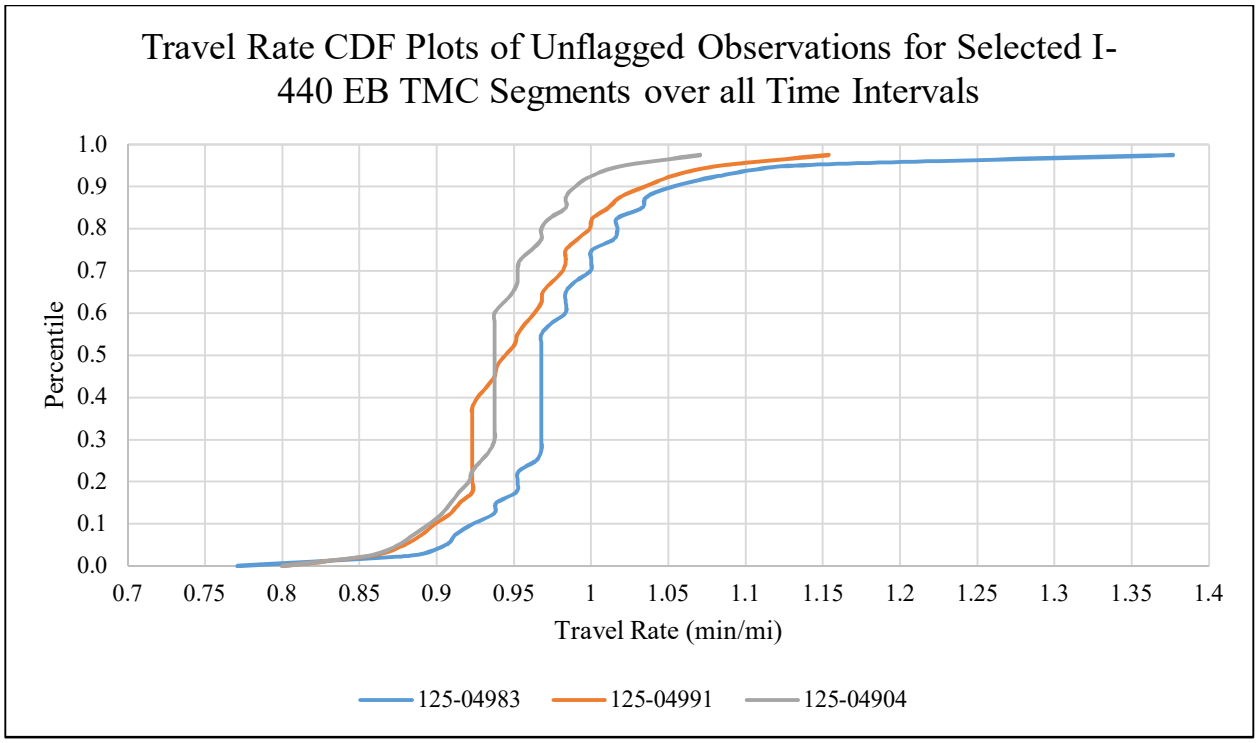

Figure 23: CDF plots of normal travel rates for selected I-440 EB TMC segments for all temporal analysis periods.

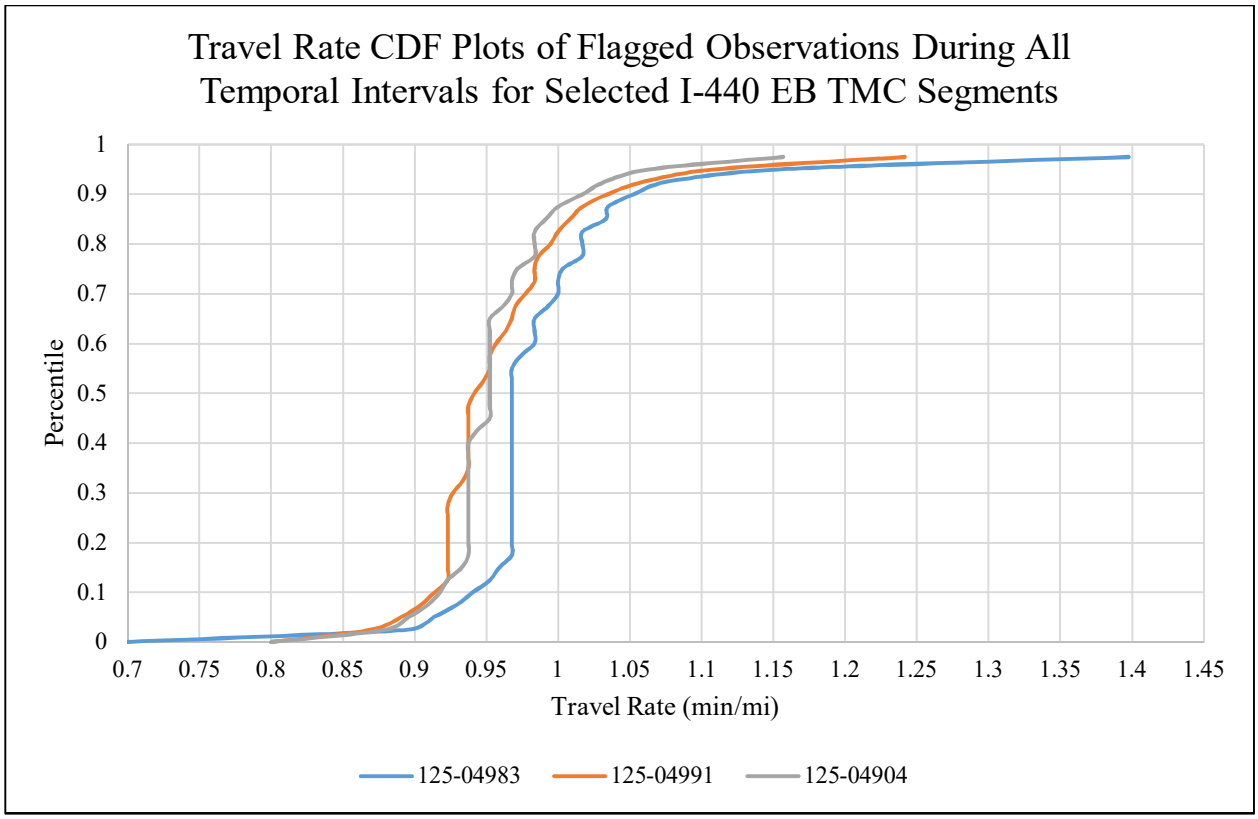

Figure 24: CDF plots of abnormal travel rates for selected I-440 EB TMC segments for all temporal intervals.

Previous speed distribution analysis for I-440 EB indicated that travel time/rate variability was higher in the AM peak period, therefore, this temporal analysis period was further highlighted. **Table 34** shows major percentile values for all, unflagged, and flagged observations during the AM peak period. **Figure 25** includes the travel rate CDF plots for all observations over all AM peak period intervals. **Figure 26** shows CDF plots for unflagged observations during the morning peak period and **Figure 27** displays the CDF plots for flagged operating conditions during the AM peak.

Table 34: Key percentiles for abnormal travel rate observations of selected I-440 EB TMC segments during the AM peak period.

Percentile	Travel Rates in Min/Mi		
All Observations	**125-04983**	**125-04991**	**125-04904**
0.05	0.8987	**0.8571**	**0.8746**
0.25	0.9647	0.9105	0.9146
0.5	1.0034	0.9487	0.9375
0.75	1.1100	0.9855	0.9615
0.80	1.1755	0.9967	0.9677
0.95	1.7984	1.0738	1.0063
Unflagged Observations	**125-04983**	**125-04991**	**125-04904**
0.05	0.8985	0.8578	0.8798
0.25	0.9677	0.9190	0.9231
0.5	0.9979	0.9524	0.9473
0.75	1.0526	0.9836	0.9677
0.80	1.0908	0.9965	0.9709
0.95	1.6501	1.0604	1.0000
Flagged Observations	**125-04983**	**125-04991**	**125-04904**
0.05	0.8985	0.8660	0.8955
0.25	0.9677	0.9238	0.9375
0.5	1.0000	0.9524	0.9524
0.75	1.0345	0.9836	0.9836
0.80	1.0545	1.0000	0.9836
0.95	1.6457	1.1269	1.0803

125-04983 reported a slightly lower buffer time index under flagged conditions, however, the other TMC segments experienced higher buffer time indices when conditions were flagged. 125-04984, the easternmost I-440 EB segment, reported the highest buffer time index, 1.1042. 125N04984 reported the highest BTI during abnormal conditions, 0.8019. During flagged conditions higher rates observed at lower percentiles, thus decreasing the BTI and LOTTR. The CDF plots show that 125-04983 had higher variation during normal operations while the others were worse during abnormal conditions. Due to high levels of recurring congestion along 125-04983, adverse impacts due to external events may be masked by the lack of capacity.

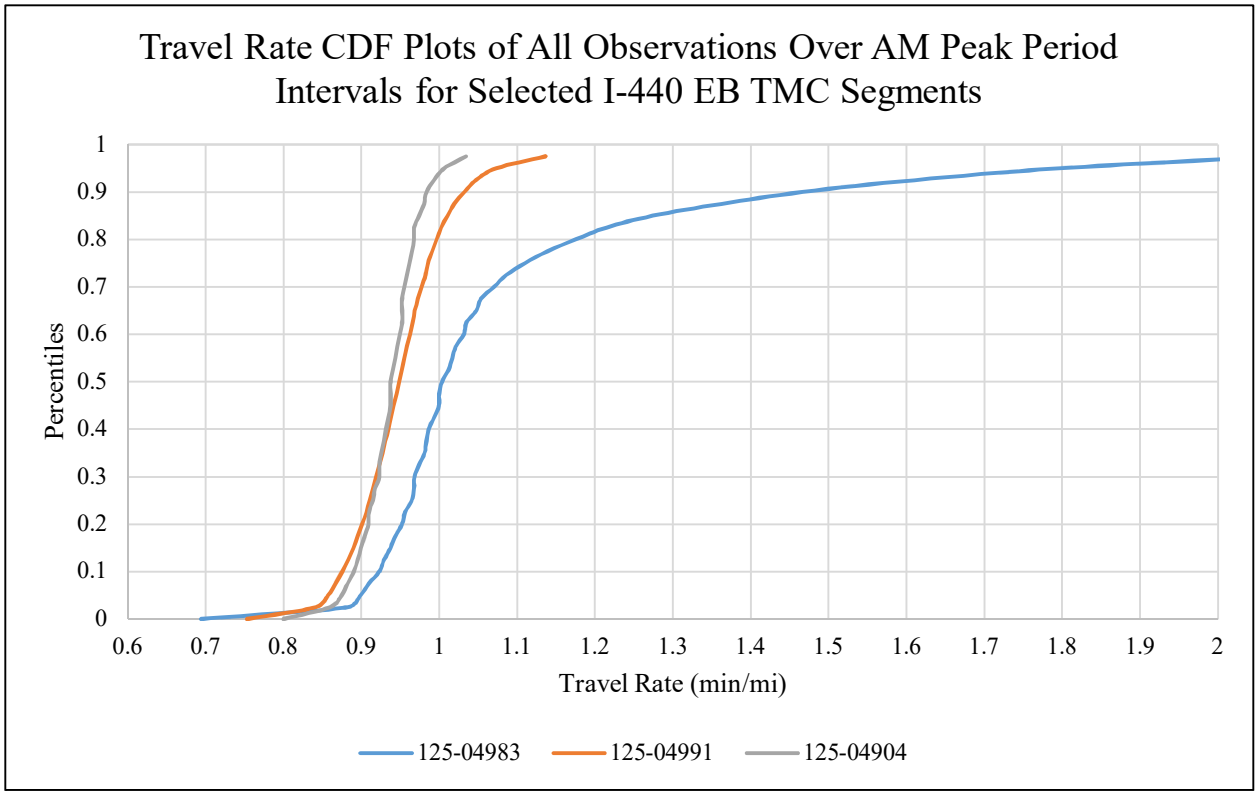

Figure 25: Travel rate CDF plots for all observations over AM peak period intervals for selected I-440 EB TMC segments.

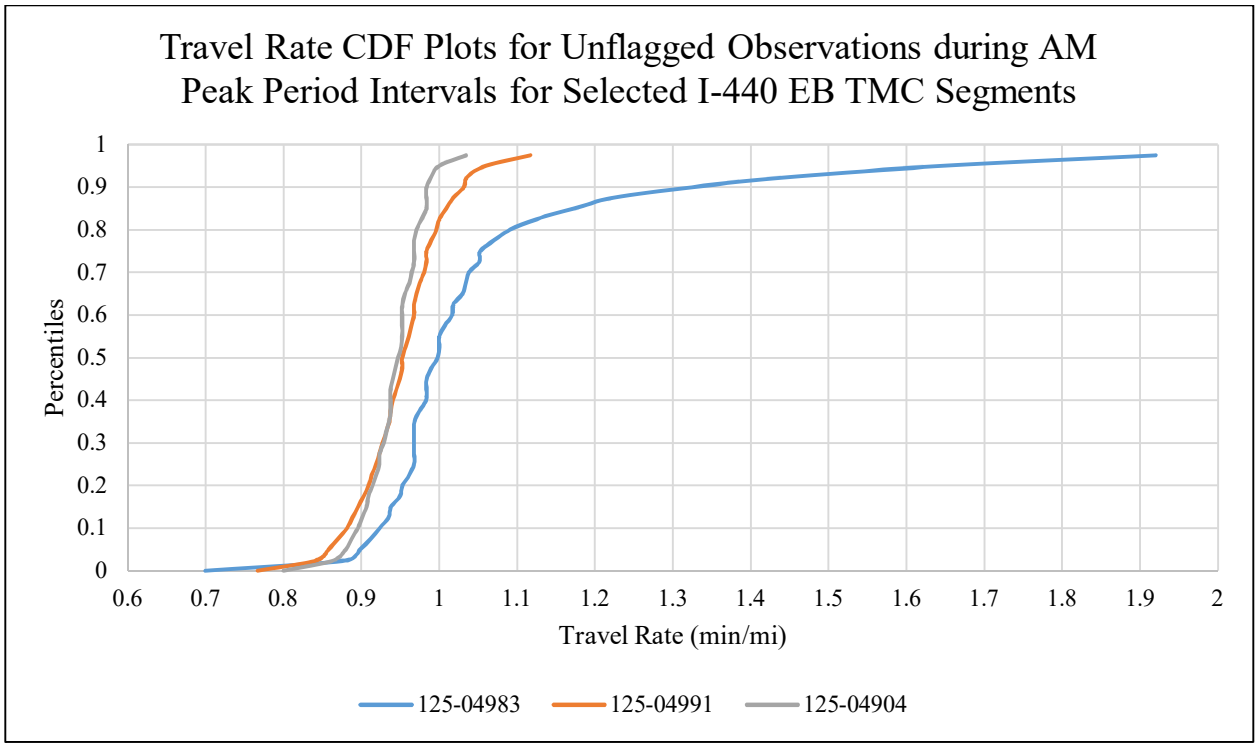

Figure 26: Travel rate CDF plots for unflagged observations over AM peak period temporal intervals for select I-440 EB TMC segments.

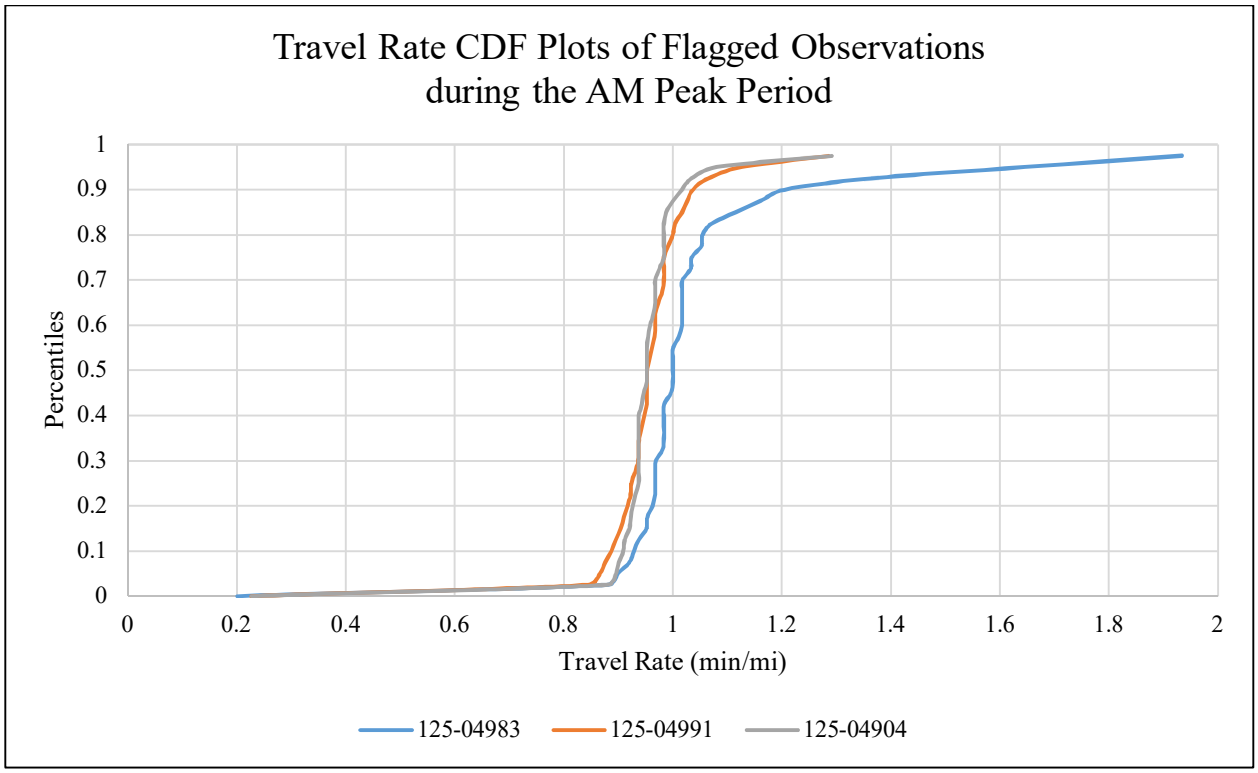

Figure 27: CDF plots of flagged travel rates for the selected I-440 EB TMC segments during the AM peak period.

Table 35 includes the frequency of external event occurrences for the three selected I-440 EB TMC segments. **Table 36** shows abnormal flow rate data compared to all travel rate observations and unflagged travel rate observations. The effective capacity along I-440 EB was 2007 pc/hr/ln. There were no unflagged incidents reported only an abnormal travel rate. **Table 37** contains the travel rate percentiles for abnormal flow rate observations for I-440 EB.

Table 35: Temporal frequency of external events for selected I-440 EB TMC segments.

	125-04983	125-04991	125-04904
Temporal intervals with an active unplanned incident			
All Intervals	29	18	13
AM Peak Period	21	0	0
PM Peak Period	8	18	0
Weekends	0	0	0
Temporal intervals with an active planned incident			
All Intervals	39	0	0
AM Peak Period	0	0	0
PM Peak Period	0	0	0
Weekends	39	0	0
Temporal intervals with an active weather event			
All Intervals	12507	12506	11972
AM Peak Period	2031	2031	1961
PM Peak Period	1051	1051	939
Weekends	3290	3289	3294

Table 36: Temporal frequency of abnormal flow and/or travel rates for selected I-440 EB TMC segments.

	125-04870	125-04857	125N04836
Temporal intervals with an abnormal flow rate			
All Intervals	3943	2469	836
AM Peak Period	2792	184	24
PM Peak Period	565	1572	75
Weekends	207	387	623
Temporal intervals with abnormal flow and travel rates			
All Intervals	1022	1607	836
AM Peak Period	621	174	24
PM Peak Period	196	766	75
Weekends	31	370	623

Table 36 (Continued).

Unflagged temporal intervals with abnormal flow and travel rates			
All Intervals	861	1250	585
AM Peak Period	512	142	13
PM Peak Period	187	687	63
Weekends	15	179	429

Table 37: Key travel rate percentiles for I-440 EB observations with abnormal flow rates.

	125-04870	**125-04857**	**125N04836**
0.05	1.0174	0.9335	1.2075
0.25	1.2369	1.0441	1.3043
0.5	1.4286	1.2706	1.5000
0.75	1.8182	1.4741	1.9795
0.80	1.9355	1.5589	2.2028
0.95	3.4078	2.2229	4.2003

CDF distributions were also generated for external event combinations for all temporal intervals. Distributions were generated for time/space observations with incidents only, weather flags only, and both an incident and weather flag. **Table 38** indicates the critical percentiles for all three external event combinations. Incident-only observations reported higher absolute travel times, however, the buffer time index was higher for weather-only observations for 125-04983. When weather and incidents were concurrent, absolute travel rates increased but variability across the distribution of observed travel rates slightly decreased.

125N04988, located near the US 1 Capital Blvd. interchange, reported the highest buffer time index for incident only observations, 4.3220. 125-04989 reported the highest buffer time index, 3.8029, near the Wake Forest Rd. interchange for weather only observations. For combined weather and incident observations, the TMC segments experienced the 28th, 13th, and 15th highest buffer time index. The highest buffer time index for this category of all 30 TMC

segments was 4.7018 and was reported for 125N04980, a segment located at the Wade Avenue interchange.

Figure 28 shows the CDF plots for incident only observations, **Figure 29** shows the CDF plots for the weather only observations, and **Figure 30** shows the CDF plots for the incident and weather observations. These plots confirm that incidents have a much larger impact on travel time unreliability than weather incidents.

Table 38: Key percentile value and buffer time index tabulations for incident only, weather only, weather plus incident observations over selected I-440 EB TMC segments.

Incidents Only	**125-04983**	**125-04991**	**125-04904**
0.05	1.5467	1.5419	0.9524
0.25	1.8399	2.1246	1.7236
0.50	1.9969	2.5968	3.0821
0.75	2.3336	3.6308	4.2181
0.80	2.4502	4.1751	4.6852
0.95	3.7849	6.9285	7.7569
Weather Only	**125-04983**	**125-04991**	**125-04904**
0.05	0.9196	0.8917	0.8955
0.25	0.9677	0.9231	0.9375
0.50	0.9677	0.9459	0.9524
0.75	1.0169	0.9864	0.9775
0.80	1.0345	1.0000	0.9836
0.95	1.9113	1.3501	1.1070
Incident + Weather	**125-04983**	**125-04991**	**125-04904**
0.05	1.6384	1.5949	1.2919
0.25	1.8462	2.1643	1.9017
0.50	1.9971	2.6694	3.1964
0.75	2.3016	3.7460	4.4891
0.80	2.4116	4.2586	4.8812
0.95	3.5966	6.9684	7.8822

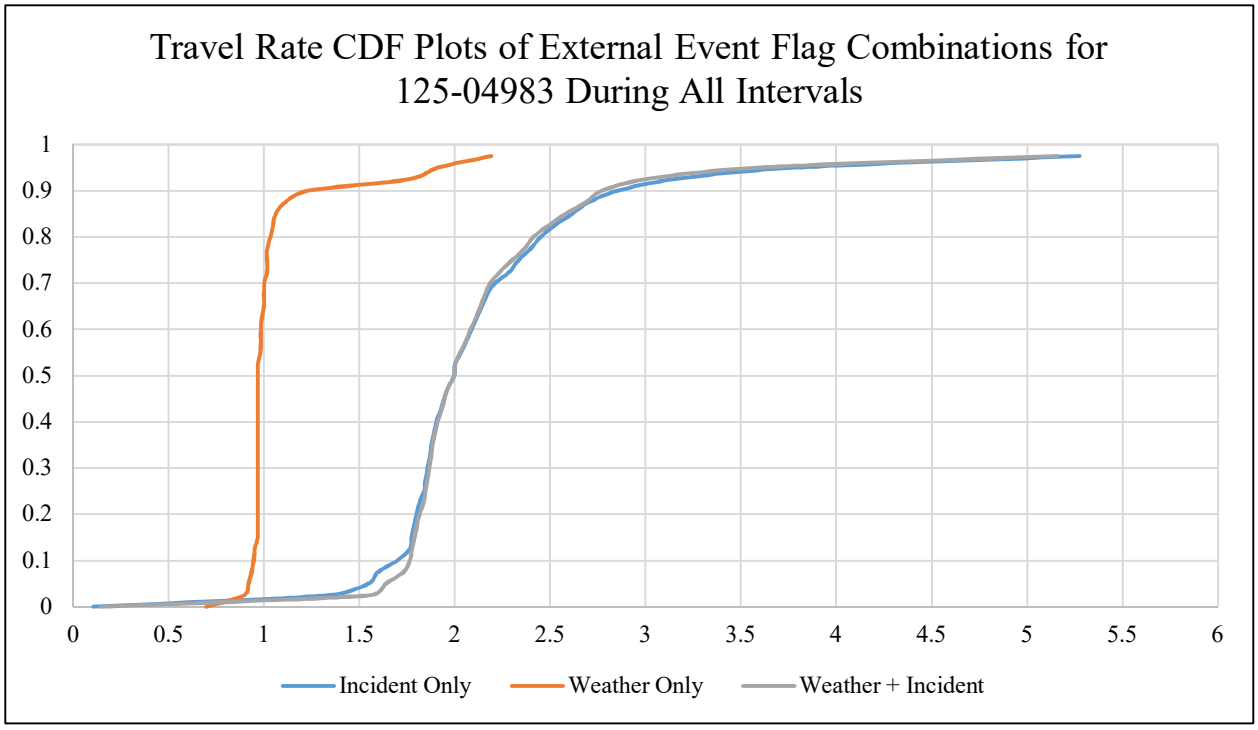

Figure 28: Travel rate CDF plots of each external event flag combination for I-440 EB TMC segment 125-04983.

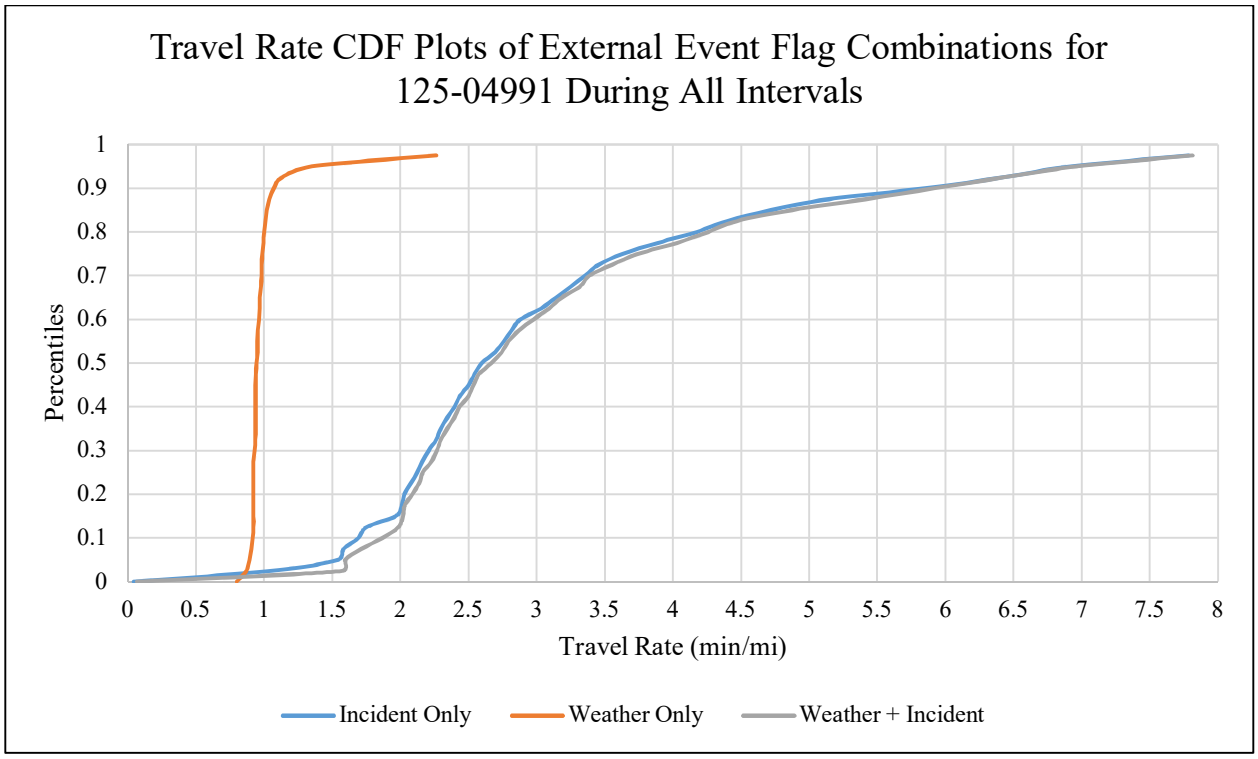

Figure 29: Travel rate CDF plots of each external event flag combination for I-440 EB TMC segment 125-04991.

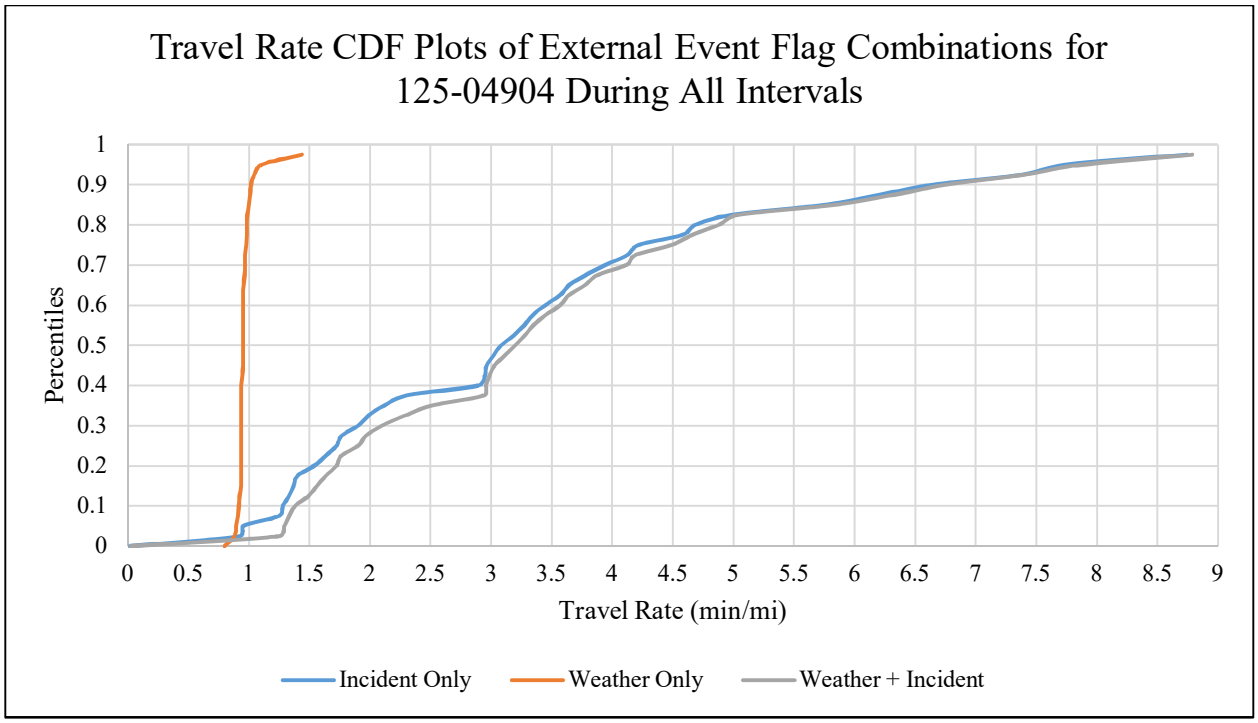

Figure 30: Travel rate CDF plots of each external event flag combination for I-440 EB TMC segment 125-04904.

I-440 Westbound Facility Analysis

There are 30 TMC segments located along I-440 EB entirely within Wake County. Only two TMC segments reported LOTTR greater than the 1.5 threshold for unreliability during the PM Peak Hour. The highest LOTTR value was observed along 125+04980 and the highest BTI value occurred along 125P04979 during the PM Peak Period. The highest magnitude of difference between BTI and LOTTR rankings was measured during the Weekend temporal analysis period. The lowest spread between BTI and LOTTR metrics occurred during the PM peak period. **Table 39** shows TMC segment reliability data for all I-440 EB TMC segments. **Figure 31** displays the LOTTR values for each TMC segment by temporal analysis period.

Table 39: Facility-wide BTI and LOTTR data for I-440 WB.

	All Intervals	AM Peak	PM Peak	Weekends
TMC w/ highest BTI	125+04980	125+04988	125P04979	125P0904
TMC w/ highest LOTTR	125+04981	125P04988	125+04980	125+04981
Average BTI	0.1768	0.3712	0.6975	0.0928
Max BTI	0.3478	1.3651	3.2613	0.1366
Average LOTTR	1.0486	1.0645	1.15	1.0321
Max LOTTR	1.0727	1.1389	1.66193	1.0545
Average Rank Spread	3.6429	3.5385	2.8800	7.82759
Max Rank Spread	10	8	6	25
Number of TMC segments w/ LOTTR > 1.5	0	0	2	0

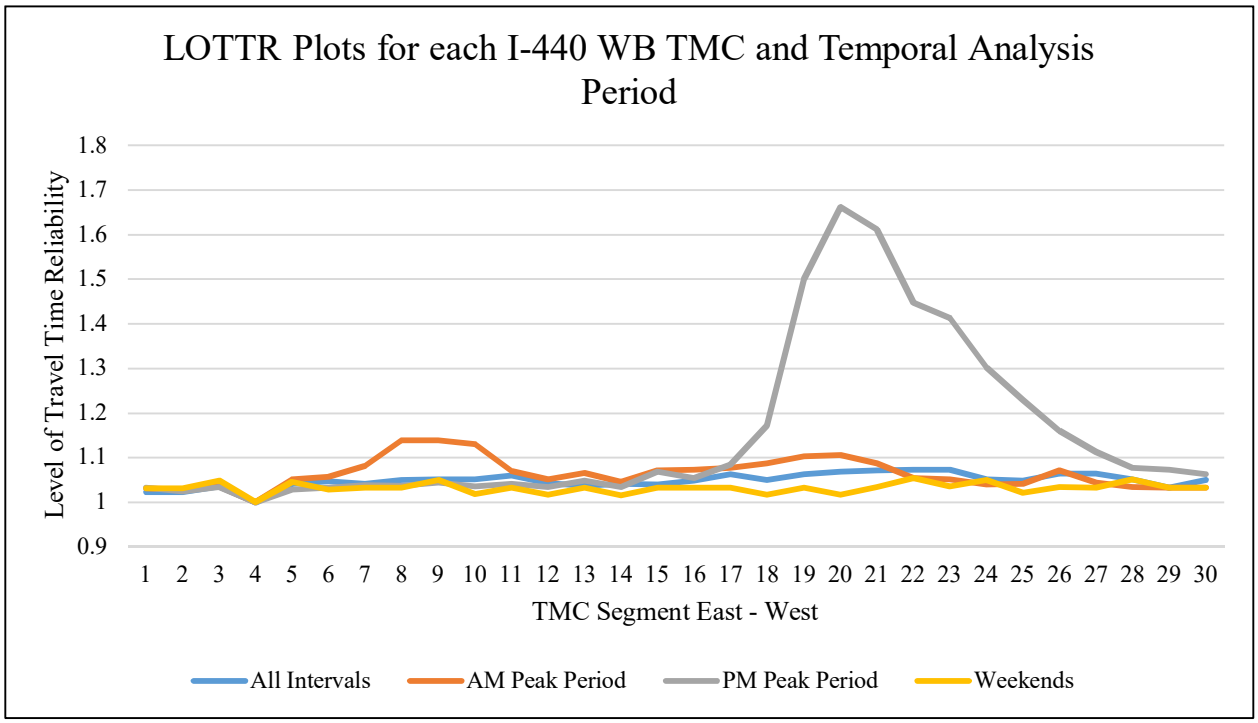

Figure 31: Plot of LOTTR for all 1-440 WB TMC segments by temporal analysis period.

Three TMC segments along I-440 WB were highlighted in this subsection. The entire facility was located within the study area; therefore, the selected segments were distributed along the entire length of the facility. Data on the other TMC segments can be found in **Appendix E.**

125P04904 is a four-lane segment near the Poole Rd. interchange at Exit 15 near the southeastern terminus of I-440. 125P04990, a three-lane segment, is located near Exit 8 at the Six Forks Rd. interchange. 125+04984 is a two-lane segment located adjacent to the Jones Franklin Rd. interchange at Exit 1. **Table 40** lists summary data and characteristics for the highlighted TMC segments.

Table 40: Descriptions of selected TMC segments along I-440 EB and metrics for all temporal intervals.

	125P04904	125P04990	125+04984
Number of Lanes	4	3	2
Length (mi)	0.6243	0.0541	0.2073
Nearest Interchange	Poole Rd.	Six Forks Rd.	Jones Franklin Rd.
County	Wake	Wake	Wake
Number of Invalid Time/Space Travel Rates	1,682	1684	1,688
Mean Travel Rate (min/mi)	0.9343	0.9833	0.9882
Median Travel Rate (min/mi)	0.9231	0.9677	0.9677
Buffer Time Index	0.1015	0.1085	0.1285
BTI Rank	27	26	20
LOTTR	1.0352	1.0368	1.0508
LOTTR Rank	26	25	13
Rank Difference	1	1	7

Table 41 shows the speed distributions for the highlighted TMC segments and the entire facility along I-440 WB over each temporal analysis period. The PM peak period had the highest variability in travel speeds across the entire I-440 WB facility. 125P04904 proves an exception to this trend because the temporal analysis period with the lowest proportion of observed vehicle speeds under 60 miles per hour was the weekend analysis period. Among the

highlighted TMC segments, 125+04984 only had 44% of speeds above 60 mph, the lowest proportion for any TMC and temporal analysis period. As was the case with I-440 EB, the posted speed limit never exceeds 60 mph, however the free-flow speeds observed by vehicles along the facility are significantly higher.

Table 41: Travel speed distributions for the entire facility and three selected TMC segments over all temporal analysis periods for I-440 WB.

24-hour (all times)	125P04904	125P04990	125+04984	Facility
60+	92.11%	83.28%	71.21%	69.22%
55 - 60	6.10%	12.62%	24.85%	24.40%
45 - 55	1.10%	2.07%	3.24%	4.32%
40 - 45	0.15%	0.40%	0.30%	0.51%
30 – 40	0.20%	0.67%	0.26%	0.68%
15 - 30	0.24%	0.68%	0.12%	0.67%
0 - 15	0.10%	0.29%	0.03%	0.20%
AM Peak Period	**125P04904**	**125P04990**	**125+04984**	**Facility**
60+	94.12%	70.85%	76.12%	64.95%
55 - 60	4.09%	16.35%	21.63%	24.04%
45 - 55	1.00%	5.47%	2.11%	6.99%
40 - 45	0.07%	1.36%	0.12%	1.05%
30 – 40	0.22%	2.49%	0.02%	1.45%
15 - 30	0.22%	2.71%	0.00%	1.16%
0 - 15	0.28%	0.76%	0.00%	0.36%
PM Peak Period	**125P04904**	**125P04990**	**125+04984**	**Facility**
60+	93.89%	76.72%	44.06%	58.40%
55 - 60	5.40%	13.45%	38.85%	23.70%
45 - 55	0.61%	3.86%	13.82%	9.84%
40 - 45	0.04%	0.95%	1.34%	1.70%
30 – 40	0.05%	1.66%	1.24%	2.50%
15 - 30	0.01%	2.13%	0.57%	2.97%
0 - 15	0.00%	1.24%	0.12%	0.89%

Table 41 (Continued).

Weekday Off Peak	125P04904	125P04990	125+04984	Facility
60+	91.82%	87.91%	79.84%	72.44%
55 - 60	7.10%	11.23%	18.38%	24.36%
45 - 55	0.96%	0.71%	1.49%	2.88%
40 - 45	0.03%	0.04%	0.14%	0.14%
30 – 40	0.03%	0.04%	0.09%	0.08%
15 - 30	0.05%	0.03%	0.04%	0.07%
0 - 15	0.00%	0.03%	0.02%	0.03%
Weekend (Sat. / Sun.)	**125P04904**	**125P04990**	**125+04984**	**Facility**
60+	90.78%	84.63%	69.77%	71.64%
55 - 60	5.71%	12.82%	29.08%	24.98%
45 - 55	1.64%	1.83%	0.91%	2.56%
40 - 45	0.42%	0.27%	0.08%	0.25%
30 – 40	0.54%	0.36%	0.10%	0.35%
15 - 30	0.69%	0.09%	0.05%	0.20%
0 - 15	0.22%	0.00%	0.02%	0.04%

Table 42 shows the critical percentile values for the selected TMC segments. Separate metrics were calculated for flagged and unflagged observations across all temporal analysis intervals. For each TMC, buffer time indices were higher for flagged conditions than for normal conditions. The highest buffer time index, 1.3988, was recorded for 125+04980, a segment located near the Wade Avenue interchange. However, this ranking doesn't account for differences in lane cross-sections. 125P04980 had the highest buffer time index among the I-440 WB during flagged conditions, 0.3940. The TMC segments reporting the most variability in the upper portion of the distribution are located upstream of a bottleneck created at the Wade Avenue interchange, where I-440 WB drops from three lanes to two for the remainder of the facility.

Table 42: Key travel rate percentiles of all, flagged, and unflagged observations for selected I-440 WB TMC segments for all temporal intervals.

	Travel Rates in Min/Mi		
All Observations	**125P04904**	**125P04990**	**125+04984**
0.05	0.8696	**0.8955**	**0.8985**
0.25	0.9176	0.9524	0.9629
0.5	0.9231	0.9677	0.9677
0.75	0.9523	0.9967	1.0000
0.80	0.9556	1.0033	1.0169
0.95	1.0168	1.0728	1.0921
Unflagged	**125P04904**	**125P04990**	**125+04984**
0.05	0.8696	0.8934	0.8965
0.25	0.9171	0.9524	0.9564
0.5	0.9231	0.9677	0.9677
0.75	0.9524	0.9935	1.0000
0.80	0.9561	1.0000	1.0169
0.95	1.0154	1.0684	1.0955
Flagged	**125P04904**	**125P04990**	**125+04984**
0.05	0.8771	0.9070	0.9073
0.25	0.9231	0.9677	0.9677
0.5	0.9231	0.9677	0.9677
0.75	0.9589	1.0000	1.0003
0.80	0.9677	1.0169	1.0169
0.95	1.0526	1.1321	1.1055

Figure 32 depicts the CDF plots for the selected TMC during both unflagged and flagged operational conditions. **Figure 33** shows the CDF plots for each selected TMC segment including unflagged observations over all temporal intervals. **Figure 34** displays CDF plots for flagged conditions during all temporal intervals for each TMC selected along I-440 WB. These plots also show that there wasn't a major gap between the unflagged and flagged distributions for each TMC segment.

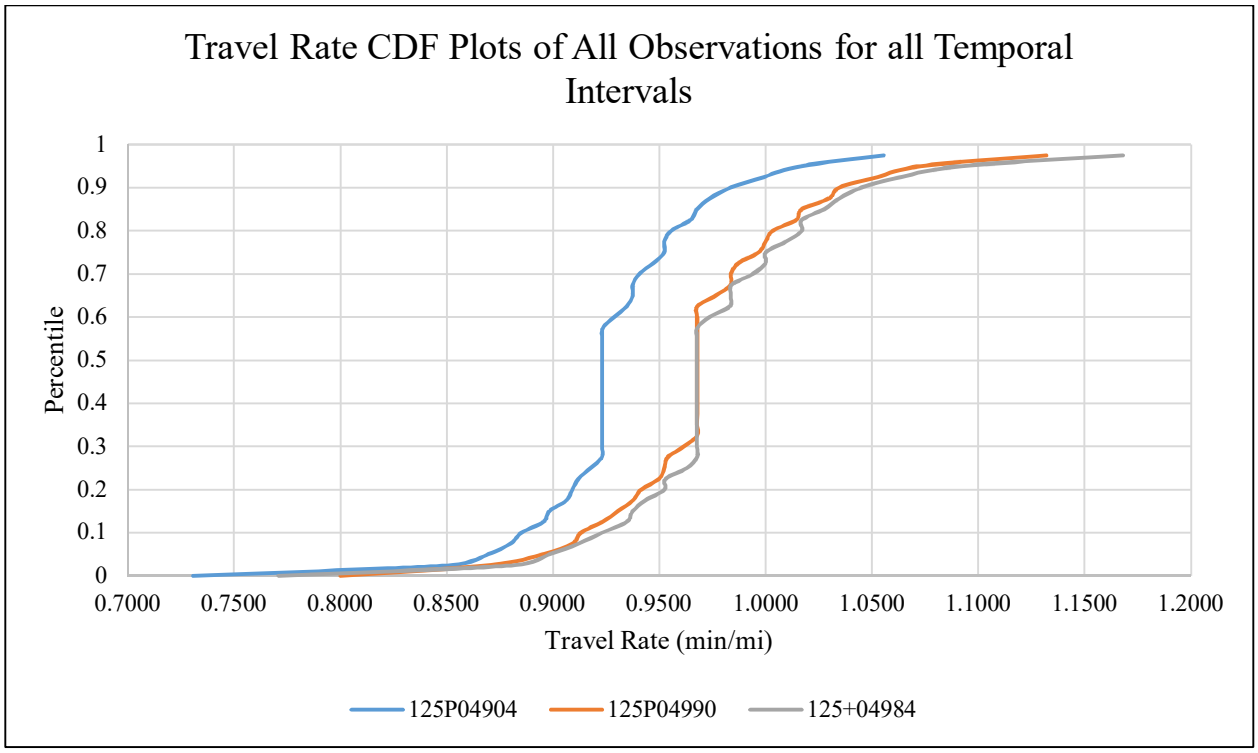

Figure 32: Travel rate CDF plots for all observations during all temporal intervals for selected I-40 WB TMC segments.

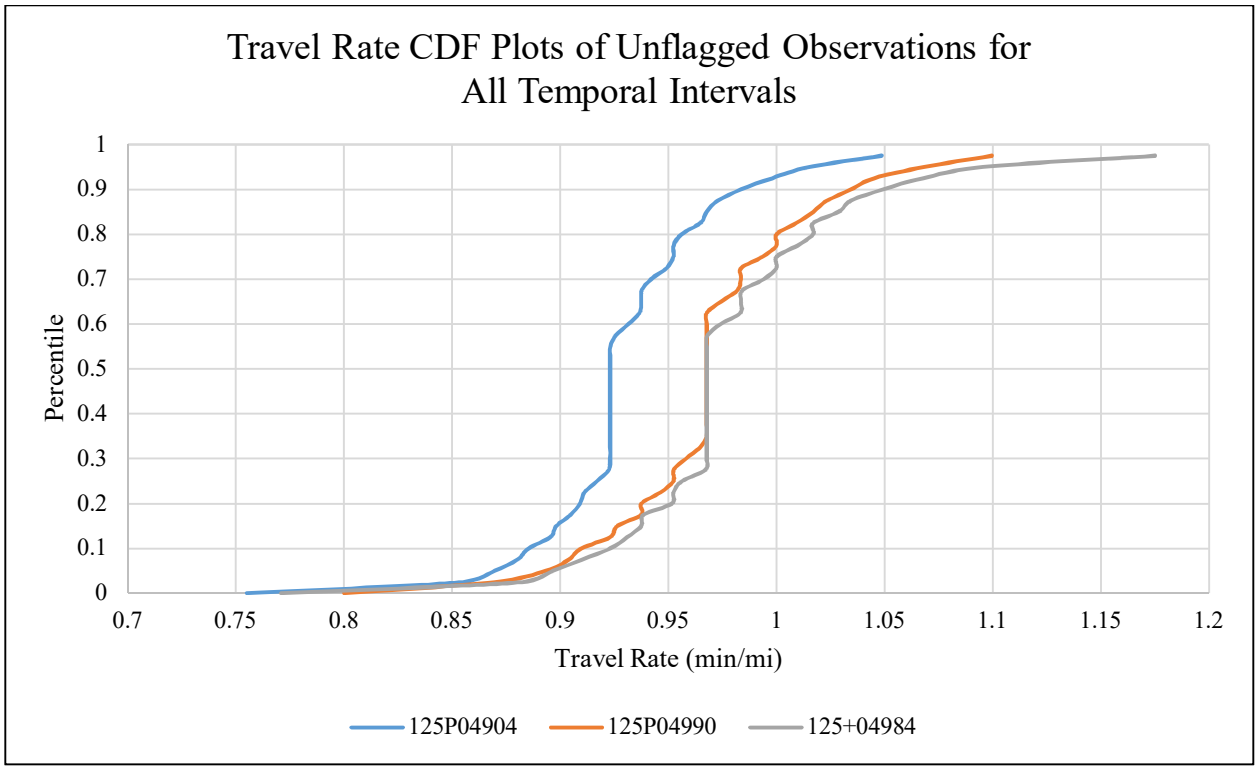

Figure 33: Travel rate CDF plots of unflagged observations for selected I-440 WB TMC segments for all temporal analysis periods.

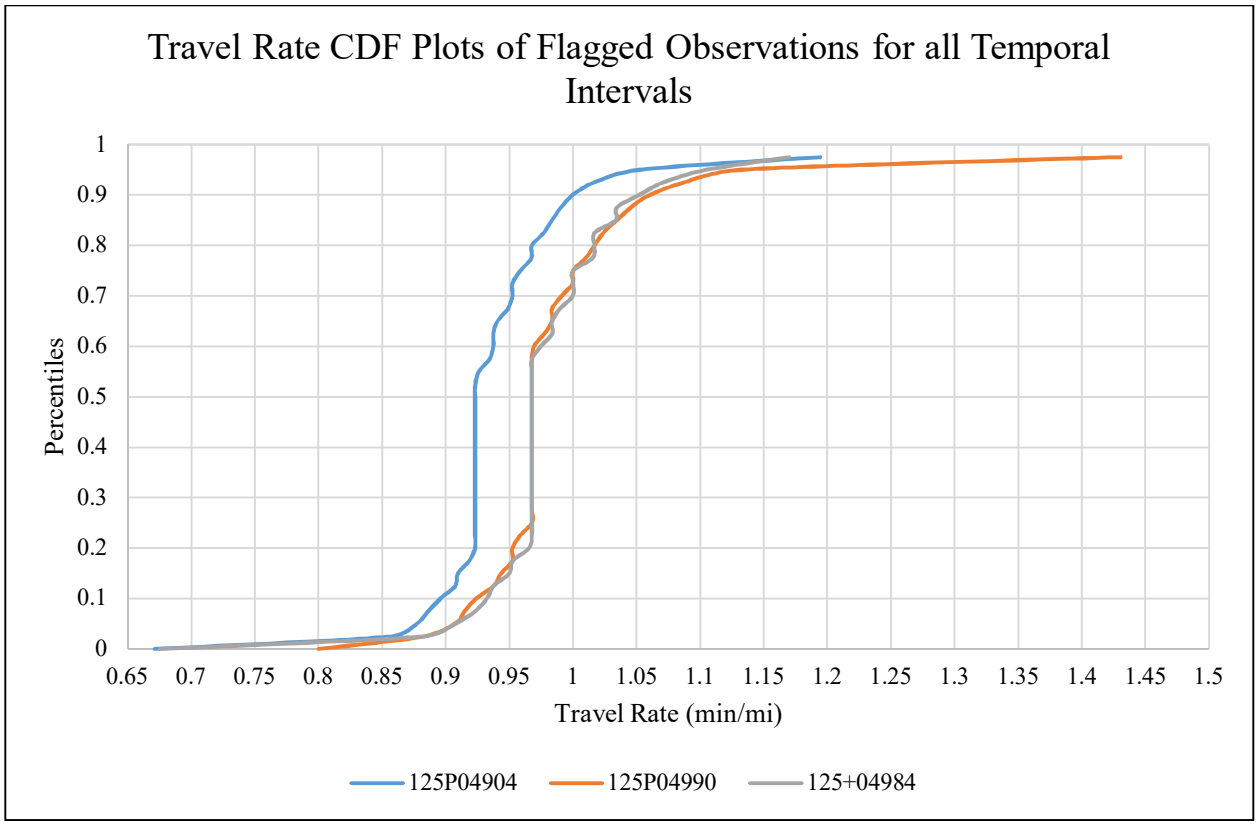

Figure 34: Travel rate CDF plots of flagged observations for selected I-440 WB TMC segments for all temporal intervals.

Based on the speed distribution analysis, the PM peak period had the most travel time variation of all of the temporal analysis periods. **Table 43** shows critical percentiles and buffer time indices for normal and abnormal observations during the PM peak period. The highest buffer time index reported among all I-440 WB TMC segments was 2.6463 along 125P04979, a segment near the Lake Boone Trail interchange. 125P04979 also reported the highest buffer time index during abnormal conditions, however, the magnitude of the index was higher at 3.8803.

Table 43: Key percentiles and buffer time indices for normal travel rates for selected I-440 WB TMC segments for all temporal intervals.

	Travel Rates in Min/Mi		
All Observations	**125P04904**	**125P04990**	**125+04984**
0.05	0.8596	0.8906	0.8821
0.25	0.8966	0.9388	0.9347
0.5	0.9230	0.9745	0.9677
0.75	0.9504	1.0169	0.9995
0.80	0.9560	1.0309	1.0002
0.95	1.0072	1.2060	1.0526
Unflagged	**125P04904**	**125P04990**	**125+04984**
0.05	0.8597	0.8793	0.9091
0.25	0.9047	0.9375	0.9677
0.5	0.9317	0.9693	1.0000
0.75	0.9525	1.0000	1.0359
0.80	0.9626	1.0169	1.0553
0.95	1.0121	1.0802	1.1765
Flagged	**125P04904**	**125P04990**	**125+04984**
0.05	0.8572	0.8879	0.9091
0.25	0.9091	0.9524	0.9703
0.5	0.9375	0.9836	1.0169
0.75	0.9711	1.0299	1.0788
0.80	0.9836	1.0526	1.1063
0.95	1.1467	1.4636	1.2976

Figure 35 depicts the CDF plots during all temporal intervals. **Figure 36** shows the travel rate CDF plots for unflagged observations along the selected TMC segments along I-440 WB during the PM analysis period. **Figure 37** displays the travel rate CDF plots for flagged observations for selected I-440 WB TMC segments during the PM peak period.

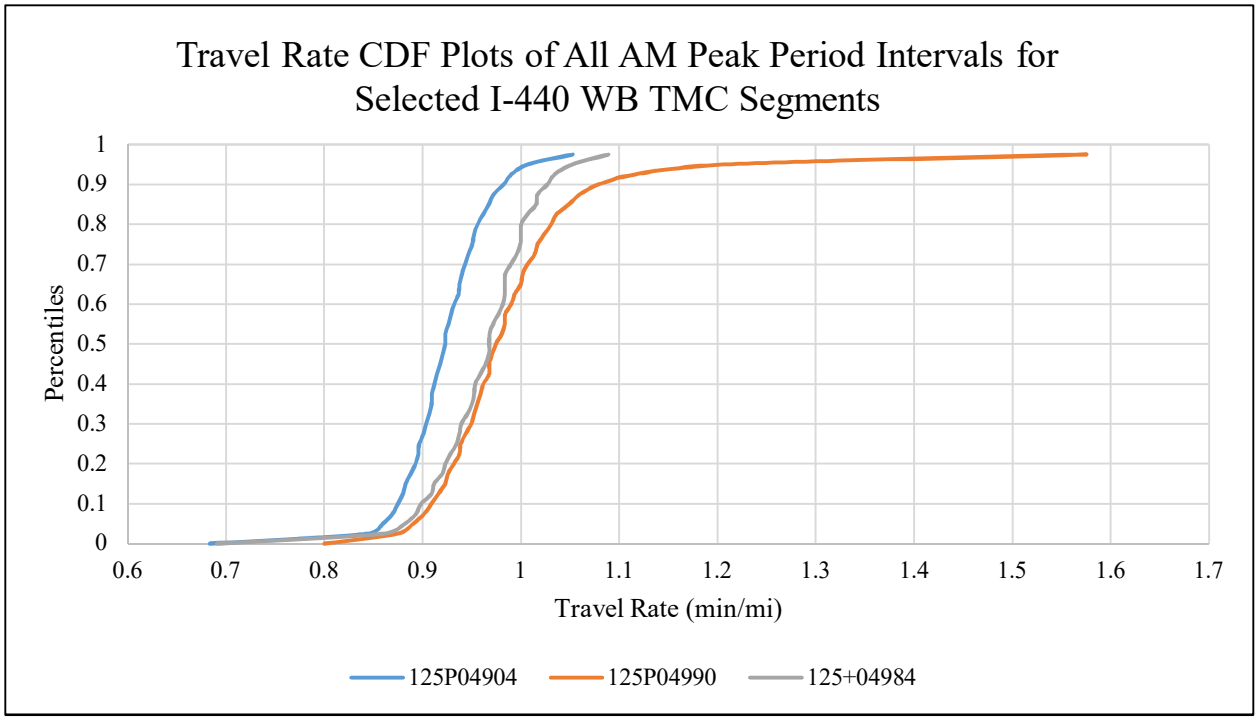

Figure 35: Travel rate CDF plot of all PM peak period observations for selected I-440 WB TMC segments.

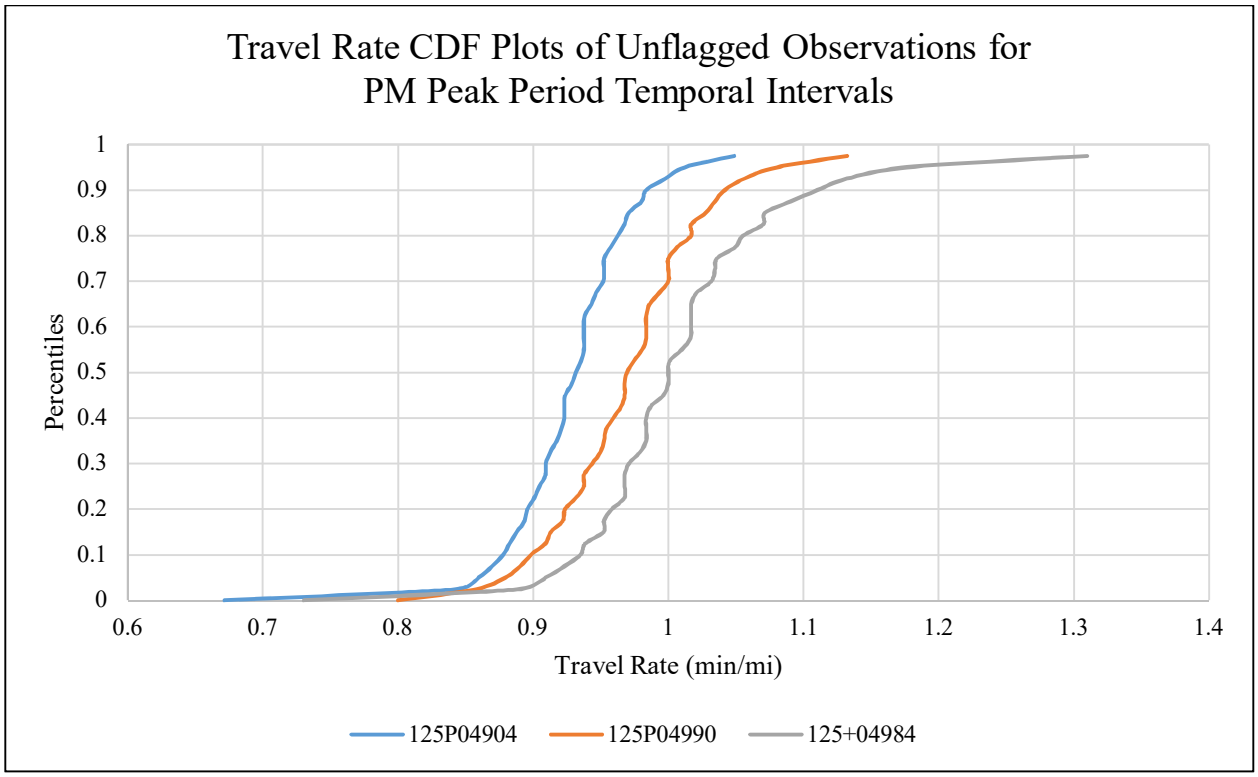

Figure 36: Travel rate CDF plots of unflagged observations for selected I-440 WB TMC segments during the PM peak period.

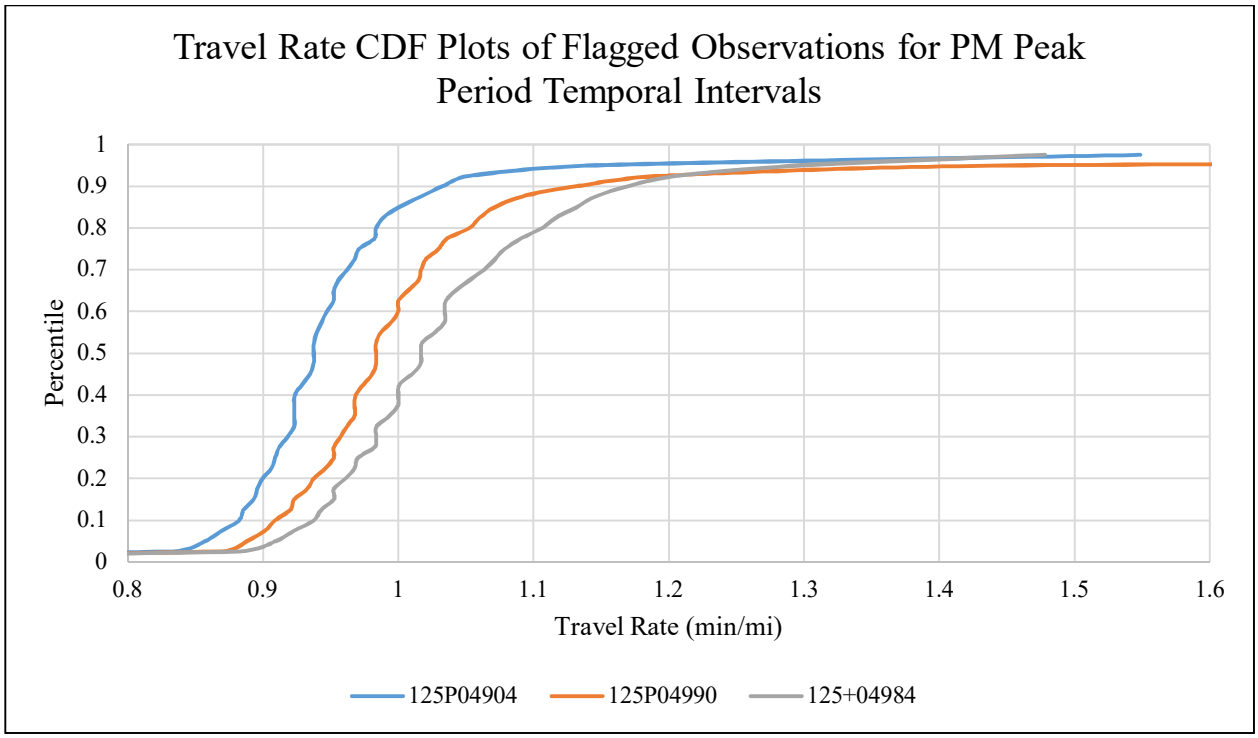

Figure 37: Travel rate CDF plots of flagged observations for selected I-440 WB TMC segments during the PM peak period.

During flagged conditions, the highest increase in travel rates was observed for 125P04990, however, during unflagged conditions, 125+04984 reported the most severe increase in travel rates. The distributions of each TMC during unflagged conditions produced CDF curves with similar shapes with stratifying travel rates. The absolute differences in travel rates are likely attributed to changes in the speed limit and number of lanes.

Table 44 lists the temporal frequency of external events for selected I-440 WB TMC segments. 125P04990 reported the highest number of incidents, both planned and unplanned among the selected TMC segments. **Table 45** shows the temporal frequency of abnormal flow and travel rates for the selected TMC segments. The effective capacity along I-440 WB was 1961 pc/hr/ln. No observations were reported with only an abnormal travel rate. **Table 46** includes key travel rate percentiles for abnormal flow observations during all temporal intervals.

Table 44: Temporal frequency of external events for selected I-440 WB TMC segments.

	125P04904	125P04990	125+04984
Temporal intervals with an active unplanned incident			
All Intervals	152	158	18
AM Peak Period	70	76	0
PM Peak Period	6	38	14
Weekends	0	6	0
Temporal intervals with an active planned incident			
All Intervals	58	964	77
AM Peak Period	0	157	12
PM Peak Period	13	177	5
Weekends	0	0	0
Temporal intervals with an active weather event			
All Intervals	11975	12506	12507
AM Peak Period	2576	2644	2644
PM Peak Period	1318	1452	1452
Weekends	3675	3800	3800

Table 45: Temporal Frequency of Abnormal Flow and/or Travel Rates for selected I-440 WB TMC segments.

	125P04904	125P04990	125+04984
Temporal intervals with an abnormal flow rate			
All Intervals	995	4095	4694
AM Peak Period	132	3082	57
PM Peak Period	31	382	4238
Weekends	676	313	123
Temporal intervals with abnormal flow and travel rates			
All Intervals	442	530	750
AM Peak Period	43	295	9
PM Peak Period	11	117	598
Weekends	366	76	63

Table 45 (Continued).

Unflagged temporal intervals with abnormal flow and travel rates			
All Intervals	308	304	591
AM Peak Period	15	206	6
PM Peak Period	6	61	503
Weekends	271	16	31

Table 46: Key travel rate percentiles for abnormal flow observations during all temporal intervals for selected I-440 WB TMC segments.

	125P04904	**125P04990**	**125+04984**
0.05	1.2233	0.9239	0.9524
0.25	1.3333	0.9836	1.0173
0.5	1.6664	1.0560	1.0811
0.75	2.6087	1.3860	1.2234
0.80	2.9884	1.4700	1.2686
0.95	5.1917	3.2580	1.7311

Table 47 displays critical percentiles for each combinations of external variables over all temporal intervals. Overall, the magnitude of the travel rates on the upper portion of the cumulative distribution was higher for incident only observations than weather only. However, 125+04984 travel rates did not increase greatly, possibly due to additional lanes limiting the impact of a single lane closure. Concurrent weather and incident events increased travel rates on the lower end of the distribution compared to incident only observations such that the buffer time index actually decreased relative to incident exclusive events. **Figure 38** displays CDF plots of each external flag combination for 125P04904, **Figure 39** displays CDF plots of each external flag combination for 125P04990. 125+04984 external flag distributions were not plotted because there weren't enough samples of the combined event flag scenario.

Table 47: Key percentile values and buffer time index tabulations for incident only, weather only, and weather plus incident observations over selected I-40 WB TMC segments.

Incidents Only	125P04904	125P04990	125+04984
0.05	0.8840	0.8982	0.9329
0.25	0.9231	0.9559	1.0000
0.5	0.9519	0.9836	1.0877
0.75	1.0229	1.0417	1.1622
0.80	1.0683	1.0658	1.1831
0.95	3.7311	3.2559	1.2868
Weather Only	**125P04904**	**125P04990**	**125+04984**
0.05	0.8772	0.9072	0.9063
0.25	0.9231	0.9677	0.9677
0.5	0.9231	0.9677	0.9677
0.75	0.9574	1.0000	1.0000
0.80	0.9677	1.0121	1.0168
0.95	1.0485	1.1071	1.0898
Incident + Weather	**125P04904**	**125P04990**	**125+04984**
0.05	0.6404	0.8950	N/A
0.25	2.7618	0.9524	N/A
0.5	3.4367	0.9677	N/A
0.75	3.9293	1.0151	N/A
0.80	4.0685	1.0169	N/A
0.95	4.7505	1.1277	N/A

The highest buffer time index, 9.3005, was recorded for 125P04988, a segment located near the US 1/US 401/Capital Blvd. interchange. For weather only events, the highest buffer time index, 0.2972, occurred along 125P04980, a segment located near the Wade Avenue interchange. Concurrent weather and incident data were not available for 125+04984 as well as several other TMC segments, therefore segment rankings weren't tabulated. These results

confirm the major impact of incidents and the additive effects of concurrent weather and incident events.

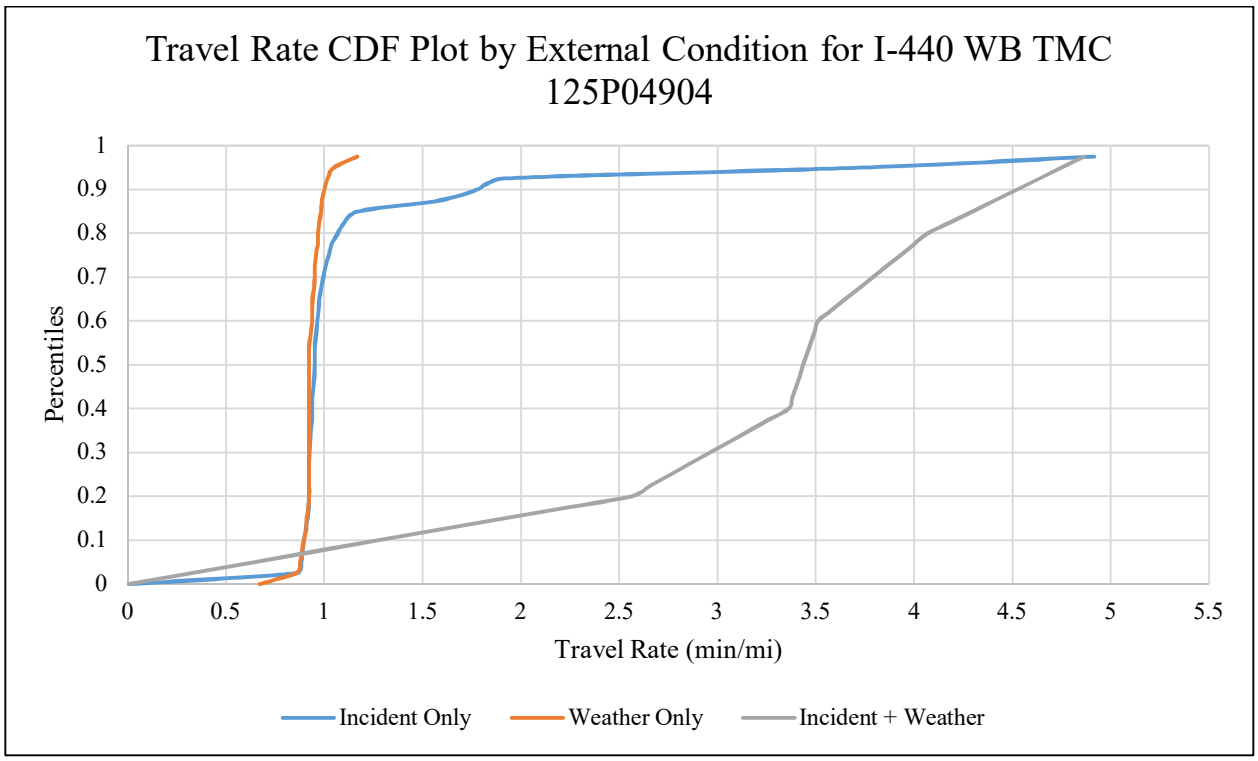

Figure 38: Travel rate CDF plots of each combination of external flag during all time intervals for 125P04904.

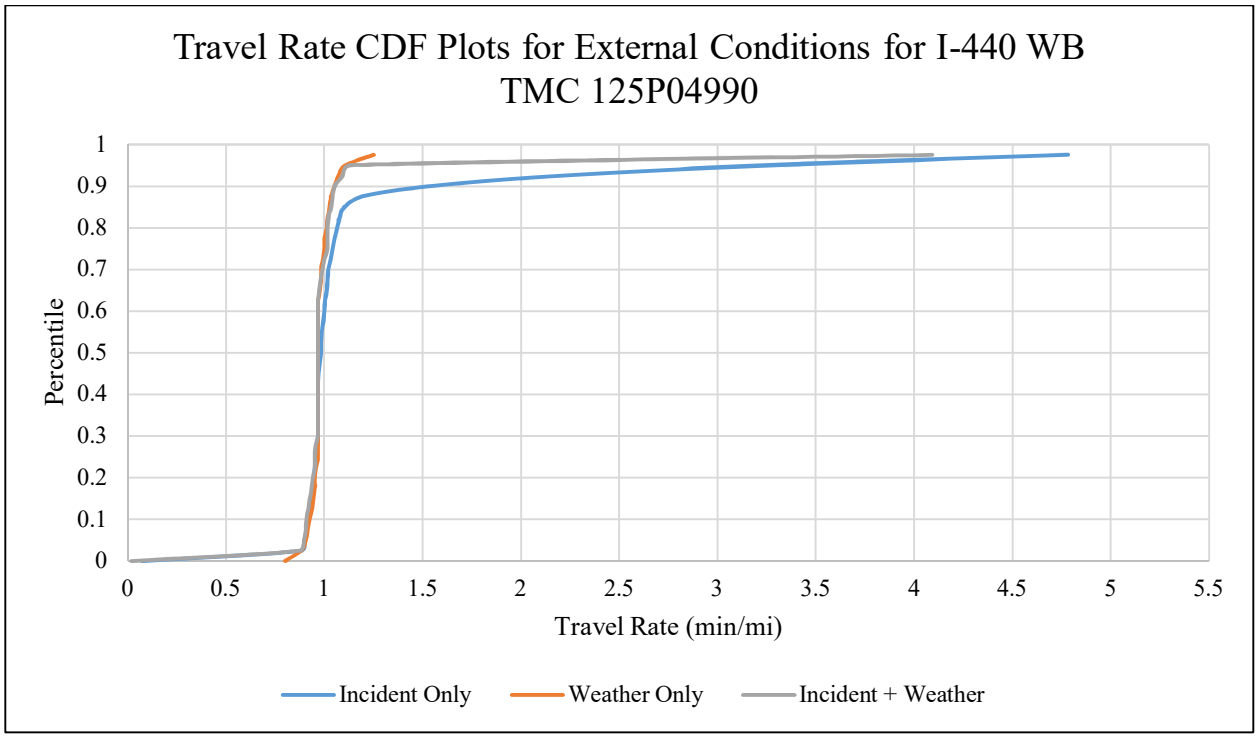

Figure 39: Travel rate CDF plots of each combination of external flags during all time intervals for 125P04990.

Chapter 6: Route-based and special event analyses

Beyond facility-level reliability analysis, popular travel routes were analyzed within the reliability context. The public generally thinks about vehicle trips in terms of their route instead of whole facilities, therefore, presenting reliability information based on common routes may make reliability information more accessible to the general public. Analysis of routes also facilitates the evaluation of the interrelationship between TMC segments. A subset of incident data was also used to determine the effective incident spatial area of influence beyond the physical boundaries of the site entered into RITIS. Note that all graphs were constructed using Microsoft Excel's spline tool to plot a contiguous line through the data points for the travel time distribution. For the cumulative distribution functions (CDFs) this can create the erroneous impression that the CDF backs up in the values of the random variable. It would have been much better to use the piecewise linear plotting function.

Route 1 WB Analysis – I-540 & US 1 Capital Blvd. to I-40 & Davis Dr.

Table 48 lists information about the route constructed from a series of TMC segments along I-540 and I-40. Route travel rates were calculated by averaging spatially and temporally accurate synthetic vehicle trajectories across the length of the route. Vehicle trajectories were only included if all of the time/space observations used to calculate the continuous trajectory are valid. Reported route travel rates for each temporal interval were classified as unflagged if on average less than five TMC segments had an external event flag, otherwise the interval was designed as flagged.

Table 48: Route 1 WB details and associated TMC descriptions.

	I-40 WB	I-540 WB	Entire Route
Number of TMC Segments	7	16	23
Total distance of TMC segments (mi)	2.7167	15.9796	18.6963
First TMC Segment	125P04863	125N05083	125N05083
Last TMC Segment	125P04866	125-04896	125P04866

Table 49 includes the distribution of the average number of flags for each type of external event and possible combinations. The number of time/space observation flags encountered by each synthetic trajectory was averaged to tabulate a value for the temporal interval. Based on the distribution, the normal/abnormal threshold was set at a two-flag average upper bound on normal observations. Using this criterion, speed distributions were generated for normal and abnormal conditions over each temporal analysis period.

Table 49: Route 1 WB event flag distributions for incidents, flow rates, and weather over all temporal intervals.

Number of Flags	Incidents	Weather	Flow	F & I	I & W	F & W	All
> 0	139	14414	8466	7	137	1281	5
> 1	110	13780	5249	2	110	879	2
> 2	56	13630	4203	0	56	714	0
> 3	35	11815	3605	0	35	515	0
> 4	23	11716	3105	0	23	409	0
> 5	21	11570	2705	0	21	352	0
Average	**2.3878**	**13.1549**	**3.6859**				

Table 50 shows the speed distributions observed along Route 1 WB in miles per hour. The most variation was observed during the AM peak period. **Table 51** includes statistical measures for all, unflagged, and flagged observations along Route 1 WB. **Table 52** displays statistics for all observations by temporal analysis period. Mean, standard deviation, key

percentiles, LOTTR and BTI for all normal observations, all abnormal observations, normal AM peak period, and PM peak period are tabulated. Of the external factors, the weather flag was active for the most time intervals. In every instance flow and incident flags were active, the weather flag was active as well. Concurrent and collocated incident and weather events had the highest frequency of observations with the number of flag active TMC segments along Route 1 WB.

Table 50: Route 1 WB speed distribution for both unflagged and flagged operating conditions for each temporal analysis period. Speeds in miles per hour.

Unflagged	All Intervals	AM Peak	PM Peak	Off-Peak	Weekend
60+	88.06%	78.80%	89.02%	88.90%	90.09%
55-60	10.35%	11.32%	10.02%	10.73%	9.52%
45-55	0.99%	5.82%	0.66%	0.28%	0.28%
40-55	0.20%	1.13%	0.15%	0.05%	0.07%
30-40	0.23%	1.58%	0.08%	0.04%	0.04%
15-30	0.16%	1.23%	0.07%	0.00%	0.00%
0-15	0.01%	0.11%	0.00%	0.00%	0.00%
Flagged	**All Intervals**	**AM Peak**	**PM Peak**	**Off-Peak**	**Weekend**
60+	86.78%	78.89%	84.66%	88.48%	88.18%
55-60	10.72%	11.99%	13.97%	11.01%	8.85%
45-55	1.60%	4.92%	0.87%	0.47%	2.07%
40-55	0.37%	1.24%	0.09%	0.02%	0.59%
30-40	0.28%	1.27%	0.09%	0.02%	0.31%
15-30	0.21%	1.39%	0.32%	0.00%	0.00%
0-15	0.04%	0.30%	0.00%	0.00%	0.00%

Table 51: Statistical data and critical percentiles by observation type for Route 1 WB for all temporal intervals.

	All Intervals	Unflagged	Flagged
Mean Travel Rate	0.9648	0.9775	0.9975
Mean S.D.	0.0520	0.1356	0.2257
# of Abnormal Travel Rates	3296	2415	881
LOTTR	1.0134	1.0130	1.0396
BTI	0.0648	0.0597	0.2963

Table 51 (Continued).

Percentiles			
0.05	0.9179	0.9179	0.9154
0.25	0.9441	0.9441	0.9431
0.5	0.9620	0.9620	0.9597
0.75	0.9668	0.9668	0.9656
0.80	0.9749	0.9749	0.9722
0.95	1.0244	1.0244	1.0170

Table 52: Statistical data and critical percentiles by temporal analysis period for Route 1 WB for all observation types.

	AM Peak	**PM Peak**	**Weekend**
Mean Travel Rate	1.0139	0.9602	0.9651
Mean S.D.	0.2736	0.0687	0.0402
# of Abnormal Travel Rates	1022	392	999
LOTTR	1.0553	1.0305	1.0102
BTI	0.3486	0.0701	0.0547
Percentiles			
0.05	0.9080	0.9122	0.9270
0.25	0.9346	0.9371	0.9494
0.5	0.9515	0.9511	0.9625
0.75	0.9890	0.9706	0.9675
0.80	1.0041	0.9801	0.9724
0.95	1.2832	1.0178	1.0152

The largest variation in route travel time was observed in the AM peak period, which is consistent with westbound traffic departing from residential neighborhoods in north Raleigh and traveling to offices near RTP. The PM peak period exhibited the highest difference between normal and abnormal speeds over 60 mph.

Figure 40 displays CDF functions for Route 1 WB travel rates for unflagged and flagged observations. The 24-hour distributions closely track each other up to the 95th percentile when the flagged travel rates exceed normal travel rates. **Figure 41** shows the travel rate CDF

functions for each temporal analysis period. As expected, the most variability was observed in the AM peak period.

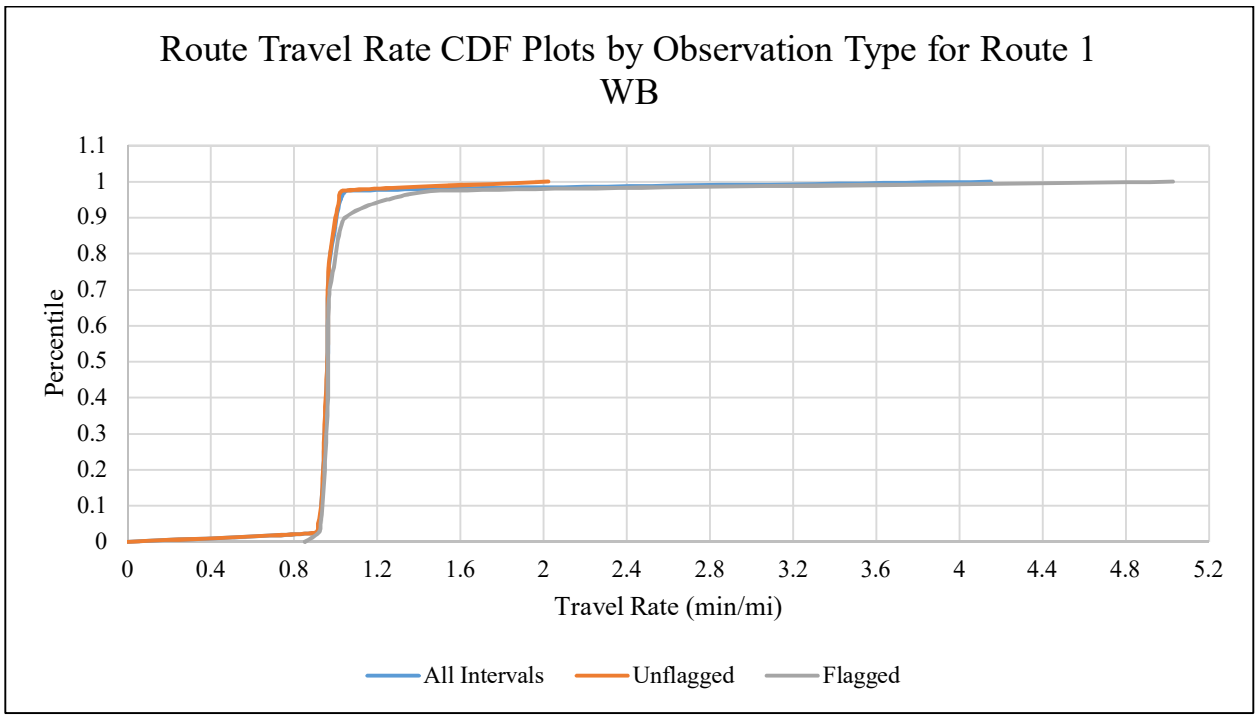

Figure 40: Travel rate CDF plots for all, unflagged, and flagged observations for Route 1 WB over all temporal intervals.

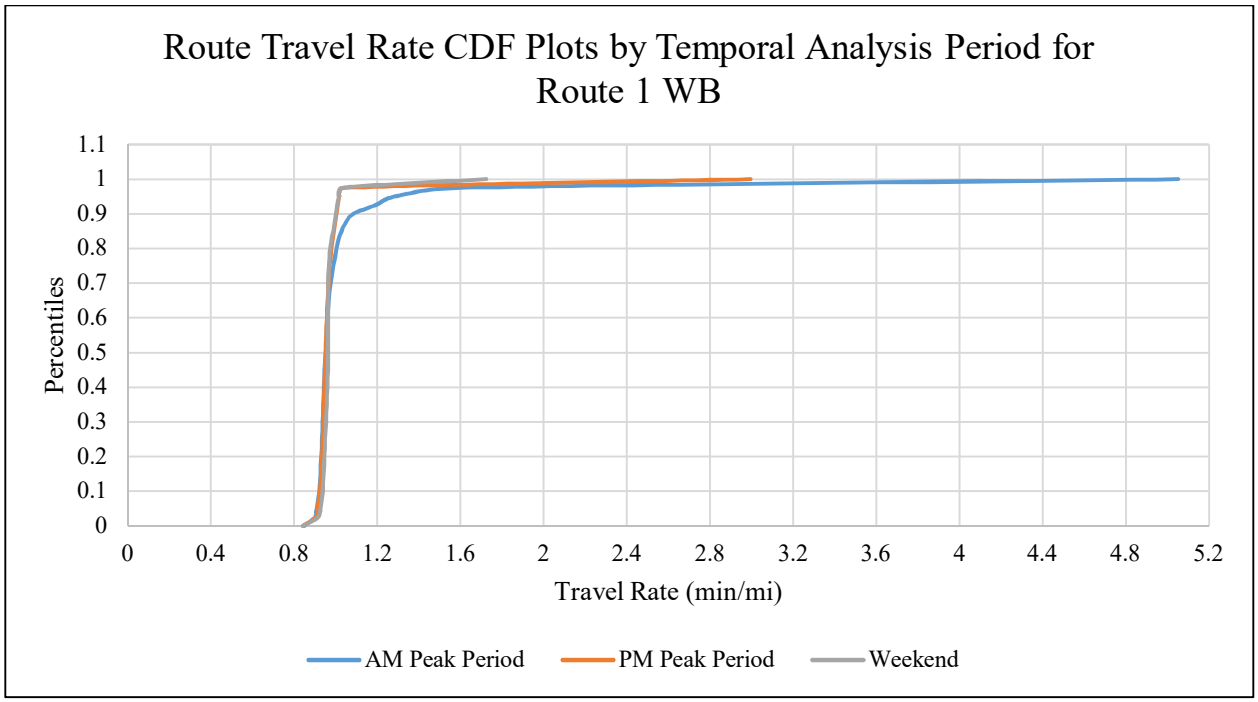

Figure 41: Travel rate CDF plots of all observation types by temporal analysis period for Route 1 WB.

Route 1 EB Analysis – I-540 & US 1 to I-40 & Davis Dr. (RTP)

Table 53 contains information about the route constructed from TMC segments along I-540 and I-40. **Table 54** shows the distribution of temporal route observations by the number of TMC segments along the route with an active external event flag. Intervals were labeled unflagged if no more than four TMC segments reported an external event averaged among the synthetic vehicle trajectories used to tabulate the route travel rate.

Table 55 lists the speed distributions observed along Route 1 EB in miles per hour. The most variable analysis period was the PM peak; however, the majority of all observations were below 60 mph on average along the route.

Table 53: Route 1 EB characteristics and associated TMC descriptions.

	I-40 EB	I-540 EB	Entire Route
Number of TMC Segments	8	16	24
Total distance of TMC segments (mi)	2.9244	16.0808	19.0052
First TMC Segment	125-04866	125+04987	125-04866
Last TMC Segment	125N04863	125P05083	125P05083

Table 54: Route 1 EB event flag distributions for incidents, flow rates, and weather for all temporal intervals.

Number of Flags	Incidents Only	Weather Only	Flow Only	F & I	F & W	I & W	All
> 0	3951	13758	11,829	1801	1325	387	50
> 1	3785	12250	8657	772	870	346	23
> 2	3246	12215	6681	413	654	282	6
> 3	3211	12198	5501	250	540	271	2
> 4	3059	12178	4736	160	478	241	1
> 5	2182	12038	4736	94	407	191	0
Average	**5.1680**	**19.0391**	**4.6367**				

Table 55: Route 1 EB speed distribution for both unflagged and flagged operating conditions for each temporal analysis period. Speeds are in miles per hour.

Unflagged	24-Hour	AM Peak	PM Peak	Off-Peak	Weekend
60+	6.50%	9.43%	8.42%	5.47%	5.72%
55-60	87.84%	89.15%	68.39%	91.77%	92.46%
45-55	3.25%	1.27%	10.52%	2.11%	1.65%
40-55	1.18%	0.09%	6.05%	0.35%	0.10%
30-40	0.92%	0.03%	5.03%	0.20%	0.05%
15-30	0.30%	0.03%	1.53%	0.09%	0.02%
0-15	0.01%	0.00%	0.07%	0.00%	0.00%
Flagged	**24-Hour**	**AM Peak**	**PM Peak**	**Off-Peak**	**Weekend**
60+	4.89%	8.54%	7.07%	3.99%	4.71%
55-60	87.25%	87.37%	68.96%	89.27%	87.80%
45-55	5.19%	2.83%	9.17%	4.80%	5.88%
40-55	1.05%	0.50%	3.72%	0.88%	0.91%
30-40	0.95%	0.25%	3.53%	0.91%	0.65%
15-30	0.59%	0.50%	6.40%	0.15%	0.05%
0-15	0.08%	0.00%	1.15%	0.00%	0.00%

Table 56 includes statistical measures and key percentiles for all, unflagged, and flagged observations during all temporal intervals. There was a significant increase in the BTI for flagged observations versus unflagged observations. However, the LOTTR did not increase significantly between unflagged and flagged observations. **Table 57** shows statistics and key percentiles for each temporal analysis period. The PM period had the highest BTI and LOTTR among the analysis periods.

Table 56: Statistical data and critical travel rate percentiles for Route 1 EB by observation type for all temporal intervals.

	All Intervals	Unflagged	Flagged
Mean Travel Rate	1.0643	1.0800	1.0394
Mean S.D.	0.1050	0.1858	0.0362
# of Intervals w/ Abnormal Travel Rates	2581	395	2186
LOTTR	1.0226	1.0195	1.0307
BTI	0.0535	0.0312	0.5479
Percentiles			
0.05	0.9985	0.9987	1.0014
0.25	1.0271	1.0262	1.0437
0.5	1.0554	1.0528	1.0665
0.75	1.0723	1.0687	1.0837
0.80	1.0793	1.0734	1.0993
0.95	1.1118	1.0857	1.6509

Table 57: Statistical data and critical travel rate percentiles for Route 1 EB by temporal analysis period.

	AM Peak	PM Peak	Weekend
Mean Travel Rate	1.0246	1.0640	1.0170
Mean S.D.	0.0450	0.5643	0.0230
# of Intervals w/ Abnormal Travel Rates	40	2009	116
LOTTR	1.0247	1.0640	1.0170
BTI	0.0450	0.5643	0.0230

Table 57 (Continued).

Percentiles	AM Peak	PM Peak	Weekend
0.05	0.9880	0.9917	0.9988
0.25	1.0159	1.0201	1.0373
0.5	1.0312	1.0482	1.0614
0.75	1.0533	1.0847	1.0755
0.80	1.0566	1.1154	1.0794
0.95	1.0776	1.6397	1.0858

The speed distribution along this route indicated poor performance across all time periods with the majority of vehicle speed observations were between 55-60 mph. This result suggests the presence of recurring congestion and likely capacity deficiencies. The normal PM peak period buffer time index was substantially higher than the other three analysis conditions.

Figure 42 displays CDF functions for Route 1 EB travel rates for both normal and abnormal observations. As shown on **Figure 43**, the normal observation PM peak period distribution indicated the sharpest increase in variability, while the normal AM peak period distribution was the flattest of the four analysis scenarios. The variation from the free flow speed occurs above the 80th percentile, therefore, the difference was not accounted for by the LOTTR metrics.

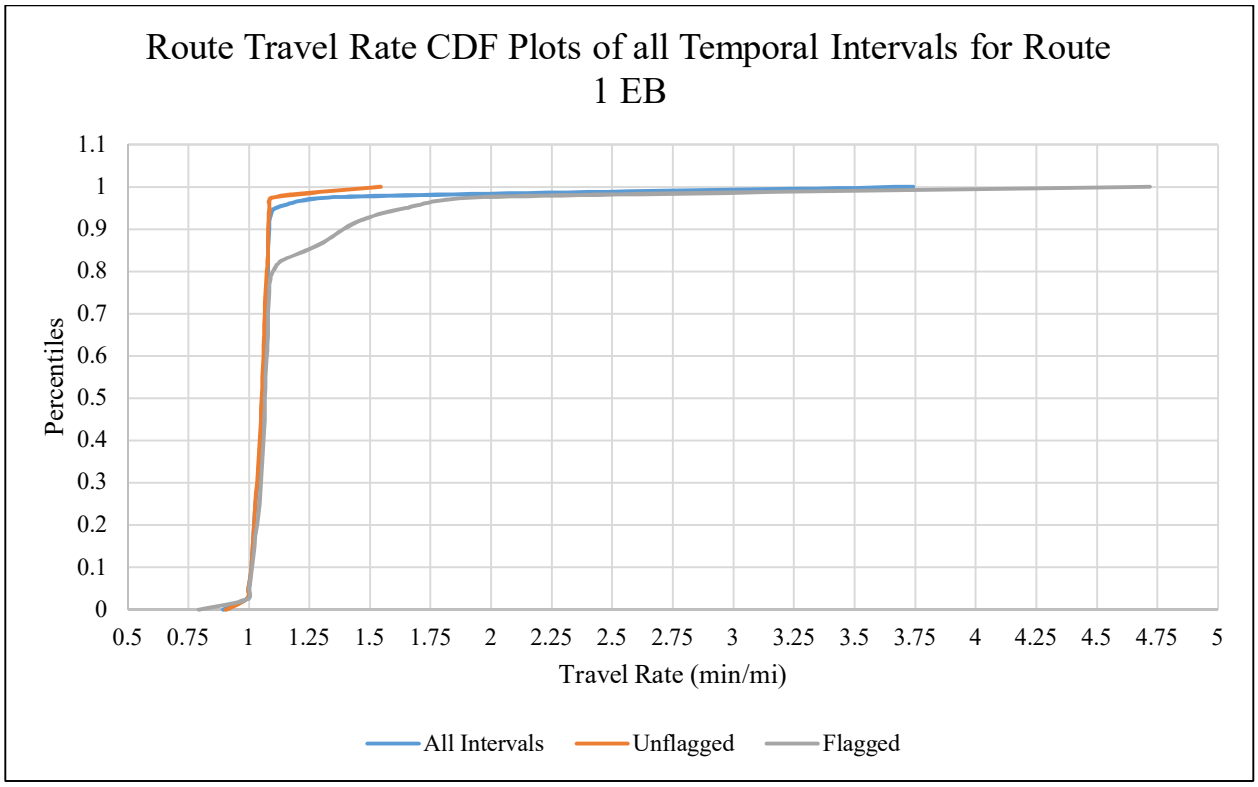

Figure 42: CDF Plots of route travel rates for all, unflagged, and flagged observations during all temporal intervals.

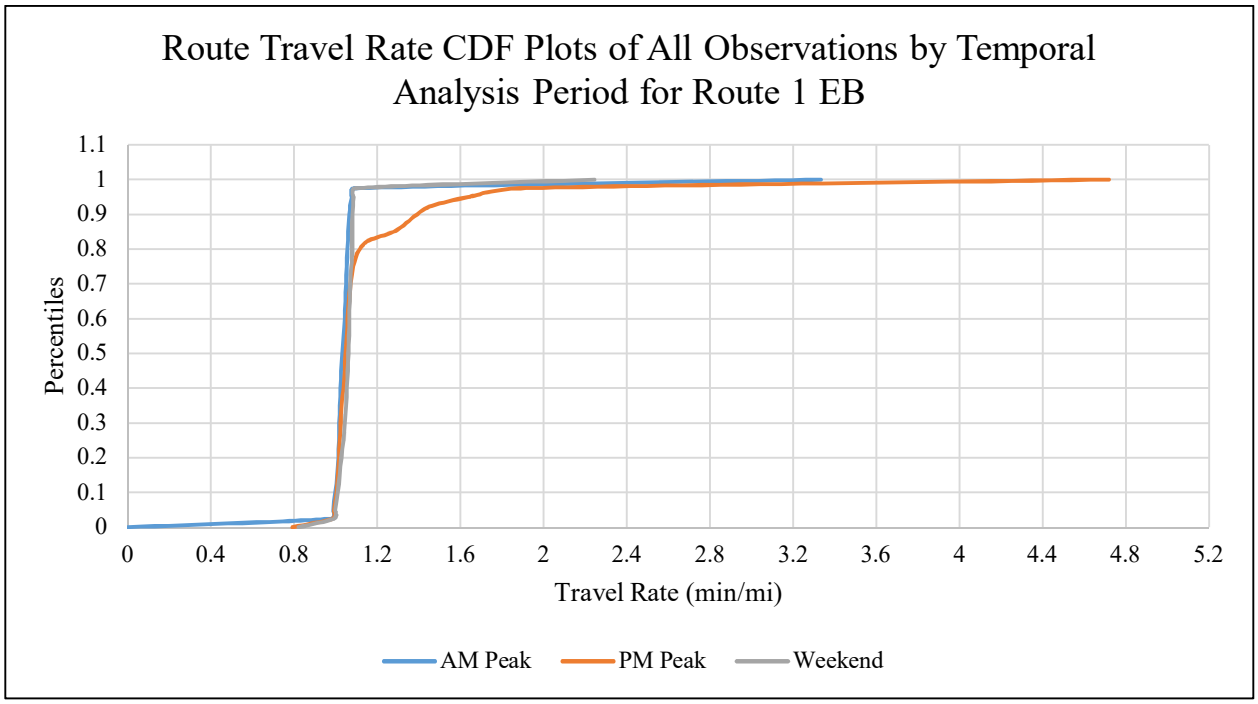

Figure 43: CDF plots of Route 1 EB travel rates by temporal analysis period.

Route 2 WB Analysis – I-440 & US 64 Bus to I-40 & Davis Dr. (RTP)

This route was comprised of TMC segments from I-440 WB, all TMC segments along Wade Avenue WB, and some TMC segments along I-40 WB from US 64 Bus in east Raleigh to Davis Dr. near RTP. **Table 58** shows information about the route and the TMC segments that comprise it.

Table 59 shows the distribution of temporal route observations by the number of TMC segments along the route with an active external event flag. Intervals were deemed unflagged if no more than four TMC segments have an external event flag, otherwise intervals were designated flagged. Based on these criteria, speed distributions were generated for normal and abnormal conditions over each temporal analysis period. **Table 60** lists the speed distributions observed along Route 2 WB. Valid travel time/speed data was only available for approximately half of the 105,120 temporal observation intervals due to missing data along Wade Avenue. Therefore, the sample size for these analyses are significantly smaller than other route and facility analyses.

Table 58: Route 2 WB characteristics and associated TMC descriptions.

	I-440 WB	**Wade Ave WB**	**I-40 WB**	**Entire Route**
Number of TMC Segments	18	6	14	38
Total distance of TMC segments (mi)	10.2194	2.2784	8.4769	20.9747
First TMC Segment	125+04986	125P10249	125+04860	125+04986
Last TMC Segment	125P04980	125+04970	125P04866	125P04866

Table 59: Route 2 WB event flag distributions for incidents, flow rates, and weather for all temporal intervals.

Number of Flags	Flow Only	Incidents Only	Weather Only	F & I	F & W	I & W	All
> 0	1413	2151	13444	96	120	184	15
> 1	734	963	7105	31	65	95	2
> 2	521	183	6665	3	42	6	0
> 3	370	83	6602	0	27	3	0
> 4	253	35	6523	0	19	2	0
> 5	253	17	6166	0	8	0	0
Average	**2.0853**	**0.9989**	**13.6840**				

Table 60: Route 2 WB speed distribution for both normal and abnormal operating conditions for each temporal analysis period.

Unflagged	24-Hour	AM Peak	PM Peak	Off-Peak	Weekend
60+	82.58%	73.36%	63.64%	89.50%	85.38%
55-60	11.15%	11.81%	14.34%	9.34%	11.95%
45-55	3.15%	7.42%	10.19%	0.77%	1.52%
40-55	0.87%	2.20%	2.76%	0.15%	0.50%
30-40	1.13%	2.66%	4.01%	0.16%	0.53%
15-30	1.08%	2.41%	4.89%	0.08%	0.13%
0-15	0.04%	0.12%	0.16%	0.00%	0.00%
Flagged	**24-Hour**	**AM Peak**	**PM Peak**	**Off-Peak**	**Weekend**
60+	76.32%	54.50%	60.27%	86.22%	82.42%
55-60	15.32%	23.46%	15.10%	12.67%	14.44%
45-55	3.98%	12.89%	7.26%	0.64%	1.77%
40-55	1.16%	4.05%	2.61%	0.11%	0.08%
30-40	1.50%	3.75%	4.09%	0.25%	0.89%
15-30	1.64%	1.35%	10.10%	0.11%	0.40%
0-15	0.07%	0.00%	0.57%	0.00%	0.00%

For unflagged observations, the PM peak period had the lowest proportion of vehicle speeds higher than 60+ miles per hour. The AM peak period had the lowest proportion of vehicle speeds higher than 60+ miles per hour for abnormal observations. For all temporal analysis periods, the abnormal speed distribution was at least a few percentage points below the

normal observations. **Table 61** shows statistical data and key travel rate percentiles for all, unflagged, flagged observations along Route 2 WB. There was not a major difference between unflagged and flagged observations. **Table 62** displays statistics and key travel rate percentiles for each temporal analysis period. Higher travel rates were observed during the PM period.

Table 61: Statistical data and critical travel rate percentiles of all, unflagged, and flagged observations along Route 2 WB over all temporal intervals.

	All Intervals	Unflagged	Flagged
Mean Travel Rate	1.0136	1.0122	1.0238
Mean S.D.	0.2199	0.2135	0.2628
Abnormal Travel Rates	1343	1147	196
LOTTR	1.0260	1.0255	1.0336
BTI	0.1994	0.1978	0.2137
Percentiles			
0.05	0.9398	0.9398	0.9398
0.25	0.9571	0.9570	0.9585
0.50	0.9696	0.9695	0.9703
0.75	0.9878	0.9876	0.9893
0.80	0.9948	0.9942	1.0029
0.95	1.1630	1.1612	1.1777

Table 62: Statistical data and critical travel rate percentiles for each temporal analysis period.

	AM Peak	PM Peak	Weekend
Mean Travel Rate	1.0604	1.1394	0.9874
Mean S.D.	0.2944	0.4531	0.0920
Abnormal Travel Rates	352	798	120
LOTTR	1.0895	1.1476	1.0204
BTI	0.5612	1.1458	0.0833

Table 62 (Continued).

Percentiles	AM Peak	PM Peak	Weekend
0.05	0.9346	0.9381	0.9423
0.25	0.9510	0.9563	0.9615
0.50	0.9694	0.9809	0.9706
0.75	1.0333	1.0597	0.9862
0.80	1.0561	1.1257	0.9904
0.95	1.5134	2.1048	1.0515

Figure 44 shows travel rate CDF functions for all, unflagged, and flagged observations along Route 2 WB. Minimal variation was observed between observations with and without and external event present, which suggests that minor impacts from external events can be smoothed over time. **Figure 45** displays travel rate CDF plots for each temporal analysis period. The weekday peak periods had more variation toward the upper end of the distribution than the weekend analysis period.

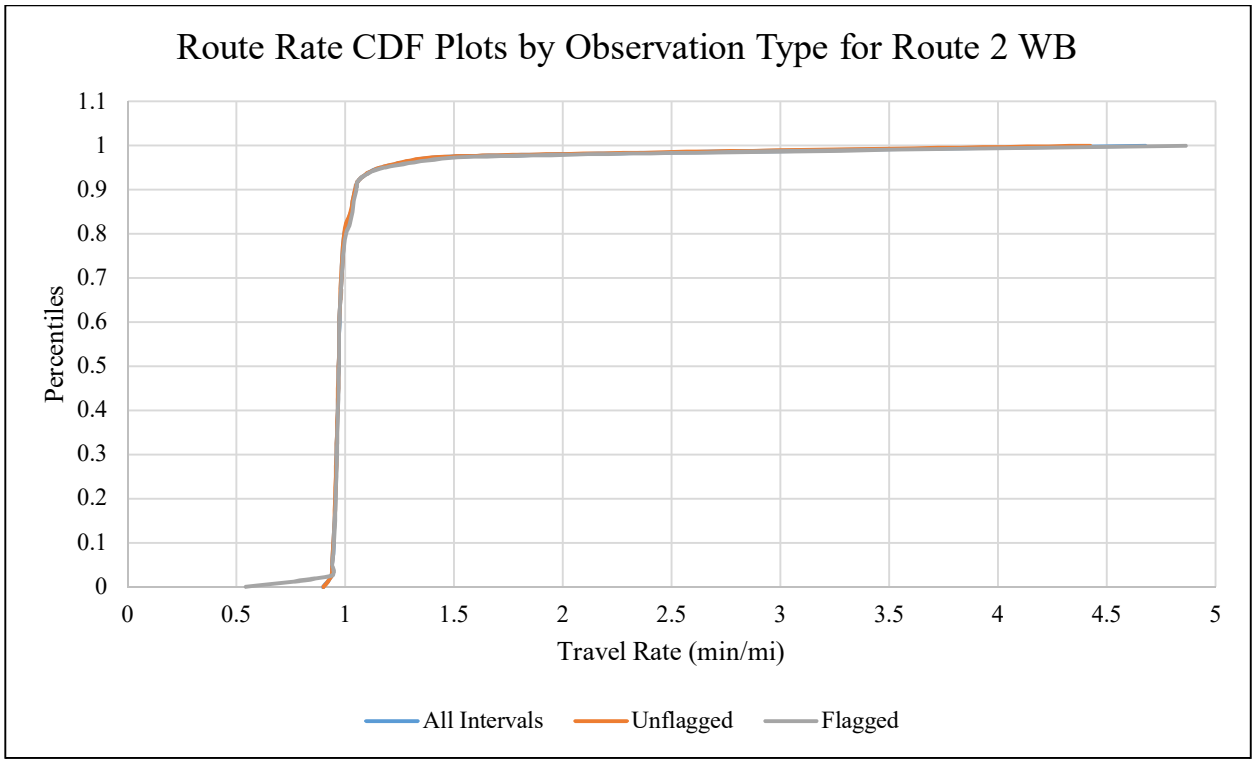

Figure 44: Route 2 WB travel rate CDF plots of all, unflagged, and flagged observations during all temporal intervals.

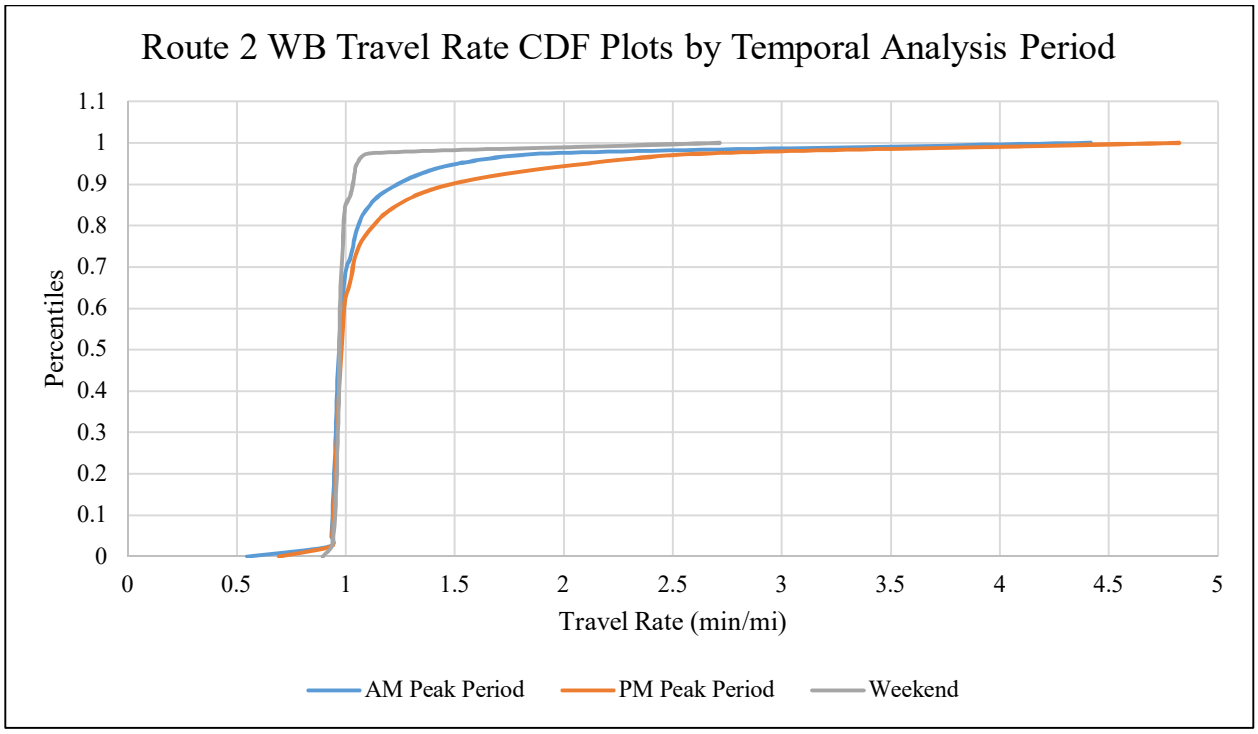

Figure 45: Route 2 WB travel rate CDF plots of all observations during each temporal analysis period.

Route 2 EB Analysis – I-40 & Davis Dr. (RTP) to I-440 & US 64 Bus

This route was constructed from TMC segments along I-440 EB, Wade Ave EB, and I-440 EB. **Table 63** displays information about the route and the component TMC segments. **Table 64** shows the distribution of temporal route observations by the number of TMC segments along the route with an active external event flag. Based on the results of this analysis, the normal/abnormal threshold was set at a two-flag average for each event type. For these criteria, speed distributions were generated for both normal and abnormal conditions during each temporal analysis period.

Table 63: Route 2 EB characteristics and associated TMC descriptions.

	I-440 EB	Wade Ave EB	I-40 EB	Entire Route
Number of TMC Segments	17	6	14	37
Total distance of TMC segments (mi)	9.2519	2.3296	8.3455	19.9270
First TMC Segment	125N04980	125-04969	125N04866	125N04866
Last TMC Segment	125N04986	125N04967	125-04859	125N04986

Table 64: Route 2 WB event flag distributions for incidents, flow rates, and weather for all temporal intervals.

Number of Flags	Flow Only	Incidents Only	Weather Only	F & I	F & W	I & W	All
> 0	1848	5651	14546	63	129	759	2
> 1	421	5047	13831	11	31	649	0
> 2	169	3565	13723	0	13	329	0
> 3	57	3420	13625	0	2	305	0
> 4	16	2457	13555	0	1	255	0
> 5	16	2401	12492	0	0	251	0
Average	**0.9121**	**4.4266**	**19.1895**				

Table 65 displays the generated speed distributions observed along Route 2 EB. Valid vehicle probe data was only available for about half of the temporal intervals during 2010, therefore, the sample of constructed route travel rates significantly smaller than other routes and facility analyses. The greatest variation among unflagged observations occurred during the PM peak period, however, the most variation among flagged observations occurred during the AM peak period.

Table 65: Route 2 EB speed distribution for both normal and abnormal operating conditions for each temporal analysis period.

Unflagged	All Intervals	AM Peak	PM Peak	Off-Peak	Weekend
60+	82.58%	73.36%	63.64%	89.50%	85.38%
55-60	11.15%	11.81%	14.34%	9.34%	11.95%
45-55	3.15%	7.42%	10.19%	0.77%	1.52%
40-55	0.87%	2.20%	2.76%	0.15%	0.50%
30-40	1.13%	2.66%	4.01%	0.16%	0.53%
15-30	1.08%	2.41%	4.89%	0.08%	0.13%
0-15	0.04%	0.12%	0.16%	0.00%	0.00%
Flagged	**All Intervals**	**AM Peak**	**PM Peak**	**Off-Peak**	**Weekend**
60+	76.32%	54.50%	60.27%	86.22%	82.42%
55-60	15.32%	23.46%	15.10%	12.67%	14.44%
45-55	3.98%	12.89%	7.26%	0.64%	1.77%
40-55	1.16%	4.05%	2.61%	0.11%	0.08%
30-40	1.50%	3.75%	4.09%	0.25%	0.89%
15-30	1.64%	1.35%	10.10%	0.11%	0.40%
0-15	0.07%	0.00%	0.57%	0.00%	0.00%

For all temporal observations, there was an approximately 6% decrease in observed speeds greater than 60 mph from normal conditions to abnormal conditions. During normal conditions, the PM peak period reported the lowest proportion of speeds greater than 60 mph. However, during abnormal conditions, the AM peak period experienced the lowest proportion of speeds greater than 60 mph. For this route direction, there was an inverse relationship between absolute travel rate and variability across each temporal analysis period and observation type. The 24-hour normal observation buffer time index was higher than normal observations during the AM peak period.

Table 66 shows statistics and key travel rate percentiles for all, unflagged, and flagged observations over all temporal intervals. A significant increase and travel rates and reliability metrics was observed in the distribution of flagged observation. The LOTTR among flagged observations was higher than 1.50, indicating possible unreliability. **Table** 67 includes the

statistics and percentiles for each temporal analysis period. The PM peak period had significant higher travel rates and the poorest reliability among analysis periods.

Table 66: Route 2 EB statistical data and critical travel rate percentiles for all, unflagged, and flagged observations over all temporal intervals.

	All Intervals	Unflagged	Flagged
Mean Travel Rate	1.0726	0.9800	1.4228
Mean S.D.	0.4078	0.0562	0.7930
# of Deviant Obs.	2209	21	2188
LOTTR	1.0288	1.0173	1.8229
BTI	0.6611	0.0600	2.2175
Percentiles			
0.05	0.9430	0.9419	0.9487
0.25	0.9615	0.9600	0.9709
0.5	0.9746	0.9724	0.9963
0.75	0.9924	0.9838	1.5470
0.80	1.0026	0.9893	1.8161
0.95	1.6189	1.0307	3.2056

Table 67: Route 2 EB statistical data and critical travel rate percentiles of all observations for each temporal analysis period.

	AM Peak	PM Peak	Weekend
Mean Travel Rate	0.9942	1.4818	1.0018
Mean S.D.	0.2918	0.7864	0.2034
# of Deviant Obs	59	1866	154
LOTTR	1.0184	1.8873	1.0195
BTI	0.0823	2.0535	0.0572
Percentiles			
0.05	0.9307	0.9481	0.9473
0.25	0.9484	0.9701	0.9667
0.5	0.9597	1.0531	0.9752
0.75	0.9730	1.7150	0.9878
0.80	0.9774	1.9875	0.9942
0.95	1.0387	3.2156	1.0310

Figure 46 shows the travel rate CDF plots of all, unflagged, and flagged conditions over all temporal analysis intervals. The travel rate distribution of flagged incidents starts to increase

above free-flow speed at the 60th percentile compared to the 90th percentile for unflagged observations. **Figure 47** includes travel rate CDF plots of all observations for each temporal analysis period. Variation begins at the 50th percentile for the PM peak period distribution while the other peak periods did not vary until the very top end of the distribution.

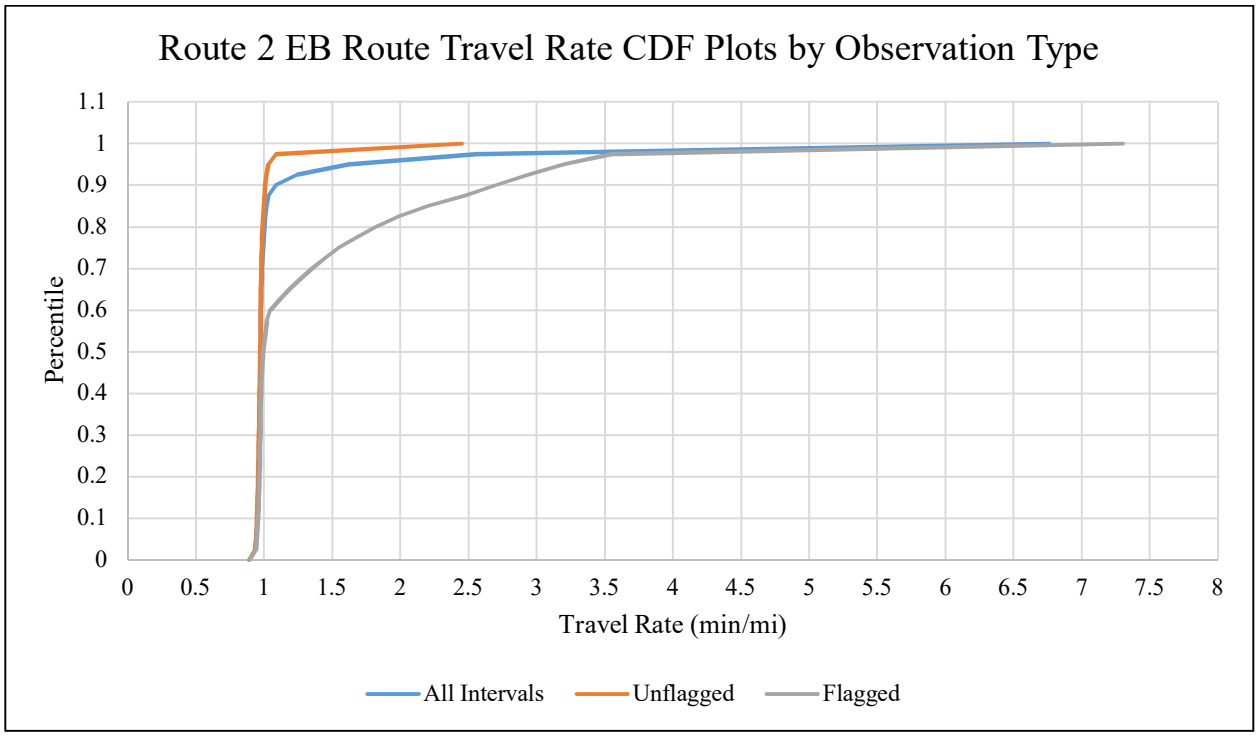

Figure 46: Route 2 EB travel rate CDF plots for all, unflagged, and flagged observations over all temporal intervals.

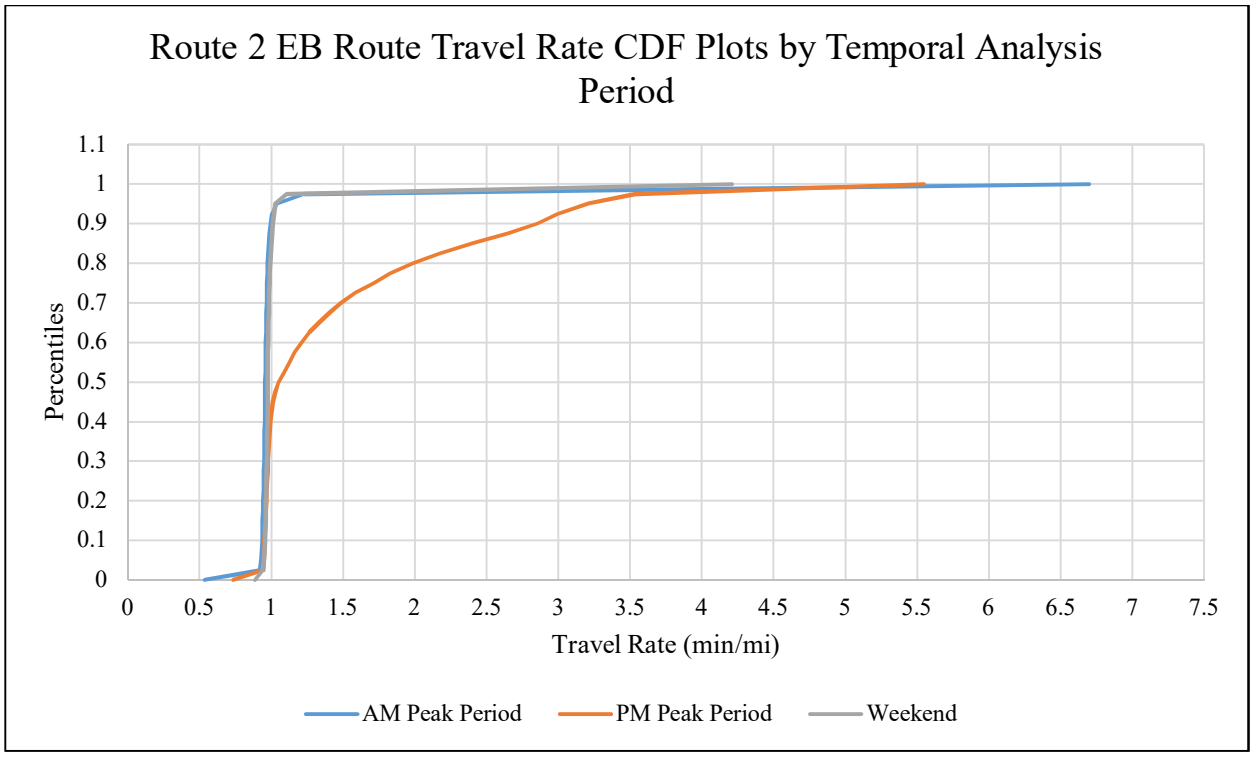

Figure 47: Route 2 EB travel rate CDF plots all observations by temporal analysis period.

Spatial Analysis of Incidents

Unlike more traditional methods of crash analysis that focus on the vehicles involved and reconstructing a narrative, travel time reliability focuses on the impacts to other vehicles in the traffic stream. While priority is rightly placed on the safety of users and responding emergency personal, incidents can significantly impair traffic operating conditions and are a major contributor to travel time unreliability. Incident locations logged in databases such as TIMS focus on correctly identifying the spatial location of the event rather than the spatial area in which users experience the impact of the collision. At the most basic level, controllers in traffic control centers decide which dynamic message signs are to be updated with incident information, in part based on the deemed severity and likelihood of causing significant delay to upstream vehicles. These operators also decide how long the warning message should be displayed.

Travel time reliability monitoring systems are only as accurate as the input data used to construct distributions and models. Therefore, the closer the incident location and bounds are to the effective limits experienced by users, the more accurate the reliability analysis will be. The NCDOT reliability monitoring system prototype was developed using ex post facto data and analysis, therefore, only data previously recorded were available for use. Operational reliability monitoring systems can benefit from observational data such as the effective spatial and temporal bounds of incidents. The use of remote video monitoring allows operators to visually determine incident impact extents and serves as a complement to automated qualitative monitoring systems that capture data for facilities not covered by a live traffic monitoring center or during hours a center to not staffed.

Direct observation can be very effective; however, more quantitative analysis methods may be needed to both account for possible variation between traffic control operators and provide greater coverage. To measure the effective incident extents of incidents, incident data reported along I-40 EB were used to develop a method based the number of abnormal travel rate observations. Travel rate time/period observations were originally deemed flagged or unflagged based on the presence of external events. For incidents, the spatial and temporal extents described in the incident report were used to assign incident flags to time/space observations included in the spatiotemporal area defined by TIMIS. Time/space observations lacking any event flags were deemed to be normal. Mean and standard deviation were tabulated for each TMC over each temporal analysis period. Normal travel observations were deemed deviant if they were outside of two standard deviations from the mean. These time/space intervals require additional analysis to determine the cause and why they weren't captured. If a monitoring system does not include flow rate data, deviant observations may reflect periods of recurring

congestion. Even under ideal data collecting conditions, some data error and loss is to be expected, therefore, some deviant observations will be present.

Additional incident extent analysis started by identifying study periods adjacent both spatially and temporal from the beginning time/space region of each accident. Regions located within the bounds reported in TIMS are already flagged as abnormal, therefore, the focus was placed on adjacent time/space regions that may not have been included in the ranges provided by RITIS. From the starting temporal and spatial bounds, the previous ten segments and twenty temporal intervals were set as the pre-incident study area to determine the average number of deviant observations spatially for each temporal interval and temporal for each spatial interval. To evaluate incident extents upstream of the incident location and the duration of impacts after the incident clears, the twenty temporal intervals beyond the reported end of the incident and the ten segments upstream of the spatial incident terminus. The number of deviant observations were tabulated for each incident and time/space combination in the control and study regions. The number of deviant cells were compared to the time and space averages to identify higher than normal regions indicative of influence from an adjacent incident.

Table 68 shows spatial and temporal averages of the pre-incident study area, the number of deviant observations adjacent to incidents for each of the 200 time/space regions in the post-incident study area, and the difference between pre-incident average and each time/space region. The Excel Solver was used to determine the appropriate temporal and spatial extents such that the difference between the number of deviant observations at each extent and the pre-incident temporal and spatial average. Excel Solver was used to optimize the number of temporal and spatial intervals such that the sum of the deltas is as close to zero as possible. The optimized analysis space was the 10 preceding spatial segments and 16 subsequent temporal intervals. The

analyst could either incorporate the entire time/space area or only those observations within the area that were calculated as deviant.

Table 68: Spatial analysis of incidents and development of incident extent study area.

			10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
			17	17	16	16	18	23	27	31	41	50	**Pre-Inc Ave**
			-1.4	0.1	0.2	2.9	8.7	4.8	3.7	2.7	1.4	-11.0	∆
∆	**Pre-Inc Ave**		**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
53.4	14.7		36	34	33	40	52	71	97	122	120	76	**1**
49.7	14.1		35	38	37	42	55	73	88	106	102	62	**2**
42.0	15.3		34	40	39	45	53	70	82	89	69	52	**3**
39.5	16.4		36	41	38	46	55	69	75	76	69	54	**4**
33.9	17.8		38	39	36	46	50	62	58	66	65	57	**5**
28.4	19.1		34	36	37	37	41	51	53	63	65	58	**6**
26.2	20.2		33	35	30	35	39	51	55	63	65	58	**7**
19.7	21.8		27	29	26	34	35	45	48	55	61	55	**8**
20.4	20.8		24	23	25	32	41	49	50	54	57	57	**9**
13.3	23.6		24	24	21	26	36	44	44	49	51	50	**10**
12.5	23.1		21	25	25	26	33	40	43	47	50	46	**11**
10.6	26.8		23	27	30	28	32	41	44	48	52	49	**12**
8.9	26.9		22	25	29	30	31	38	41	47	48	47	**13**
6.3	26.1		21	22	23	27	29	32	36	44	44	46	**14**
1.3	27.3		18	19	17	20	25	29	32	38	44	44	**15**
1.9	25.0		16	17	16	19	27	28	31	34	42	39	**16**
1.3	24.8		16	17	18	23	29	25	27	31	39	36	**17**
-2.4	27.0		16	18	18	24	27	27	26	30	30	30	**18**
-9.6	31.7		14	17	17	22	27	26	22	25	26	25	**19**
-17.6	37.9		12	17	16	21	22	22	24	19	25	25	**20**

Chapter 7: Special Event Data Summary and Analysis

The only special demand-generating event identified during the 2010 study year was a Thursday-night NC State home football game held at Carter-Finley Stadium, the university's off-campus football venue, on September 16th. The football game started at 7:30 PM, however, fans began arriving in the parking lots earlier in the afternoon. For the purpose of reliability analysis, the start of the event analysis period was set at 4:00 PM; the event analysis period ended at 10:00 PM. This temporal window includes the entire weekday evening peak period. The stadium is located adjacent to the Wade Avenue extension and in the vicinity of I-40 and I-440, therefore gameday traffic interacted with typical evening rush hour traffic and likely increased travel times near the stadium. By the end of the game, background traffic was likely significantly lower and departing fans were more easily absorbed into the freeway traffic streams.

Figure 48 indicates the location of the stadium and adjacent TMC segments that were analyzed to determine possible impacts on facility direction and commuting routes. Determination of which public events occurring during the study year constitute special demand-generating events was the responsibility of the analyst based on the purpose and objectives of the analysis and local knowledge about such events and adjacent facilities. Other mass-gathering events occurred during the 2010 study year, however, adjacent facilities can typically handle the additional demand. Congestion may be present but limited to local streets used to access the venue.

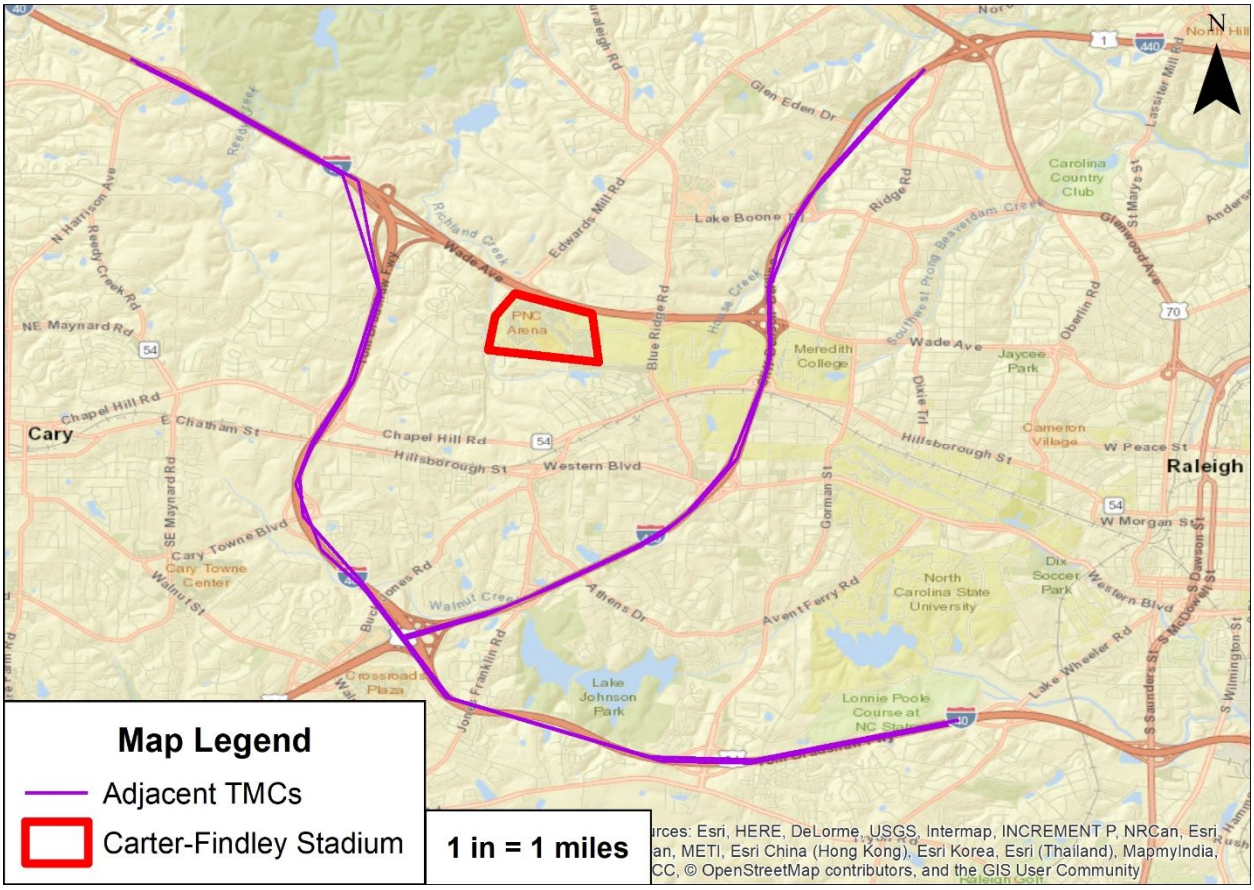

Figure 48: Location of football stadium and TMC segments included in the event analysis.

Wade Avenue was not included in the analysis because this facility primarily provides access to the stadium, adjacent arena, and state fairgrounds. Commuters that typically utilize the Wade Avenue extension on weekday evenings likely chose alternative routes to avoid gameday traffic. However, I-40 and I-440 continued to serve commuter traffic and were susceptible to major impacts on the traffic stream. A spatial selection was performed in GIS to develop a list of TMC segments in the immediate vicinity of the stadium that could have outsized traffic demand due to the football game. Traffic along US 1 south of I-440 was also likely impacted, however, that facility was not among those in this study.

12 TMC segments were identified as likely impacted for both directions of I-40 and 13 TMC segments were identified for both directions of I-440. Travel rate data, deviant time/space

observations, means, and percentile data were retrieved from the facility direction datasets. Deviant time/space regions without associated external events as defined by the facility PM peak period mean and standard deviation were identified for each TMC during the event temporal analysis period. Travel rates without any external event flags were classified as deviant if outside of two standard deviations on either side of the mean. While the last two hours of the event analysis period were outside of the facility PM peak period, the PM means and standard deviations for each TMC were used for all time intervals.

I-40 EB TMC segments located near the stadium reported 68 normal deviant observations during the event temporal analysis period. 125-04859 and 125N04859 both reported the highest number of deviant five-minute temporal intervals at 12. 9.87 miles of I-40 EB was included in the event analysis area, the longest of any facility direction in the vicinity of the stadium. The mean travel rates were tabulated for each TMC from 4:00 PM to 8:00 PM on the day of the event and compared to the PM peak facility means for the entire year. On average TMC means during the special events were 0.076 minutes per mile higher than the PM peak facility mean. The highest increase, 0.242 minutes per mile, occurred along the 125N04859 segment. The difference in means for each I-40 EB TMC was less than one standard deviation.

On **Figure 49**, 5-minute aggregated travel rates during the event temporal analysis period were plotted for several I-40 EB TMC segments; 125N04860, 125-04859, 125-04857,125N04857, 125-04965, and 125N04965. **Table 69** contains information about the TMC segments along I-40 EB in the vicinity of the stadium.

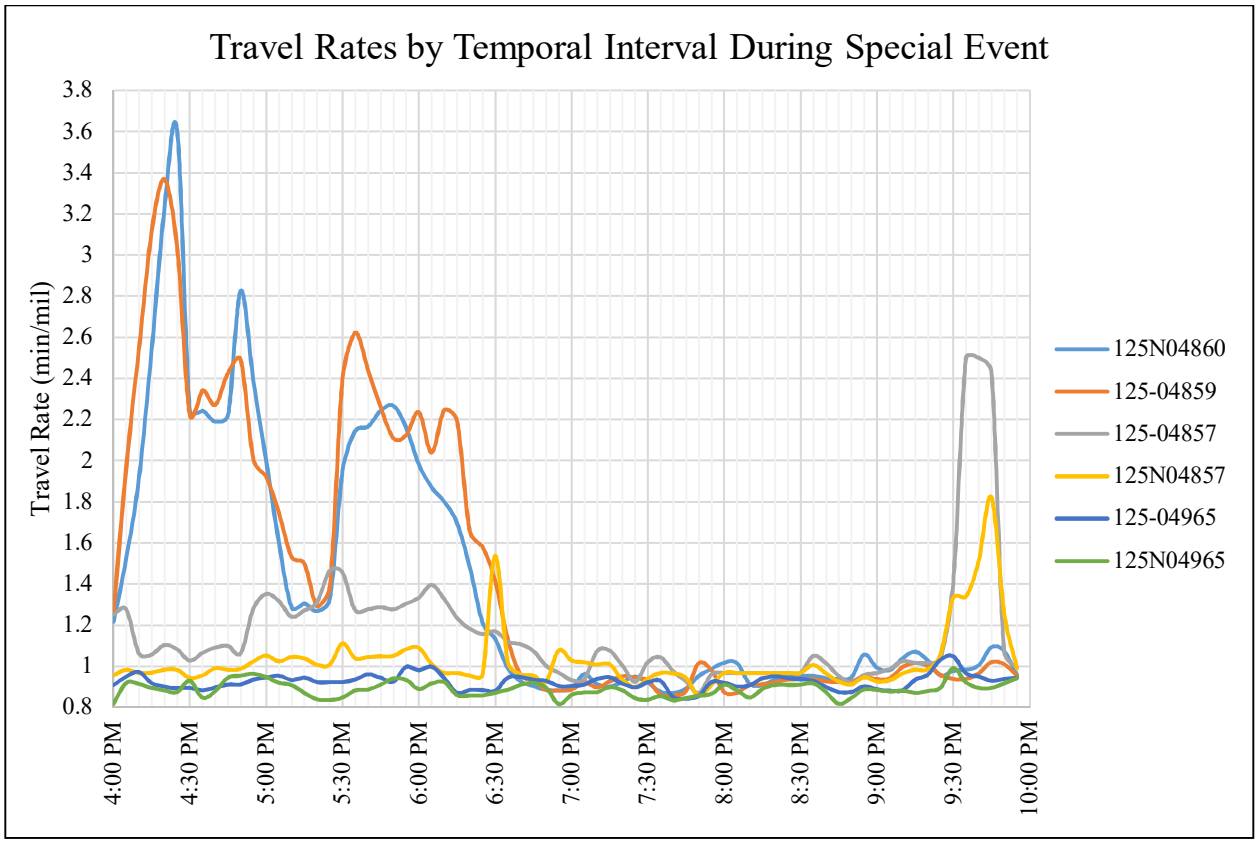

Figure 49: Travel Rates for selected I-40 EB TMC segments during special event.

.

Table 69: Description of TMC segments along I-40 EB included in the event study area.

TMC Segment	Nearest Interchange	Length (miles)	Mean Event PM Peak Travel Rate	Number of Deviant Intervals
125N04860	Harrison Ave	0.548	1.5965	6
125-04859	Wade Ave Ext	1.083	1.6997	12
125N04859	Wade Ave Ext	1.063	1.6129	12
125-04858	NC-54 / Cary	0.783	1.4310	6
125N04858	NC-54 / Cary	0.519	1.4654	10
125-04857	Cary Town Blvd	0.378	1.1480	3
125N04857	Cary Town Blvd	0.571	1.0039	1
125-04856	I-440/US 1 / 64	0.402	0.9812	2
125N04856	I-440/US 1 / 64	1.064	1.0345	8
125-04965	Gorman St.	1.531	0.9213	0
125N04965	Gorman St.	0.598	0.8992	0
125-04964	Lake Wheeler Rd.	1.332	0.8849	0
TOTALS:		**9.87335**		**68**

Figure 50 includes CDF plots for two TMC segments in the I-40 EB event study area using the travel rates during the PM peak period on the day of the special event and travel rates from every weekday PM peak period during the 2010 study year. The PM peak period facility CDFs of 125-04859, a TMC located west of the stadium, and 125-04965, a TMC to the east of the stadium, were compared with a CDF plot based on the travel rates reported during the event temporal analysis period for each TMC. The median travel rate during the event for 125-04859 was significantly higher than the median travel rate over all weekday PM peak periods during the study year. However, the 95th percentile travel rate for all PM peaks was higher than the event-based distribution. This suggests that some users recognized the potential for delays and chose alternative routes once travel rates start drastically increasing. 125-04859 had buffer time indices of 0.7826 and 2.3747 for the event analysis period and all PM peak periods in 2010

respectively. 125-04965 had a PM peak buffer time index of 0.0847 and an event temporal period buffer time index of 0.0590.

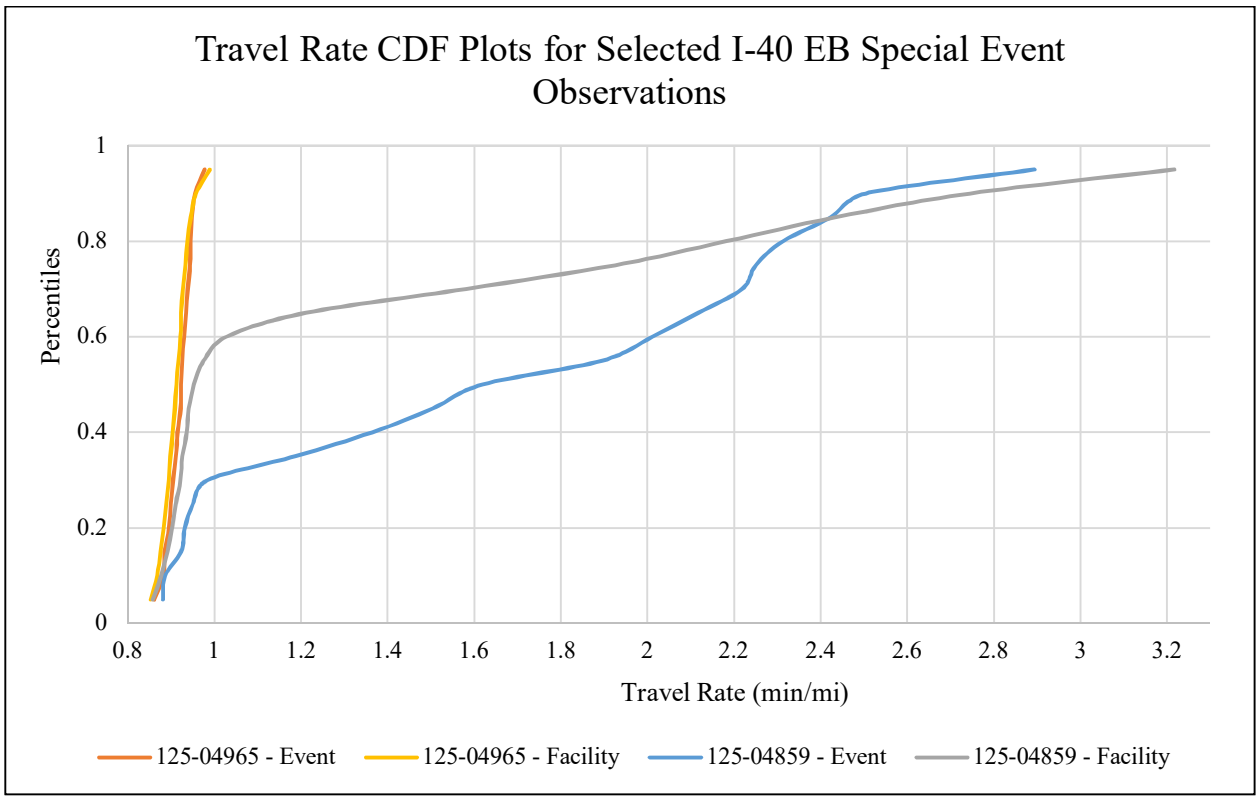

Figure 50: CDF plots for two TMC segments along I-40 EB in event spatial and temporal intervals.

I-40 WB TMC segments in the event spatial study area reported 135 deviant observations based on the PM peak period mean and standard deviation for the facility direction. 125+04965 reported the highest number of deviant observations, 25. On average, I-40 WB TMC segments had a mean travel rate during the event analysis period that was 0.027 min/mi higher than the mean travel rates for all PM peak periods in 2010. **Figure 51** includes travel rate plots for TMC segments 125P-4965, 125+04966, 125+04859, and 125P04859. At 5:15 PM and again at 5:30 PM, a sharp peak in travel rate was observed in 125+04966. Later in the event analysis period, at 8:30 PM, 125P04859 experienced a spike in travel rate; 125+04859 had a concurrent spike in travel rates of a smaller magnitude. 125P04965 peaked at 5:35 PM and 6:05 PM, however, the

peak travel rate was significantly lower than 125+04966. **Table 70** includes information on TMC segments along I-40 WB included in the event spatial study area.

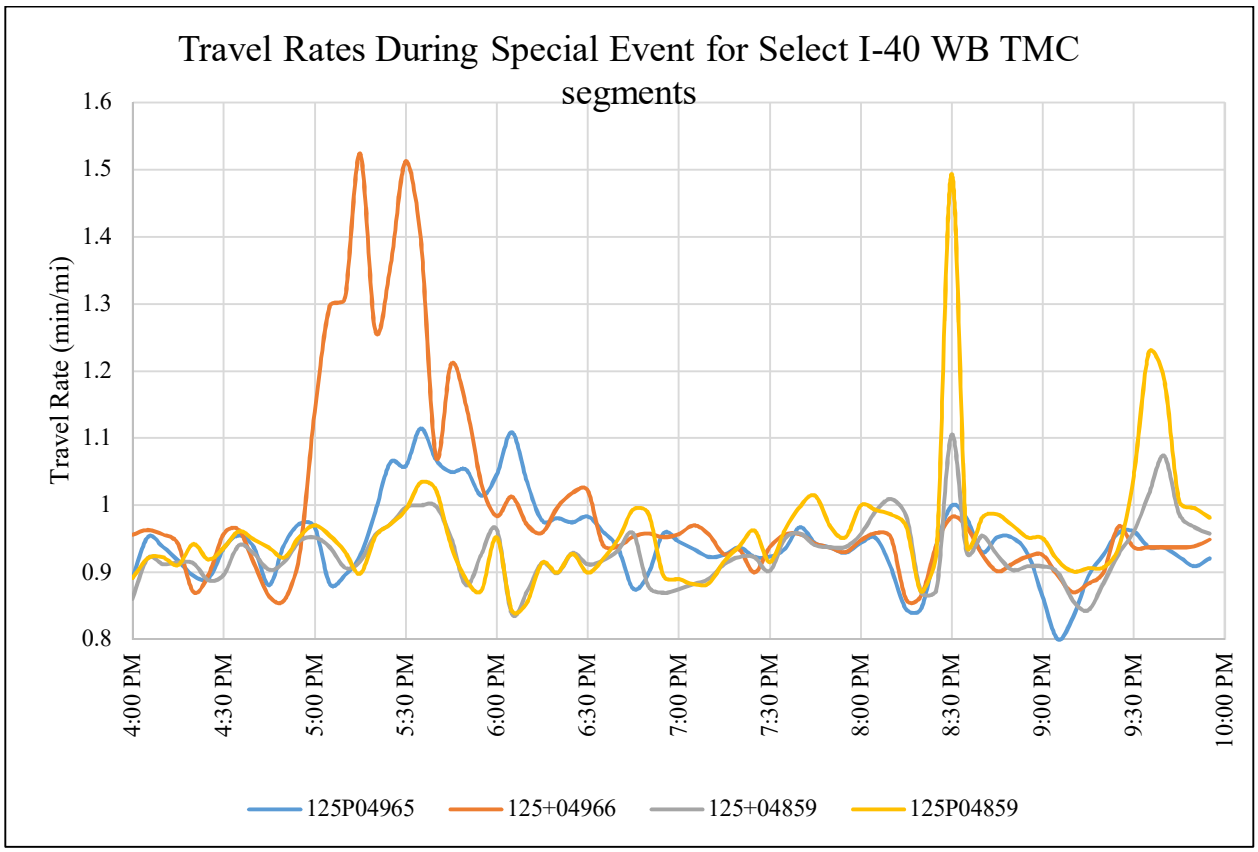

Figure 51: Travel rates during special event temporal analysis period for selected I-40 WB TMC segments in the event spatial area.

Table 70: Description of TMC Segments along I-40 WB within the event analysis area.

TMC Segment	Nearest Interchange	Length (miles)	Mean Event PM Peak Travel Rate	Number of Deviant Intervals
125+04965	Gorman St.	1.3827	1.1436	25
125P04965	Gorman St.	0.6926	0.9615	19
125+04966	US 64 / US 1	1.4222	1.0279	10
125P04966	US 64 / US 1	1.1002	1.1064	6
125P04856	US 1/64/I-440	1.1002	1.1401	7
125+04857	Cary Towne Blvd	0.6841	0.9625	0
125P04857	Cary Towne Blvd	0.3270	1.0144	8
125+04858	NC -54 / Cary	0.2662	1.0116	8
125P04858	NC -54 / Cary	0.5929	1.0151	12
125+04859	Wade Ave Ext	0.7160	0.9220	10
125P04859	Wade Ave Ext	1.0111	0.9358	6
125+04860	Harrison Ave.	1.1875	0.9666	12
125P04860	Harrison Ave.	0.6064	0.8990	12
TOTALS:		**9.3824**		**135**

CDFs of all weekday PM peak periods and the event PM peak period were generated for 125+04966 and 125+04859. The plots of each distribution are shown in **Figure 52**. For these I-40 WB TMC segments, the 95th percentile travel rate is higher for the distribution of all PM peak periods than the event peak period. 125+04966 had a buffer time index of 0.788 based on all peak periods and a buffer time index of 0.3964 based on the event temporal travel rate observations. 125+04859 had buffer time indices of 0.124 and 0.086 for all PM peak periods and the event analysis period respectively.

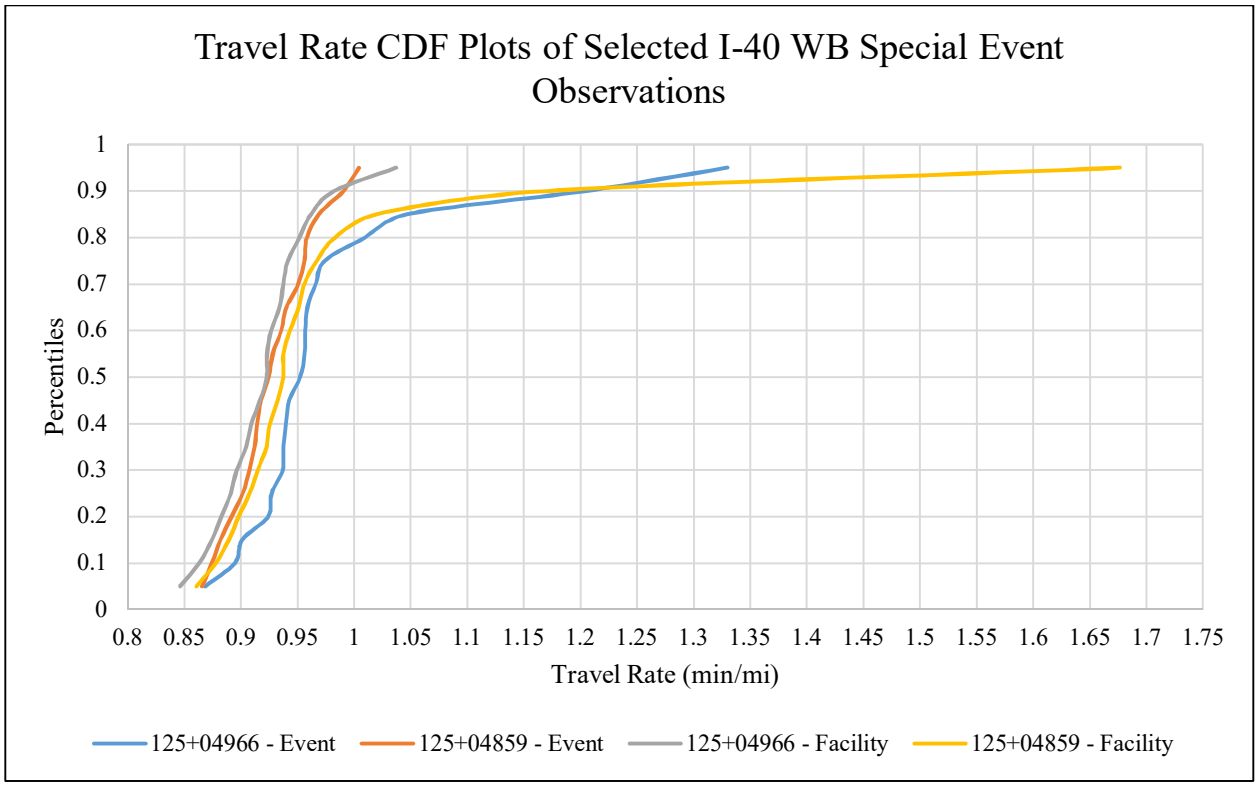

Figure 52: CDFs of selected I-40 WB TMC segments over all PM peak periods and the event analysis period.

Only one TMC along I-440 EB among the spatial segments included in the event analysis reported a deviant time/space travel rate based on the mean and standard deviation over all PM peak periods of 2010. 125N04982 reported a single deviant observation at 5:25 PM. Among I-440 EB TMC segments in the event spatial analysis area, the average difference in event and PM peak period means was -0.02 mins per mile. **Figure 53** shows the travel rates for selected TMC segments along I-440 EB. **Table 71** contains descriptions and other metrics on the TMC segments on I-440 EB within the event spatial areas.

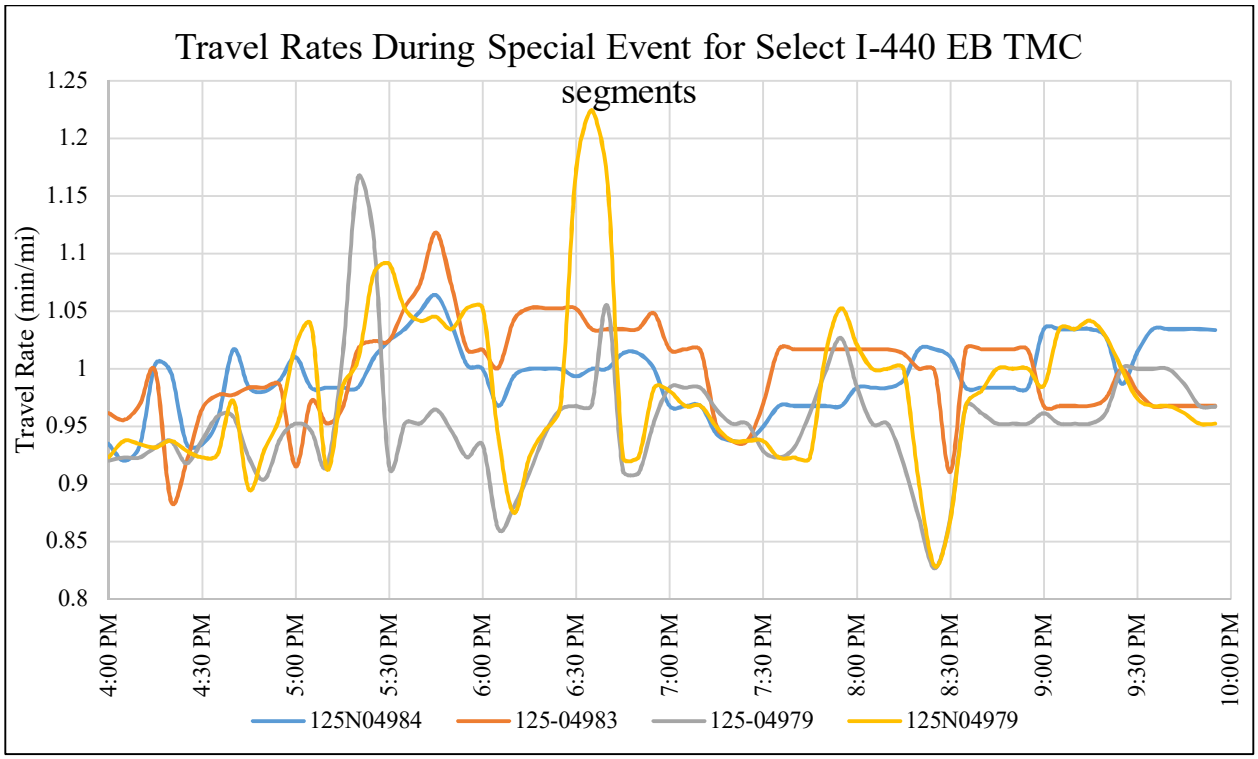

Figure 53: Travel rates during the temporal event analysis period for selected I-440 EB TMC segments.

Table 71: Description of I-440 EB TMC segments in the event spatial study area.

TMC Segment	Nearest Interchange	Length (miles)	Mean Event PM Peak Travel Rate	Number of Deviant Intervals
125-04984	Jones Franklin Rd.	0.1310	0.9768	0
125N04984	Jones Franklin Rd.	0.5353	0.9929	0
125-04983	Melbourne Rd.	0.6243	0.9983	0
125N04983	Melbourne Rd.	0.1858	0.9810	0
125-04982	Western Blvd.	0.3140	1.0110	0
125N04982	Western Blvd.	0.4853	1.0222	0
125-04981	Hillsborough St. (NC 54)	0.6320	1.0644	1
125N04981	Hillsborough St. (NC 54)	0.1795	1.0234	0
125-04980	Wade Avenue	0.1013	1.0323	0
125N04980	Wade Avenue	0.5082	1.0075	0
125-04979	Lake Boone Trail	0.5832	0.9534	0
125N04979	Lake Boone Trail	0.3491	0.9811	0
125-04978	Ridge Rd	1.0446	0.9707	0
TOTALS:		**5.6733**		**1**

Figure 54 shows CDF plots for 125N04984 and 125-04979 corresponding to event analysis period data and facility data for every PM peak weekday period in 2010. For both TMC segments, the event distribution generally had higher rates than the facility distributions based on a year's worth of data. However, the 95th percentile was higher for both facility distribution. The larger time horizon incorporated into the facility distribution may have captured significantly deviant travel rate observations above and beyond the impacts of the special event. 125N04984 had an event buffer time index of 0.0835 and a facility buffer time index of 0.1301. 125-04979 experienced an event buffer time index of 0.1044 and a facility buffer time index of 0.1929.

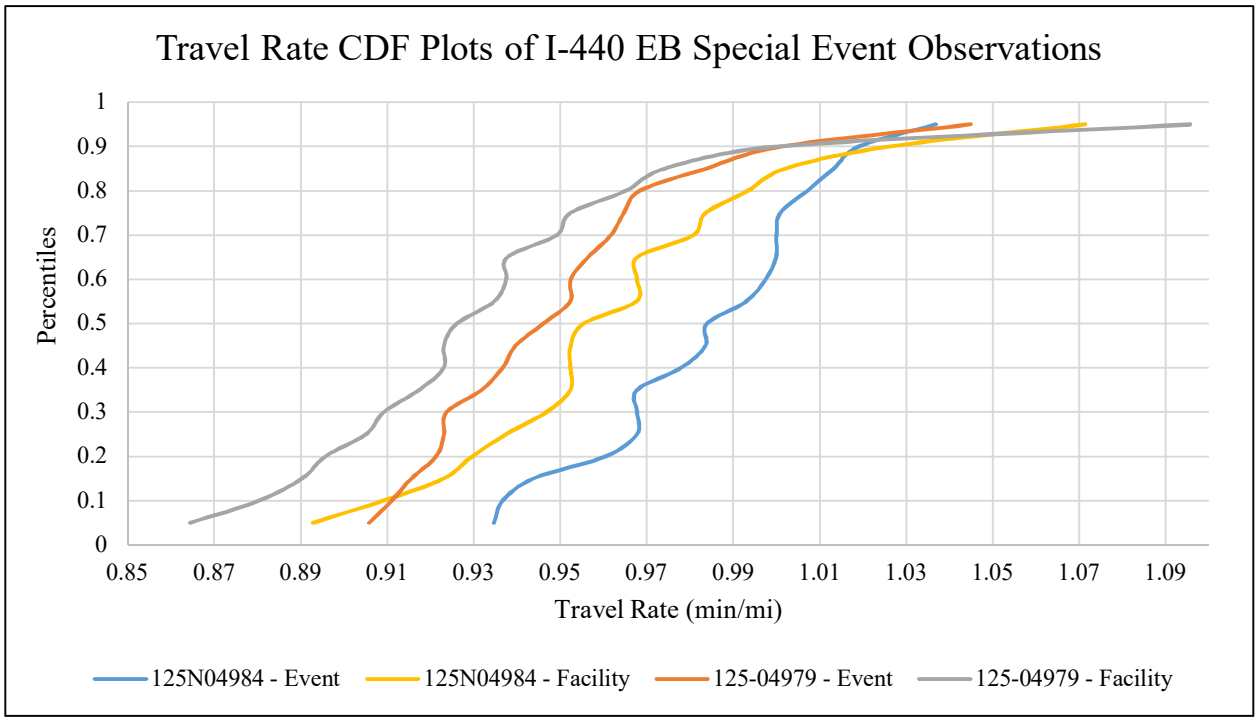

Figure 54: Travel Rate CDF plots of selected I-440 EB TMC segments during the special event compared to the facility under normal conditions.

A total of 34 time/space observations along I-440 WB TMC segments in the event spatial study area were deviant based on the PM peak period mean and standard deviation. 125P04982 reported the highest number of deviant time/space observations with 7. On average, the event mean was 0.092 min/mi lower than then the facility means. **Figure 55** shows a plot of travel

rates for several I-440 WB TMC segments in the event study area over the temporal analysis period. 125P04979 and 125+04980 experienced a significant spike in travel rates at approximately 5:30 PM. 125+04980 had a secondary peak at 6:00 PM. These TMC segments are located near the I-440 and Wade Ave. interchange, a primary access point for fans driving to the stadium. The other TMC segments are near the Jones Franklin Rd. interchange, a segment of I-440 WB not expected to carry event related traffic.

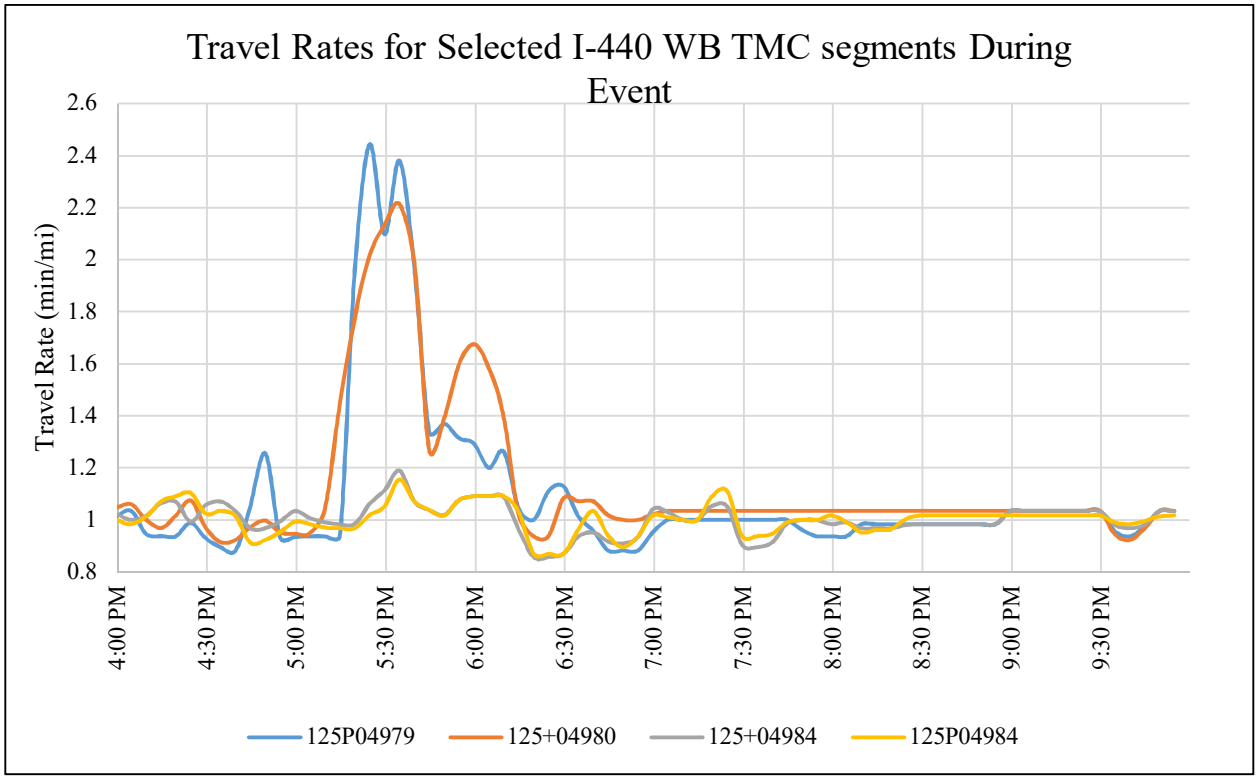

Figure 55: Travel rates for selected I-440 WB TMC segments in the event spatial analysis area.

Table 72 contains TMC descriptions and other metrics for the I-440 WB TMC segments included in the event analysis area.

Table 72: Description of I-440 WB TMC segments located within the event analysis area.

TMC Segment	Nearest Interchange	Length (miles)	Mean Event PM Peak Travel Rate	Number of Abnormal Observations
125+04979	Lake Boone Trail	1.3196	1.0558	0
125P04979	Lake Boone Trail	0.4010	1.0948	2
125+04980	Wade Ave Ext.	0.3720	1.1308	2
125P04980	Wade Ave Ext.	0.5257	1.1830	4
125+04981	Hillsborough St. (NC 54)	0.1090	1.1634	6
125P04981	Hillsborough St. (NC 54)	0.1841	1.1353	6
125+04982	Western Blvd.	0.6689	1.0706	4
125P04982	Western Blvd.	0.4780	1.1035	7
125+04983	Melbourne Rd.	0.1367	1.0829	3
125P04983	Melbourne Rd.	0.2978	1.0276	0
125+04984	Jones Franklin Rd.	0.6390	1.0023	0
125P04984	Jones Franklin Rd.	0.1634	1.0038	0
125+04985	I-40/US 1/US 64	0.2198	0.9804	0
TOTALS:		**5.5149**		**34**

Figure 56 shows CDF plots for 125+04980 and 125+04984 for both event data during the PM peak period and PM peak periods over the entire study year. Unlike previous facility directions, the facility distributions had higher 95th percentile travel rates than the event distributions. The facility buffer time for 125+04980 was 2.2813 compared to the event buffer time index of 0.8103. For 125+04984, the facility buffer time was 0.1765 compared to the event buffer time index of 0.0891.

I-440 EB and I-40 EB showed the largest impact at least qualitatively attributed to the special event. The rarity required to be designated a special demand-generating event means that reliability shouldn't necessarily be expected during such events. Therefore, analysis of these abnormal events primarily identifies time/space observations that should be classified as abnormal rather than normal.

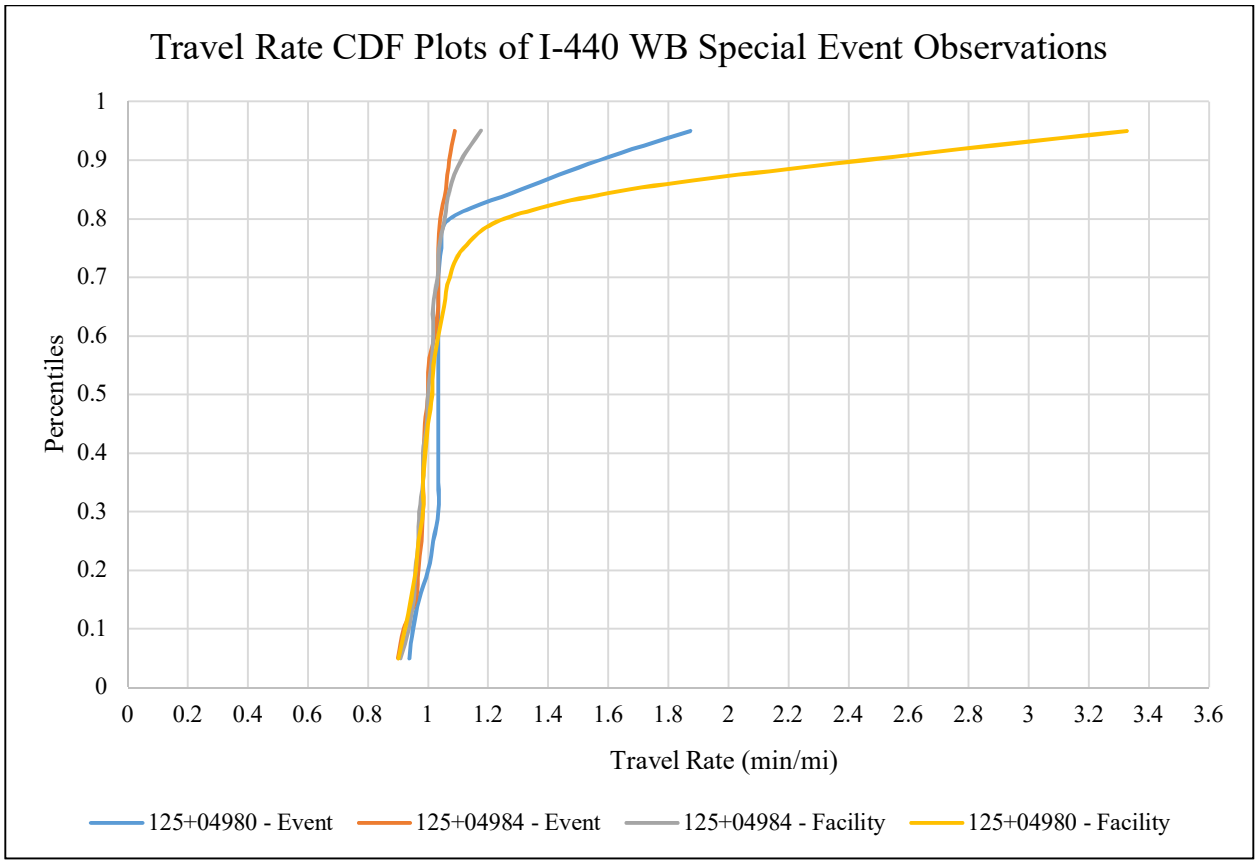

Figure 56: CDF plots for selected I-440 WB TMC segments based on event travel rates or all PM peak periods.

Chapter 8: Conclusions and Recommendations

Travel time reliability will become increasingly relevant as travel demand increases beyond current capacity and even potential future roadway capacity. Predictive methods, such as the procedures outlined in the *HCM*, are well suited for planning and forecasting, however, baseline reliability measures are needed to compare the predictive results. The expanding capabilities of traffic management centers and integrated ITS systems enables real-time reliability monitoring and data collect. Therefore, reliability monitoring systems based on field data and observations benchmark current operating conditions and measure benefits and changes due to improvement projects. This prototype provides a framework for the launch of an operational statewide travel time reliability monitoring system and the types of reliability analysis that can yield insights into the reliability of individual TMC segments, facilities, and routes.

Feasibility of Using Existing Data Sources

Input data sources are a critical component of any travel time reliability monitoring system. Part of prototype development entailed reviewing available sources of travel rate and external data for use by the prototype. INRIX data was easily accessed and provided excellent coverage of both the study area and the entire station. Maintained by NCDOT, the TIMS archive was a solid source of incident data compiled on the basis of disruption to the travel stream rather than crash investigation. Flow rate data limited the extents of the study area and are no longer operational in the state. Weather data was easily accessed but of dubious accuracy and precision. While the current data sources are sufficient for high-level analysis, improving the input data sets will improve the analysis output by the monitoring system.

GIS files containing spatial representations of current TMC segmentation were difficult to obtain and the shapefiles initially utilized were not accurate. A rudimentary shapefile was developed by plotting the start and end coordinates of each TMC segment and connected via a straight line. All spatial identification was performed manually during development of prototype; however, an operational system may require automated spatial location. An accurate shapefile of TMC segmentation should continuously maintained and changes documented for future analysis.

Incident data reported in TIMS is located by one set of geographic coordinates and statewide milepost(s). However, facility shapefiles or geodatabases in GIS data utilize a county-based milepost system such that the mileposts reset after a county boundary is crossed. While spot incidents were located by geographic coordinates, segment incidents such as planned road work were spatially located using a shapefile containing the locations of the actual milepost signs for each direction. Provided that the first responders and traffic controllers use the statewide mileposts referenced in the field by these signs, this doesn't present a problem. However, several mileposts were missing from the shapefile so visual approximations were made for TMC segment assignments to planned incidents. This kind of discrepancy can be readily addressed by developing accurate GIS milepost data statewide but should not be overlooked when developing an operational monitoring system.

Weather data available for prototype development was limited to data archived from the 2010 study year whereas an operational monitoring system should capture weather data in real-time. The spatial variation of precipitation, especially thunderstorms common in North Carolina, suggests that increased temporal and spatial resolution weather data sources would significantly aid in pinpointing the periods of significant precipitation that can adversely impact the traffic

flow. Analysis indicated that there was measurable variation between the hourly precipitation rates recorded at each station. Note that this data was only reported hourly and represents the amount of precipitation that fell during the hour. National weather service warnings may lack the spatial resolution to effectively locate severe weather in cases of thunderstorms or tornados. Warnings for flooding and winter weather lack sufficient temporal to accurately identify observations adversely effected.

Inclusion of abnormal-demand generating special events required a somewhat subjective determination as to what constitutes such an event. By definition, the sample size of these events is so small, that analysis is limited to diagnosis of unflagged observations displaying very abnormal flow and/or travel rates. Additionally, the single year study duration limited analysis comparing reliability during the school year to the summer season when most public schools are not in session. The degree to which special events should be included in an operational monitoring system depend on the specific application but should benefit from real-time data collection and observation by traffic control centers.

Reliability as a Performance Measure

Fundamentally, travel time reliability is the variation in travel times drivers experience along a facility or route. The greater the range of possible travel rates, the greater the buffer time allocated to ensure on-time arrivals. As SHRP 2 L02 noted, a single travel time reliability metric can't convey the entire nature of reliability (*3*). Two types of variation were observed in the CDF plots generated for distributions of individual TMC segments and routes. In some cases, the distribution started to increase from near free-flow speeds, as designated by almost vertical slope, at lower percentiles such that for half of all trips, the experienced travel rate could vary by several minutes per mile. In other cases, near free-flow speeds are maintained until around the

90th percentile, when a major jump of several minutes per mile occurs. Some users may prefer lower travel rates for 85 percent of the time and are willing to risk a major delay only occasionally. Other users may accept higher travel rates in exchange for significantly reducing the chance of catastrophic delay.

Using the 1.5 LOTTR threshold set by FHWA, very few individual TMC segments were deemed unreliable, even using peak period distributions. However, reliability is somewhat dependent on user perspectives. What might be considered reliable in traffic-dense areas such as northern Virginia, may considered unreliable by users in the Research Triangle. Therefore, holistic analysis of the entire distribution for all observation types and temporal analysis periods is essential for analysis and decision making derived from travel time reliability data.

Facilities operating near to at capacity are most susceptible to variation in demand day-to-day, information not captured from density-based capacity analysis performed using an annualized average or a single peak period of counts. Therefore, the travel time data may shed light onto recurring congestion in addition to non-recurring sources.

Calibrating the Severity of External Variables

To reduce data complexity, external event data were reduced to factor-type flags applied to observations based on predetermined thresholds for incidents and weather. Such a data structure limits the computing resources needed to maintain a reliability monitoring system. However, as noted in the literature, these thresholds should be developed and adjusted to fit local driver populations. The high number of observations flagged for weather and the minimal difference between unflagged and weather only distributions suggest that the criteria used to determine adverse weather conditions were too strict and failed to isolated observations where the weather greatly impacted traffic flow either by low visibility or higher incident frequencies.

Conversely, the incident flag was assigned to only the extents of the incident itself. The impact of major incidents likely extended beyond these boundaries. Additional analysis of the observations immediately adjacent to incidents may prevent observations impacted by an incident from being included in the unflagged travel rate distribution. The limited study duration prevented the collection of enough samples to break down analysis into planned and unplanned incidents or be the number of lanes closed, two important factors in determining the traffic flow impact of incidents. The impact of an incident on adjacent traffic likely depends on the type of incident even within the planned and unplanned designations. For example, the presence of a work zone speed limit may lead to mischaracterizations of reliability. A real-time operational monitoring system should be able to classify incidents into groups of like impact and utilize a multi-type flag rather than a binary label.

Takeaways and Next Steps

The prototype developed as part of this project should continue to be refined and enhanced as new data and computing resources become available to turn the functional prototype into an operational system. Analysis resulting from the development of the prototype also provides an important framework for the use of reliability data in a freeway context. The following are some key takeaways and suggestions to advance this research:

- Existing data sources are more than sufficient for basic travel time reliability analysis in North Carolina, however, data can always be improved in both accuracy and precision. Weather data should especially be explored as a way to improve the external event analysis.

- Flow rate data is not an essential component of a reliability monitoring system. The number of observations that reported an abnormal travel rate, but a normal flow rate and no external event flags was minimal.
- Use of CDF plots allows for qualitative visualization of the entire distribution, however, metrics derived from travel rate percentiles can be useful for quantitative comparison.
- Very few TMC segments had a LOTTR above the 1.5 unreliability threshold set forth in federal rule making documents. Even during the most severe peak period, only a couple of TMC segments reported values above the threshold. Additional insights could be gained by looking at the changes in LOTTR over time, as demand and congestion have most likely increase along freeways since the 2010 study year.

REFERENCES

1. USDOT FHWA. National Performance Management Measures: Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program. 23 CFR Part 490, FHWA-2013-0054. *Federal Register*. Vol. 82, No. 11, 2017, pp.5970-6050.
2. van Lint, J.W.C., H.J. van Zuylen, and H. Tu. Travel Time Unreliability on Freeways: Why Measures Based on Variance Tell Only Half the Story. *Transportation Research Part A,* Vol. 42, 2008, pp. 258-277. doi:10.1016/j.tra.2007.08.008.
3. List, G.F., B. Williams, N. Rouphail. *SHRP 2 Report S2-L02-RR-1:Establishing Monitoring Programs for Travel Time Reliability*. Transportation Research Board, Washington, D.C., 2014, DOI 10.17226/22612.
4. List, G.F., B. Williams, N. Rouphail. Introduction. In *SHRP 2 Report S2-L02-RR-1:Establishing Monitoring Programs for Travel Time Reliability*. Transportation Research Board, Washington, D.C., 2014, DOI 10.17226/22612.
5. Alvarez, P. and M. Hadi. Time-Variant Travel Time Distributions and Reliability Metrics and Their Utility in Reliability Assessments. *Transportation Research Record: Journal of the Transportation Research Board,* No. 2315*,* 2012, pp. 81-88. DOI: 10.3141/2315-09
6. van Lint, J.W.C., H.J. van Zuylen. Monitoring and Predicting Freeway Travel Time Reliability: Using Width and Skew of Day-to-Day Travel Time Distribution. *Transportation Research Record: Journal of the Transportation Research Board,* No. 1917, 2005, pp. 54-62.
7. McLeod, Douglas S, L. Elefteriadou, L. Jin. Travel Time Reliability as a Performance Measure: Applying Florida's Predictive Model to an Entire Freeway System. *Institute of Transportation Engineers ITE Journal.* Vol. 82, No. 11,2012, pp. 43-47.
8. Boyce, D.E., A. Kirson, J.L. Schofer. Design and Implementation of ADVANCE: The Illinois Dynamic Navigation and Route Guidance Demonstration Program. *Proceedings-Society of Automotive Engineers*, P-253 pt. 1, 1991, pp. 415-426.
9. Vandenberghe, W., E. Vanhauwaert, S. Verbrugge, L. Moerman, and P. Demeester. Feasibility of Expanding Traffic Monitoring Systems with Floating Car Data Technology. *IET Intelligent Transport Systems*, Vol. 6, No. 4, 2012, pp. 347-354. doi: 10.1049/iet-its.2011.0221

10. Isukapati, I.K., G.F. List, B.M. Williams, and A.F. Karr. Synthesizing Route Travel Time Distributions from Segment Travel Time Distributions. *Transportation Research Record: Journal of the Transportation Research Board,* No. 2396, 2013, pp. 71-81. DOI: 10.3141/2396-09.
11. Chase, R.T., B.M. Williams, N.M. Rouphail, and S. Kim. Comparative Evaluation of Reported Speeds from Corresponding Fixed-Point and Probe-Based Detection Systems. *Transportation Research Record: Journal of the Transportation Research Board,* No. 2308, 2012, pp. 110-119. DOI: 10.3141/2308-12.
12. Chase, R.T., B.M. Williams, N.M. Rouphail, and S.Kim. Comparing Reported Travel Times between Temporally-Stitched and Simultaneous Methods at Various Aggregation Intervals. Presented at 91st Annual Meeting of the Transportation Research Board, Washington, D.C., 2012.
13. Guido, G., V. Gallelli, F. Saccomanno, A. Vitale, D. Rogano, and D. Festa. Treating Uncertainity in the Estimation of Speed from Smartphone Traffic Probes. *Transportation Research Part C*, Vol. 47, 2014, pp. 100-112.
14. Zhang, Z., D. Yang, T. Zhang, Q. He, and X. Lian. A Study on the Method for Cleaning and Repairing the Probe Vehicle Data. *IEEE Transactions on Intelligent Transportation Systems*, Vol. 14, No. 1, 2013, pp. 419-427.
15. List, G.F., B.M. Williams, N.M. Rouphail. Survey of Existing Systems and User Needs. In *SHRP 2 Report S2-L02-RR-1 Establishing Monitoring Programs for Travel Time Reliability*. Transportation Research Board, Washington, D.C., 2014, DOI 10.17226/22612.
16. List, G.F., B.M. Williams, N.M. Rouphail. Functional Specifications. In *SHRP 2 Report S2-L02-RR-1 Establishing Monitoring Programs for Travel Time Reliability*. Transportation Research Board, Washington, D.C., 2014, DOI 10.17226/22612.
17. List, G.F., B.M. Williams, N.M. Rouphail. Data Collection, Assembly, and Cleaning. In *SHRP 2 Report S2-L02-RR-1 Establishing Monitoring Programs for Travel Time Reliability*. Transportation Research Board, Washington, D.C., 2014, DOI 10.17226/22612.
18. List, G.F., B.M. Williams, N.M. Rouphail. Sensor Spacing and Sampling for Travel Time Reliability Monitoring. In *SHRP 2 Report S2-L02-RR-1 Establishing Monitoring*

Programs for Travel Time Reliability. Transportation Research Board, Washington, D.C., 2014, DOI 10.17226/22612.

19. List, G.F., B.M. Williams, N.M. Rouphail. Data Processing and Analysis. In *SHRP 2 Report S2-L02-RR-1 Establishing Monitoring Programs for Travel Time Reliability*. Transportation Research Board, Washington, D.C., 2014, DOI 10.17226/22612.
20. Caceres, H., H. Hwang, and Q. He. Estimating Freeway Route Travel Time Distributions with Consideration to Time-of-Day, Inclement Weather, and Traffic Incidents. *Journal of Advanced Transportation*, Vol. 50, 2016, pp. 967-987. DOI: 10.1002/atr.1384.
21. Kwon, J., T. Barkley, R. Hranac, K. Petty, and N. Compin. Decomposition of Travel Time Reliability into Various Sources: Incidents, Weather, Work Zones, Special Events, and Base Capacity. *Transportation Research Record: Journal of the Transportation Research Board*, No. 2229, 2011, pp. 28-33. DOI: 10.3141/2229-04
22. Williges, C., B. McCullough, Y. Chu, N. Amatya, R. Kuo, M. Lin, L. Chu. Pilot Testing of SHRP 2 Reliability Data and Analytical Products: Southern California. *SHRP 2 Reliability Project L38A*. 2015, DOI: 10.17226/22332
23. I-95 Corridor Coalition, *Regional Integrated Transportation Information System (RITIS)*, http://i95coalition.org/projects/regional-integrated-transportation-information-system-ritis/
24. National Weather Service, Raleigh Forecast Office, https://www.weather.gov/rah/
25. Iowa Environmental Mesonet, Iowa State University, https://mesonet.agron.iastate.edu/nws/
26. State of North Carolina Climate Office, http://www.nc-climate.ncsu.edu/
27. *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis*, Transportation Research Board, Washington, D.C., 2016.
28. Federal Communication Commission, Public Safety Issues & Initiatives, Emergency Alert System (EAS), https://www.fcc.gov/general/emergency-alert-system-eas
29. WRAL News. State Fair Attendance Near Record Rate. WRAL.com, https://www.wral.com/entertainment/story/8466764/
30. North Carolina State Athletics, Football, 2010 Schedule, http://gopack.com/schedule.aspx?schedule=201&path=football

31. National Weather Service Glossary, National Weather Service, https://w1.weather.gov/glossary/
32. NWS Flood Products: What Do They Mean?, NWS Birmingham, Alabama Weather Forecast Office, National Weather Service, https://www.weather.gov/bmx/outreach_flw
33. Wright, B., Y. Zou, and Y. Wang. Impact of Traffic Incidents on Reliability of Freeway Travel Times. *Transportation Research Record: Journal of the Transportation Research Board*, No. 2484, 2015, pp. 90-98. DOI: 10.3141/2484-10.
34. Hojati, A.T., L. Ferreira, S. Washington, P. Charles, and A. Shobeirinejad. Modeling the Impact of Traffic Incidents on Travel Time Reliability.
35. Edwards, M.B., and M.D. Fontaine. Investigation of Travel Time Reliability in Work Zones with Private-Sector Data. *Transportation Research Record: Journal of the Transportation Research Board*, No. 2272, 2012, pp. 9-18. DOI: 10.3141/2272-02.
36. Haseman, R.J., J.S. Wasson, and D.M. Bullock. Real-Time Measurement of Travel Time Delay in Work Zones and Evaluation Metrics Using Bluetooth Probe Tracking. *Transportation Research Record: Journal of the Transportation Research Board,* No. 2169, 2010, pp. 40-53. DOI: 10.3141/2169-05
37. Shi, Q., and M. Abdel-Aty. Evaluation of the Impact of Travel Time Reliability on Urban Expressway Traffic Safety. *Transportation Research Record: Journal of the Transportation Research Board*, No. 2582. 2016, pp. 8-17. DOI: 10.3141/2582-02.
38. Brodsky, H., and A.S. Hakkert. Risk of a Road Accident in Rainy Weather. *Accident Analysis and Prevention*, Vol. 20, No. 3, 1988, pp. 161-176.
39. Eisenberg, D. The Mixed Effects of Precipitation on Traffic Crashes. *Accident Analysis and Prevention*, Vol. 36, 2004, pp. 637-647.
40. Hermans, E., T. Brijs, T. Stiers, and C. Offermans. The Impact of Weather Conditions on Road Safety Investigated on an Hourly Basis. Presented at the 85th Annual Meeting of the Transportation Research Board, Washington, D.C., 2006.
41. Yannis, G. and M.G. Karlaftis. Weather Effects on Daily Traffic Accidents and Fatalities: A Time Series Count Data Approach. Presented at the 89th Annual Meeting of the Transportation Research Board, Washington, D.C., 2010.
42. Xu, C., W. Wang, and P. Liu. Identifying Crash-Prone Traffic Conditions Under Different Weather on Freeways. *Journal of Safety Research*, Vol. 46, 2013, pp. 135-144.

43. Chung, E., O. Ohtani, and M. Kuwahara. Effect of Rainfall on Travel Time and Travel Demand. *Intelligent Transportation Systems, IEEE Proceedings*, 2005, pp. 1080-1083.
44. Chase, T.R., A. Hajbabaie, and B.J. Schroeder. Incorporating Weather Effects in HCM Reliability Analysis. Presented at the 92nd Annual Meeting of the Transportation Research Board, Washington, D.C., 2013.
45. Lamm, R., E.M. Choueiri, and T. Mailaender. Comparison of Operating Speeds on Dry and Wet Pavements of Two-Lane Rural Highways. *Transportation Research Record: Journal of the Transportation Research Board*, No. 1280, 1990, pp. 197-207.
46. Li, Z., L. Elefteriadou, and A. Kondyli. Quantifying Weather Impacts on Traffic Operations for Implementation into A Travel Time Reliability Model. *Transportation Letters: The International Journal of Transportation Research*, Vol. 8, No. 1, 2016, pp. 47-59.
47. Jaroszweski, D., T. McNamara. The Influence of Rainfall on Road Accidents in Urban Areas: A Weather Radar Approach. *Travel Behaviour and Society*. Vol. 1, 2014, pp. 15-21.

APPENDICES

Appendix A: More Detail on External Variables Affecting Travel Time Reliability

Travel time reliability can also incorporate external events that materially impact users and the overall performance of the network during abnormal conditions including incidents, weather, and special demand-generating events. Measured and perceived impacts from these factors vary based on the driver population and the frequency with which these events occur. Users generally expect more travel time reliability during common events than rare occurring events. Drivers in the northeast US expect facility performance through moderate snow events, however, users in the southeast US have little expectation of reliability during accumulated snow events. Before applying external events to travel time reliability, the direct impacts of these external events on the traffic stream are considered.

Incidents and Travel Time Reliability

In this thesis, incidents include both unplanned collisions, vehicle breakdowns, etc., and planned work zone construction. Both types of incidents will be reviewed and analyzed further as sources of non-recurring congestion that would not be captured in conventional travel demand data such as annual average daily traffic.

Within the travel time reliability context, incidents can materially impact the traffic stream by either reducing physical capacity by closing lanes or slowing vehicles to safely pass the scene. The unpredictable nature of unplanned incidents can introduce travel time variation for the affected time/space observations. Existing research on incident travel time implications was previously limited by the collection of detailed incident data (*33*). Travel time and incident data for the I-5 and I-405 freeway facilities in Seattle, Washington were collected and analyzed. Travel time data was collected from inductive loops from 2009 to 2012; observations from 5 AM to 7 PM were used to calculate percentile values while 24-hour data were used to generate

congestion measures. Sensors collected data at a 20-second ramp that were aggregated into average travel times in five-minute intervals; mileposts were used as the spatial reference. Raw data from the inductive loops were input to a volume-weighted algorithm that output space-mean-speeds, a procedure utilized by Washington Department of Transportation (WSDOT). The single loop detectors generated travel times based on a standard vehicle length, which doesn't account for heavy vehicles within the traffic stream. Data were collected on a lane-by-lane basis and then aggregated together for analysis. Error checking thresholds for erroneous data were set for the dataset to remove severely abnormal observations (*33*).

Incident data were obtained from the WSDOT incident management system, a statewide repository data on incidents reported along the state highway network (*33*). Detailed temporal and spatial data were included in the incident dataset; incident start and clearance times were reported along with the number and duration of lane closures. Incidents that occurred in HOV lanes were a separate accident type. The incidents were paired with the speed data using the common milepost spatial reference system. Incidents with multiple lane closure conditions were subdivided into smaller events so that the lane closure state was constant for the duration of each event (*33*).

I-5, the major north-south freeway in region, had three general purpose lanes in each direction. I-405, a secondary bypass route, only had two general purpose lanes. The number of lanes open were more representative of the impacts than the number of lanes closed during an incident; one lane closed on a two-lane facility may result in a more pronounced impact than a single lane closed on a four-lane facility (*33*). Shoulder incidents comprised a majority of the dataset, suggesting the significance of a lane closure to travel time expectations. During the course of incidents, overall variability increased 41% and the buffer time increased 21%. When a

travel lane was closed along I-45, variability increased 66% and the buffer time increased 42%. The effect increased drastically if multiple lanes are closed along the facility. Even shoulder-only incidents adversely impact the traffic stream by laterally influencing passing vehicles (*33*).

Modeling techniques can also be used to analyze the contribution of incidents to non-recurring congestion and unreliable travel times. Empirical data collected can be used to calibrate models and quantify the impacts on travel time (*34*). Speed data from inductive loops was combined with incident data; baseline data were obtained from travel time observations outside of incident occurrences. Flow rate data were also collected to gauge congestion levels. In addition to the provided location and time information for each incident, shockwave analysis was utilized to determine the spatial impact extents for each incident. The buffer time index was tabulated because it isolated the impacts of non-recurring congestion unlike the planning time index, which incorporates all additional time beyond the free-flow travel time (*34*).

Based on the empirical data collected, a logit model was developed to predict the impact of various incident types and severities. Incident type was a significant parameter affecting the clearance time of the incident. The inclusion of the volume to capacity ratio accounted for vehicle exposure in addition to the changes in flow rates upstream of the incident location. Duration, severity, lane closures, and random variation were all determined to be statistically significant (*34*).

Travel time reliability impacts attributed to work zones are of specific relevance for maintenance of traffic plans seeking to minimize disruptions to the traffic stream. Unlike vehicle collisions and breakdowns, road work can be planned in advance and during periods of low demand. Facility users are typically notified in advance and alternative routes and itineraries can be implemented. Current tools and methodologies can capture basic, density-based metrics,

however, reliability during work zones have not been included in maintenance of traffic (MOT) analysis (*35*). Vehicle probe data was obtained for the year 2010 to study the reliability of work zones in Virginia. Work zones and corresponding comparison sites were identified based on the duration of the work zone and the availability of data. Work zone locations were eligible for inclusion if the duration was greater than four-months and divided into full-year and partial-year durations. Comparison sites were determined by identifying sites with similar geometric designs and functional classification (*35*).

INRIX data aggregated into 15-minute temporal intervals was used to measure the reliability of these work zone locations. Eight freeway and six arterial work zones were selected for analysis; seven sites were in effect the entire year. Data were obtained for all 24 hours and subdivided into groups for the morning, midday, and evening peak hours for the work zones and comparison sites. Work zone limits were spatially referenced by mile posting. The 95th percentile travel time, buffer time index, and planning time index were tabulated for each location. A majority of the work zones and all eight of the freeway work zones experienced statistically significant increases to BTI and PTI; a trend during all temporal analysis conditions, including off-peak. Impacts were greatest at night, when lane closures were more common, and attributed to very low flow rates (*35*).

Bluetooth data collected along a work zone in Indiana was used to measure delay in terms of travel times experienced by users (*36*). A ten-mile segment of I-65, a major freight route to/from Chicago, was analyzed during a three-month repaving project. A 35,000 AADT was measured in the vicinity of the work zone and the traffic stream was 40% truck traffic. High weekend demand, especially during holiday weekends, was a concern as the single lane cross-overs could not be altered during periods of peak demand. Atypical geometric configurations

used to maintain traffic flow while work zones are active rendered physical capacity difficult to obtain. An 8% rate of vehicles sampled within the traffic stream was deemed sufficient to generate travel time information to be displayed to the public in real time. Analysis determined incidents occurring within a work zone have a severe impact on reliability, however, non-recurring bottlenecks upstream of the work zone can distort the performance of the work zone by artificially limited demand within the work zone. Traveler information was most effective when alternative routes were easily identifiable and the numerical travel time savings was shown via dynamic message sign (*36*).

Correlation between incidents and travel time unreliability may two-sided; unreliable travel times indicative of a turbulent traffic stream may foreshadow an increase in the likelihood of a collision. A study of a toll expressway facility outside of Orlando, Florida analyzed the impact of poor reliability on incident likelihood (*37*). The 20-mile facility primarily serves commuting traffic in the region. Previous research supports a link between sharp speed gradients and increased collision frequency. Variation was tabulated as the ratio of the standard deviation to the average travel time or rate. The BTI and misery index, ratio of the difference of the mean travel time above 80^{th} percentile and the mean travel time to the mean travel time. Data was obtained from the electronic toll collection transponders used by commuters to pay the tolls; not all vehicles were equipped with transponders therefore the data represents a sample of vehicles in the traffic stream. Equidistant segments were used to spatially reference the speed/travel time data and incident data were obtained from a statewide database. A Poisson log-normal model was proposed to predict the likelihood of a collision by estimating variable coefficients. Both the BTI and misery index were statically significant, and researchers noted that these metrics place

more cost weighting on arriving late which may not reflect the utility equation for every user in the population (*37*).

Weather and Travel Time Reliability

To understand the impact of adverse weather conditions on travel time reliability, the impact of adverse weather conditions on vehicles and drivers should be evaluated. Weather can impact travel time reliability by several methods; limitation on the driver/vehicle to maintain free-flow travel rates from low visibility, poor surface conditions that persist beyond the weather event, and incidents attributed to weather conditions. In the case of severe weather, reliability focuses on the recovery of travel times after the conclusion of the severe weather event.

A majority of existing research focuses on the increase in the probability of incident occurrence during and immediately following weather events; both incidents caused by low visibility and slick pavement conditions are included. The National Transportation Safety Board (NTSB) previously noted that substantial precipitation events can increase the probability of an incident approximately four times the likelihood under normal conditions (*38*). Early studies isolated weather incidents by identifying weather as an attributing factor listed in crash data; later studies utilized meteorological data to identify weather conditions and classify intensity to be cross-referenced against off a list of incidents reported during the study period. Modeling addressed the difference between the likelihood of an incident occurring and the frequency that were reported; during major weather events the individual likelihood of an incident may be significantly higher, but a decrease in demand prevents the observed frequency from reflecting the increased risk (*38*).

Proposed by the NTSB, the wet pavement ratio compares the proportion of incidents caused in part of wet pavement to the proportion of the study period during which the pavement

was wet. Pavement drying times could not be measured directly, therefore, 45 minutes after the conclusion of the precipitation event was a conservative assumption (*38*). Fatal incident and weather data from Israel and the eastern United States were collected as part of an analysis of incident likelihood during weather events to study different driver populations and climates (*38*). In Israel, there are seasonal periods of frequent rain and intermittent rain; within the eastern US, some states had higher rainfall totals than others. A large spatial analysis area accounted for any variation attributable to the instrumentation. According to collected data, major precipitation events had a greater impact in temporal and spatial regions where rainfall was infrequent (*38*).

Eisenberg notes that the data can indicate conflicting conclusions depending on the temporal resolution used to analyze. Monthly crash data suggests an inverse relationship between fatalities and precipitation; fatal collisions decrease during periods of intense precipitation. However, daily crash statistics indicate that fatalities increase during heavy precipitation events and decrease after major precipitation events. The non-fatal collision rate typically increases during heavy precipitation events due to an overall increase in incidents and a decrease in incident severity attributed to drivers slowing down to adjust to the precipitation. In the aftermath of a significant precipitation event, collision likelihood was impacted by increased driver caution and wet pavement. A comparative analysis was performed by comparing travel times during the major precipitation event to travel times measured along the same spatial area during normal conditions (*39*).

At low to medium intensities, precipitation likely increases driver awareness without increasing risk significantly. However, high intensity precipitation events did increase the frequency of fatal collision (*39*). Fluids deposited from vehicles can accumulate on the road surface and mix with precipitation runoff to create dangerously slick conditions, however, after

the precipitation can ultimately rinse the deposited fluids off the roadway and have a positive impact on incident likelihood. An "upsides down U relationship" was observed within the snow incident data; impact peaked at a moderate snowfall intensity, after which impact decreased because many vehicles could not operate in such conditions (*39*).

At high temporal resolutions, collision rates are somewhat random in frequency, a characteristic that decreases as the temporal resolution is decreased. Additionally, analysis of collision frequencies fails to account for the number of vehicles on the facility at the time; collision likelihood is somewhat increased when there are more vehicles spaced closer together (*40*). Rates, frequencies normalized by vehicle miles traveled over the spatial/temporal analysis area, were considered to be a more accurate measure of safety. In an analysis of collision data sourced from the Netherlands, the data were applied to the passion distribution and the negative binomial distribution with an over dispersion parameter; all users had an equivalent likelihood of experiencing a collision. Incidents were spatially assigned to the nearest weather station. Each weather station reported wind, cloud cover, humidity, hourly precipitation rate, and description of current weather (*40*).

The data were analyzed using both the Poisson distribution and negative binomial distribution by estimating correlation coefficients with a heuristic. Temperature data was excluded as the researchers inferred that temperature wasn't a causal variable. The negative binomial distribution was a closer fitting distribution (*40*). Precipitation had the highest causal influence of the weather inputs on both collision frequency and rates. Use of data gleaned from crash reports relies on the accuracy of the responding law enforcement officer and traffic flow data was not collected (*40*).

Yannis and Karlaft compared weather-related information included in crash report documents with observation weather data in the vicinity of the incident. Reported data by law enforcement has much tighter spatial applicability to the incident than observational data from weather stations located further away from the season. Existing research produced mixed conclusions on the incident impacts of air temperature; cooler temperatures may increase collision likelihood; however, overall demand can be tempered yielding negligibly higher system-wide impact (*41*). Data were collected across Athens, Greece using data from the National Technical University of Athens and observational weather data obtained from a local weather station. A time-series dataset of weather and collision data was utilized to develop a model for temporal interval analysis over the study period. When fitting the empirical data to the model, the over-dispersion parameter was low, suggesting that the model parameters accounted for variation within the dataset (*41*).

Collision frequency declined during the heaviest rain events (freezing precipitation is extremely rare in the region) in part because unaccustomed drivers decreased operating speed and increased awareness. Without traffic flow data, vehicle exposure was estimated on a relative basis by comparing days of the week; exposure was expected to be greater during the week. On the contrary to the exposure assumptions, incidents increased during weekends. This contradiction was attributed to higher risk within the weekend nighttime driving population. Pedestrian-involved collisions and fatalities were positively correlated with air temperature, an observation attributed to warmer temperatures increasing pedestrian activities (*41*).

Loop detector data along I-880 outside of Oakland, California was paired with observational meteorological data from adjacent weather stations and incident data from the PeMS database to develop a model of incidents occurring during certain weather events and

various levels of congestion (*42*). Using location data assigned to each incident, adjacent inductive loops were identified and used to determine flow rates upstream and downstream of the incident location. Inductive loops measured data every 30 seconds that was then aggregated into five-minute temporal analysis intervals. Weather data was obtained at hourly resolution from local weather stations via the National Climate Data Center (NCDC), a federal agency that collects and maintains repositories of historical weather data. Conditions were grouped into categories defined for clear, rainy, and limited visibility conditions (*42*).

A Bayesian approach was used to construct a regression model comprised of random variables to estimate collision probabilities. Within the context of increasing flow rates; incident likelihoods increase with congestion until vehicle speeds decrease from free-flow enough to actually decrease the probability of an incident occurring (*42*). During clear operating conditions, the greatest incident likelihood was observed at flow conditions corresponding to 25% sensor occupancy. At flow rates lower than observed at peak risk, the odds ratio in clear conditions was greater than one, an indication that the incident probability increases at a higher rate than vehicle speeds. The odds ratio varied by the flow rate measured by the upstream detectors. During rainy conditions, the odds ratio is higher for corresponding speed gradients between adjacent loop detectors; the highest odds ratio is observed during periods of lower densities, when drivers are more likely to be surprised by sudden deceleration. The outputs and conclusions drawn from the model could be used to power advanced warning notification during periods of higher collision risk (*42*).

The Vehicle Information Communication System, a vehicle-to-infrastructure platform utilized in Japan that provides users with turn-by-turn navigation instructions informed in part by real-time travel time data. Based on user surveys, pre-departure travel time information was

more valued due to more options in response to current travel times, however, the accuracy of data decreases moving back from the intended departure time (*43*). Weather events may significantly impact the accuracy of predicted travel times and interpretations of those events. Unlike travel time data, weather forecasts were deemed precise and accurate several hours in advance and could be used to account for rain impacts on future travel times and the reliability of those projections (*43*).

Across the entire nation of Japan, 1300 weather stations were spaced on average about 17 kilometers apart and reported hourly precipitation rates, wind data, air temperature, and sunrise/sunset. Nationwide, 13.5% days per year recorded daily rain duration less than three hours. 15.% days per year recorded total daily rain duration greater than three hours. Five weather stations were selected along a 12-kilometer segment of a major expressway in Tokyo subject to a $7 toll for cars (*43*). Typically travel times range from nine minutes during free-flow operations to 70 minutes at peak congestion levels. Flow rate data collected from the facility was aggregated into a daily value. Observations were segmented into peak hours in the morning and evening; Sundays and holidays were excluded from the dataset. Speed data was obtained from ultrasonic sensors spaced at 300-meter intervals and aggregated into five-minute reporting intervals. Days when an incident was reported are excluded from the dataset. Analysis of the collected data indicated that rain events impart the greatest impact on travel times during high levels of congested traffic flow (*43*).

The external event thresholds used in SHRP 2 Project L08, project to develop a predictive travel time reliability tool within the framework of the FREEVAL platform, provides a starting point for monitoring systems that can be further refined based on local conditions. This methodology to predict travel time reliability from Project L08 was incorporated into the

sixth edition of the *Highway Capacity Manual* (27). Intensity thresholds were established for possible weather conditions; rain, snow, air temperature, wind speed, and visibility (*44*). Weather effects were accounted for in the 2010 edition of the *Highway Capacity Manual* by use of capacity adjustment factors and free-flow speed adjustment factors that vary based on the free-flow speed of the studied facilities (*44*).

Pavement wetness may not significantly affect safety until the rainfall intensity is high enough to limit driver visibility (*45*). In light rain, defined as less than a quarter-inch per hour, capacity could drop up to 10% and up to 30% during rainfall at rates higher than a quarter-inch per hour (Smith et al.). The HCM defined light rain as less than 0.1 inch per hour, moderate rain as greater than 0.1 inch per hour but less than 0.25 inch per hour, and heavy rain as rates higher than 0.25 inch per hour (*27*, *46*).

Inclusion of observational weather data enhanced evaluation of correlation of weather and incidents, however, weather patterns are subject to significant spatial and temporal variation. Radar data, however, provides higher spatial resolution over short temporal intervals and can measure precipitation intensity (*47*). Weather stations are typically located at airports and other locations outside of urban population centers, limiting the spatial relevance of data collected from those stations. Rain intensity and resulting spray from other vehicles decrease visibility, which increases the driver workload. Climate also influences how quickly drivers are able to adapt to adverse conditions; if major rain events have been less frequent, drivers may take longer to adjust to prevailing conditions (*47*).

Historical weather radar imagery across the United Kingdom was acquired from 2008-2011, a three-year study period. Short temporal intervals were utilized to best capture variable weather events and reduce the likelihood drivers adjust to conditions within the intervals. Crash

data was obtained from local police departments in London and Manchester in the form of crash reports containing location, temporal, and observed weather information. In 2010, 1833 incidents attributed to rain were reported in London, 286 were reported in Manchester (*47*). Incidents were assumed to begin at the time stated on the crash report even though that time includes response time to the scene. For the purpose of the analysis, rain events were defined as moderate rain occurring for at least three consecutive hours over at least 70% of the spatial analysis area for each city; the intensity was considered to remain constant throughout the entire rain event. Radar images were obtained for every hour in five-kilometer grids for the entire spatial study area; intensity values on the radar images were calibrated using observation data from weather stations within the study area. Only daytime observations from 7 AM to 8 PM were included in the analysis to filter out observational periods with extremely low flow rates and ensure equal comparisons between operating conditions (*47*).

Ratios were tabulated for incidents during adverse weather to incidents occurring in normal conditions. Using weather station observational data, incidents were 1.5 times more frequent during rain events in Manchester and 1.18 times more frequent in London; the relative different was attributed to London's significantly larger sample size of incidents. Based on radar data, incidents were 1.82 times more frequent in Manchester and less frequent in London with a 0.97 ratio. The frequency decrease in London was attributed to background congestion in London and users choosing other modes or deferring trips during rainy conditions (*47*). Minor collisions were often not responded to by law enforcement and correlation to other variables was not accounted for. The three-hour duration requirement significantly limited the sample size of incidents that occurred during rain events (*47*).

Appendix B: I-40 EB Additional Datasets

Table B-1: Travel rate percentiles for all observations.

	125N04872	125-04871	125N04871	125-04870	125N04870	125-04869	125N04869	125-04868	125N04868	125-04867	125N04867	125-04866	125N04866	125-04865	125N04865	125-04864	125N04864	125-04863
0.0001	0.7308	0.1538	0.8000	0.7308	0.8000	0.7308	0.8000	0.3462	0.8000	0.7308	0.7308	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
0.05	0.8247	0.8381	0.8243	0.8385	0.8432	0.8453	0.8439	0.8418	0.8394	0.8473	0.8458	0.8451	0.8523	0.8571	0.8451	0.8451	0.8428	0.8380
0.1	0.8432	0.8528	0.8406	0.8548	0.8571	0.8595	0.8571	0.8564	0.8571	0.8642	0.8598	0.8607	0.8696	0.8730	0.8624	0.8608	0.8571	0.8571
0.15	0.8557	0.8628	0.8523	0.8651	0.8696	0.8703	0.8696	0.8661	0.8696	0.8760	0.8706	0.8711	0.8804	0.8850	0.8748	0.8749	0.8698	0.8696
0.2	0.8646	0.8711	0.8610	0.8740	0.8780	0.8813	0.8777	0.8738	0.8824	0.8849	0.8814	0.8824	0.8886	0.8955	0.8825	0.8835	0.8824	0.8799
0.25	0.8722	0.8798	0.8696	0.8827	0.8850	0.8877	0.8837	0.8817	0.8902	0.8955	0.8879	0.8902	0.8955	0.9044	0.8955	0.8955	0.8919	0.8876
0.3	0.8824	0.8866	0.8804	0.8919	0.8955	0.8955	0.8941	0.8880	0.8955	0.9018	0.8956	0.8955	0.9063	0.9103	0.9010	0.9036	0.8983	0.8955
0.35	0.8903	0.8944	0.8877	0.8981	0.9005	0.9025	0.8987	0.8953	0.9065	0.9091	0.9034	0.9054	0.9119	0.9204	0.9091	0.9091	0.9091	0.9063
0.4	0.8963	0.8999	0.8955	0.9077	0.9091	0.9091	0.9091	0.9004	0.9120	0.9171	0.9091	0.9091	0.9208	0.9231	0.9174	0.9186	0.9146	0.9102
0.45	0.9074	0.9070	0.9063	0.9108	0.9124	0.9144	0.9123	0.9076	0.9231	0.9231	0.9149	0.9183	0.9231	0.9231	0.9231	0.9231	0.9231	0.9208
0.5	0.9099	0.9105	0.9091	0.9199	0.9231	0.9222	0.9231	0.9107	0.9231	0.9231	0.9225	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.55	0.9215	0.9167	0.9202	0.9231	0.9231	0.9231	0.9231	0.9175	0.9231	0.9231	0.9231	0.9231	0.9231	0.9261	0.9231	0.9231	0.9231	0.9231
0.6	0.9231	0.9226	0.9231	0.9231	0.9231	0.9231	0.9231	0.9227	0.9231	0.9231	0.9231	0.9231	0.9246	0.9352	0.9231	0.9231	0.9231	0.9231
0.65	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9232	0.9231	0.9231	0.9349	0.9375	0.9289	0.9349	0.9289	0.9231
0.7	0.9231	0.9231	0.9231	0.9231	0.9259	0.9242	0.9232	0.9231	0.9352	0.9291	0.9237	0.9288	0.9375	0.9435	0.9375	0.9390	0.9375	0.9320
0.75	0.9231	0.9231	0.9231	0.9236	0.9352	0.9329	0.9346	0.9261	0.9375	0.9372	0.9323	0.9375	0.9494	0.9524	0.9464	0.9524	0.9473	0.9375
0.8	0.9317	0.9252	0.9259	0.9319	0.9375	0.9376	0.9381	0.9347	0.9494	0.9415	0.9379	0.9438	0.9564	0.9646	0.9554	0.9646	0.9585	0.9524
0.85	0.9375	0.9338	0.9375	0.9376	0.9524	0.9505	0.9524	0.9432	0.9559	0.9524	0.9519	0.9554	0.9677	0.9753	0.9693	0.9836	0.9742	0.9677
0.9	0.9524	0.9448	0.9498	0.9522	0.9649	0.9625	0.9660	0.9565	0.9743	0.9677	0.9674	0.9742	0.9935	1.0000	1.0000	1.0139	1.0040	0.9934
0.95	0.9807	0.9667	0.9709	0.9776	0.9898	0.9884	0.9934	0.9836	1.0169	1.0014	1.0055	1.0213	1.0526	1.0717	1.0909	1.1229	1.1111	1.0714
0.9999	17.347	12.000	12.000	10.009	12.811	9.4424	5.5364	4.4765	4.3649	4.1507	5.1566	4.7400	6.3758	6.8646	7.9337	9.9851	10.367	10.515

Table B-1 (Continued).

	125N04863	125-04862	125N04862	125-04861	125N04861	125-04860	125N04860	125-04859	125N04859	125-04858	125N04858	125-04857	125N04857	125-04856	125N04856	125N04966	125-04965	125N04965
0.0001	0.7221	0.7308	0.7308	0.8000	0.7308	0.3437	0.7308	0.5385	0.7308	0.7308	0.8000	0.8000	0.7308	0.8000	0.7308	0.7308	0.5385	0.7308
0.05	0.8230	0.8247	0.8268	0.8333	0.8367	0.8549	0.8526	0.8552	0.8760	0.8735	0.8798	0.8824	0.8621	0.8571	0.8715	0.8715	0.8565	0.8406
0.1	0.8362	0.8404	0.8427	0.8500	0.8532	0.8696	0.8698	0.8701	0.8955	0.8951	0.9009	0.9009	0.8823	0.8722	0.8904	0.8904	0.8702	0.8551
0.15	0.8459	0.8499	0.8524	0.8607	0.8646	0.8805	0.8829	0.8824	0.9090	0.9073	0.9149	0.9165	0.8955	0.8850	0.9038	0.9038	0.8807	0.8645
0.2	0.8568	0.8579	0.8602	0.8696	0.8732	0.8887	0.8955	0.8929	0.9161	0.9149	0.9231	0.9231	0.9014	0.8955	0.9133	0.9133	0.8877	0.8705
0.25	0.8634	0.8695	0.8696	0.8811	0.8824	0.8966	0.9063	0.9004	0.9231	0.9231	0.9231	0.9231	0.9091	0.9051	0.9231	0.9231	0.8955	0.8799
0.3	0.8703	0.8769	0.8781	0.8878	0.8915	0.9043	0.9120	0.9091	0.9231	0.9231	0.9231	0.9231	0.9148	0.9091	0.9231	0.9231	0.9013	0.8850
0.35	0.8817	0.8833	0.8852	0.8955	0.8982	0.9100	0.9231	0.9150	0.9231	0.9231	0.9231	0.9231	0.9231	0.9204	0.9231	0.9231	0.9083	0.8932
0.4	0.8890	0.8951	0.8955	0.9065	0.9086	0.9176	0.9231	0.9231	0.9231	0.9231	0.9289	0.9325	0.9231	0.9231	0.9231	0.9231	0.9110	0.8965
0.45	0.8957	0.9002	0.9038	0.9091	0.9120	0.9231	0.9231	0.9231	0.9244	0.9234	0.9375	0.9375	0.9231	0.9231	0.9248	0.9248	0.9179	0.9063
0.5	0.9066	0.9091	0.9091	0.9202	0.9226	0.9231	0.9231	0.9231	0.9330	0.9300	0.9406	0.9455	0.9231	0.9231	0.9337	0.9337	0.9231	0.9091
0.55	0.9096	0.9138	0.9177	0.9231	0.9231	0.9231	0.9261	0.9231	0.9375	0.9375	0.9524	0.9524	0.9231	0.9231	0.9375	0.9375	0.9231	0.9174
0.6	0.9218	0.9229	0.9231	0.9231	0.9231	0.9235	0.9375	0.9288	0.9460	0.9413	0.9559	0.9617	0.9282	0.9231	0.9394	0.9394	0.9231	0.9231
0.65	0.9231	0.9231	0.9231	0.9231	0.9231	0.9299	0.9435	0.9375	0.9525	0.9524	0.9678	0.9709	0.9375	0.9346	0.9494	0.9494	0.9231	0.9231
0.7	0.9231	0.9231	0.9231	0.9231	0.9242	0.9375	0.9524	0.9458	0.9664	0.9617	0.9836	0.9836	0.9435	0.9375	0.9537	0.9537	0.9242	0.9231
0.75	0.9231	0.9231	0.9231	0.9318	0.9366	0.9457	0.9677	0.9588	0.9815	0.9761	1.0032	1.0000	0.9525	0.9524	0.9657	0.9657	0.9313	0.9231
0.8	0.9236	0.9289	0.9321	0.9391	0.9461	0.9568	0.9836	0.9805	1.0053	0.9986	1.0345	1.0239	0.9679	0.9646	0.9762	0.9762	0.9375	0.9235
0.85	0.9374	0.9406	0.9458	0.9540	0.9650	0.9767	1.0169	1.0182	1.0571	1.0377	1.0986	1.0601	0.9902	0.9810	0.9928	0.9928	0.9477	0.9373
0.9	0.9528	0.9641	0.9677	0.9836	0.9992	1.0238	1.1115	1.2000	1.2774	1.1937	1.3620	1.1422	1.0281	1.0045	1.0169	1.0169	0.9621	0.9521
0.95	0.9985	1.0214	1.0684	1.1311	1.2816	1.5625	2.1491	2.2013	2.0190	1.9319	1.9322	1.3274	1.1361	1.0686	1.0728	1.0728	0.9921	0.9767
0.9999	10.668	10.037	11.589	10.856	11.753	11.559	12.894	10.256	11.477	10.266	11.289	11.296	10.812	10.720	6.6776	6.6776	7.3713	10.576

Table B-1 (Continued).

	125-04964	125N04964	125-04963	125N04963	125-04962	125N04962	125-04961	125N04961	125-04960	125N04838	125-04837	125N04837	125-04836	125N04836	
0.0001	0.5385	0.7308	0.8000	0.8000	0.8000	0.7308	0.7516	0.8000	0.7308	0.7308	0.7461	0.7308	0.7308	0.7308	
0.05	0.8336	0.8297	0.8333	0.8451	0.8427	0.8463	0.8566	0.8409	0.8418	0.8675	0.8552	0.8471	0.8571	0.8404	
0.1	0.8470	0.8440	0.8503	0.8573	0.8571	0.8647	0.8699	0.8571	0.8571	0.8824	0.8692	0.8621	0.8727	0.8571	
0.15	0.8571	0.8530	0.8622	0.8696	0.8696	0.8760	0.8824	0.8671	0.8694	0.8955	0.8789	0.8713	0.8839	0.8694	
0.2	0.8645	0.8600	0.8718	0.8824	0.8824	0.8853	0.8906	0.8748	0.8773	0.9062	0.8858	0.8821	0.8949	0.8782	
0.25	0.8707	0.8696	0.8824	0.8880	0.8947	0.8955	0.8974	0.8824	0.8834	0.9101	0.8950	0.8884	0.9020	0.8859	
0.3	0.8781	0.8759	0.8902	0.8955	0.9018	0.9051	0.9069	0.8910	0.8954	0.9203	0.8996	0.8955	0.9092	0.8955	
0.35	0.8833	0.8825	0.8955	0.9039	0.9091	0.9103	0.9115	0.8966	0.9009	0.9231	0.9077	0.9035	0.9170	0.9028	
0.4	0.8905	0.8918	0.9063	0.9091	0.9231	0.9218	0.9205	0.9091	0.9091	0.9231	0.9108	0.9091	0.9231	0.9091	
0.45	0.8955	0.8957	0.9091	0.9183	0.9231	0.9231	0.9231	0.9124	0.9121	0.9231	0.9180	0.9146	0.9231	0.9161	
0.5	0.9009	0.9060	0.9193	0.9231	0.9231	0.9231	0.9231	0.9231	0.9229	0.9231	0.9231	0.9225	0.9231	0.9230	
0.55	0.9091	0.9091	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.6	0.9142	0.9194	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9236	0.9231	0.9231	0.9245	0.9231	
0.65	0.9222	0.9231	0.9231	0.9231	0.9231	0.9235	0.9235	0.9231	0.9231	0.9319	0.9231	0.9231	0.9327	0.9231	
0.7	0.9231	0.9231	0.9231	0.9231	0.9375	0.9339	0.9316	0.9231	0.9231	0.9375	0.9231	0.9231	0.9375	0.9231	
0.75	0.9231	0.9231	0.9231	0.9318	0.9435	0.9378	0.9375	0.9288	0.9232	0.9409	0.9299	0.9311	0.9457	0.9315	
0.8	0.9231	0.9231	0.9261	0.9375	0.9524	0.9520	0.9487	0.9375	0.9346	0.9524	0.9375	0.9375	0.9528	0.9381	
0.85	0.9267	0.9231	0.9375	0.9524	0.9677	0.9653	0.9602	0.9524	0.9433	0.9665	0.9498	0.9518	0.9677	0.9524	
0.9	0.9394	0.9359	0.9524	0.9677	0.9901	0.9836	0.9827	0.9677	0.9647	0.9864	0.9677	0.9698	0.9874	0.9733	
0.95	0.9650	0.9524	0.9772	1.0090	1.0418	1.0403	1.0345	1.0187	1.0188	1.0675	1.0327	1.0244	1.0481	1.0479	
0.9999	10.594	7.5856	8.9976	10.401	12.061	10.139	9.0631	9.5912	9.6910	18.536	9.8164	10.000	8.1119	11.319	

Table B-2: Travel rate percentiles for all unflagged observations during all temporal intervals.

	125N04872	125-04871	125N04871	125-04870	125N04870	125-04869	125N04869	125-04868	125N04868	125-04867	125N04867	125-04866	125N04866	125-04865	125N04865	125-04864	125N04864	125-04863
0.0001	0.7308	0.1538	0.8000	0.7308	0.8000	0.7308	0.8000	0.3462	0.8000	0.7340	0.7308	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
0.05	0.8246	0.8382	0.8243	0.8385	0.8431	0.8453	0.8451	0.8417	0.8382	0.8474	0.8460	0.8451	0.8524	0.8571	0.8451	0.8451	0.8427	0.8380
0.1	0.8436	0.8526	0.8406	0.8548	0.8571	0.8595	0.8571	0.8560	0.8571	0.8640	0.8599	0.8600	0.8696	0.8729	0.8623	0.8608	0.8571	0.8571
0.15	0.8552	0.8623	0.8523	0.8651	0.8696	0.8703	0.8696	0.8659	0.8696	0.8750	0.8707	0.8703	0.8812	0.8850	0.8748	0.8750	0.8699	0.8696
0.2	0.8636	0.8703	0.8607	0.8739	0.8774	0.8808	0.8773	0.8733	0.8803	0.8839	0.8811	0.8824	0.8884	0.8955	0.8827	0.8835	0.8824	0.8798
0.25	0.8707	0.8784	0.8696	0.8824	0.8835	0.8870	0.8831	0.8812	0.8877	0.8949	0.8877	0.8892	0.8955	0.9043	0.8955	0.8955	0.8907	0.8876
0.3	0.8824	0.8850	0.8798	0.8904	0.8934	0.8953	0.8930	0.8871	0.8955	0.9005	0.8955	0.8955	0.9063	0.9101	0.9013	0.9036	0.8982	0.8955
0.35	0.8878	0.8925	0.8851	0.8963	0.8982	0.9006	0.8982	0.8943	0.9039	0.9089	0.9023	0.9038	0.9103	0.9203	0.9091	0.9091	0.9089	0.9040
0.4	0.8955	0.8976	0.8955	0.9053	0.9068	0.9082	0.9068	0.8992	0.9091	0.9146	0.9091	0.9091	0.9204	0.9231	0.9153	0.9183	0.9124	0.9091
0.45	0.9039	0.9044	0.9010	0.9092	0.9096	0.9113	0.9094	0.9058	0.9202	0.9222	0.9138	0.9174	0.9231	0.9231	0.9231	0.9231	0.9231	0.9199
0.5	0.9091	0.9091	0.9091	0.9165	0.9184	0.9194	0.9176	0.9094	0.9231	0.9231	0.9216	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.55	0.9167	0.9135	0.9131	0.9226	0.9231	0.9231	0.9231	0.9149	0.9231	0.9231	0.9231	0.9231	0.9231	0.9259	0.9231	0.9231	0.9231	0.9231
0.6	0.9231	0.9193	0.9231	0.9231	0.9231	0.9231	0.9231	0.9208	0.9231	0.9231	0.9231	0.9231	0.9264	0.9346	0.9231	0.9264	0.9231	0.9231
0.65	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9244	0.9234	0.9231	0.9231	0.9375	0.9375	0.9318	0.9375	0.9317	0.9231
0.7	0.9231	0.9231	0.9231	0.9231	0.9239	0.9237	0.9231	0.9231	0.9375	0.9300	0.9241	0.9289	0.9375	0.9464	0.9375	0.9413	0.9375	0.9346
0.75	0.9231	0.9231	0.9231	0.9234	0.9346	0.9314	0.9327	0.9255	0.9375	0.9374	0.9331	0.9375	0.9497	0.9524	0.9475	0.9524	0.9495	0.9388
0.8	0.9290	0.9240	0.9231	0.9316	0.9375	0.9375	0.9375	0.9332	0.9497	0.9428	0.9377	0.9444	0.9574	0.9649	0.9569	0.9677	0.9595	0.9524
0.85	0.9375	0.9322	0.9364	0.9375	0.9524	0.9489	0.9512	0.9411	0.9569	0.9524	0.9513	0.9547	0.9677	0.9772	0.9715	0.9836	0.9745	0.9677
0.9	0.9523	0.9425	0.9465	0.9516	0.9615	0.9592	0.9615	0.9530	0.9742	0.9677	0.9664	0.9715	0.9914	1.0000	1.0000	1.0169	1.0040	0.9935
0.95	0.9716	0.9628	0.9677	0.9725	0.9836	0.9835	0.9836	0.9767	1.0077	1.0000	0.9988	1.0169	1.0493	1.0713	1.0870	1.1225	1.1070	1.0639
0.9999	18.010	12.000	9.7643	10.037	11.158	4.1740	4.7556	3.9769	4.4319	3.5671	5.1621	4.7159	6.0991	6.5433	7.2322	10.359	10.746	10.885

Table B-2 (Continued).

	125N04863	125-04862	125N04862	125-04861	125N04861	125-04860	125N04860	125-04859	125N04859	125-04858	125N04858	125-04857	125N04857	125-04856	125N04856	125N04966	125-04965	125N04965
0.0001	0.7308	0.7308	0.7308	0.8000	0.7308	0.3462	0.7308	0.5385	0.7308	0.7308	0.8000	0.8000	0.7308	0.8000	0.7308	0.7308	0.5385	0.7308
0.05	0.8228	0.8248	0.8268	0.8333	0.8360	0.8545	0.8513	0.8538	0.8730	0.8714	0.8772	0.8799	0.8596	0.8557	0.8710	0.8711	0.8561	0.8403
0.1	0.8359	0.8403	0.8409	0.8499	0.8530	0.8696	0.8696	0.8693	0.8931	0.8919	0.8967	0.8983	0.8798	0.8696	0.8895	0.8896	0.8700	0.8548
0.15	0.8455	0.8497	0.8522	0.8599	0.8644	0.8800	0.8824	0.8814	0.9053	0.9042	0.9120	0.9124	0.8915	0.8824	0.9015	0.9016	0.8800	0.8625
0.2	0.8553	0.8575	0.8597	0.8696	0.8724	0.8876	0.8945	0.8903	0.9125	0.9115	0.9231	0.9231	0.8983	0.8955	0.9108	0.9108	0.8870	0.8698
0.25	0.8620	0.8675	0.8696	0.8798	0.8824	0.8955	0.9025	0.8971	0.9225	0.9226	0.9231	0.9231	0.9091	0.9009	0.9210	0.9211	0.8946	0.8797
0.3	0.8696	0.8747	0.8764	0.8853	0.8904	0.9027	0.9091	0.9071	0.9231	0.9231	0.9231	0.9231	0.9095	0.9091	0.9231	0.9231	0.8995	0.8829
0.35	0.8784	0.8824	0.8826	0.8955	0.8961	0.9091	0.9202	0.9113	0.9231	0.9231	0.9231	0.9231	0.9205	0.9146	0.9231	0.9231	0.9065	0.8912
0.4	0.8847	0.8906	0.8929	0.9016	0.9063	0.9149	0.9231	0.9208	0.9231	0.9231	0.9231	0.9278	0.9231	0.9231	0.9231	0.9231	0.9096	0.8956
0.45	0.8952	0.8957	0.8983	0.9091	0.9093	0.9218	0.9231	0.9231	0.9237	0.9231	0.9375	0.9375	0.9231	0.9231	0.9231	0.9231	0.9154	0.9036
0.5	0.9008	0.9062	0.9090	0.9146	0.9194	0.9231	0.9231	0.9231	0.9313	0.9285	0.9376	0.9434	0.9231	0.9231	0.9277	0.9278	0.9217	0.9091
0.55	0.9091	0.9091	0.9109	0.9231	0.9231	0.9231	0.9259	0.9231	0.9375	0.9370	0.9524	0.9524	0.9231	0.9231	0.9362	0.9363	0.9231	0.9136
0.6	0.9149	0.9180	0.9224	0.9231	0.9231	0.9231	0.9372	0.9270	0.9434	0.9391	0.9525	0.9589	0.9236	0.9231	0.9382	0.9382	0.9231	0.9228
0.65	0.9230	0.9231	0.9231	0.9231	0.9231	0.9283	0.9432	0.9369	0.9524	0.9504	0.9677	0.9677	0.9351	0.9317	0.9474	0.9475	0.9231	0.9231
0.7	0.9231	0.9231	0.9231	0.9231	0.9235	0.9367	0.9524	0.9441	0.9623	0.9561	0.9817	0.9836	0.9390	0.9375	0.9529	0.9529	0.9239	0.9231
0.75	0.9231	0.9231	0.9231	0.9292	0.9346	0.9428	0.9676	0.9568	0.9750	0.9685	0.9979	1.0000	0.9523	0.9473	0.9643	0.9643	0.9307	0.9231
0.8	0.9232	0.9264	0.9290	0.9375	0.9432	0.9539	0.9836	0.9784	0.9968	0.9876	1.0205	1.0169	0.9650	0.9585	0.9742	0.9742	0.9375	0.9233
0.85	0.9366	0.9378	0.9418	0.9524	0.9603	0.9720	1.0168	1.0169	1.0366	1.0204	1.0692	1.0493	0.9831	0.9715	0.9893	0.9893	0.9465	0.9368
0.9	0.9524	0.9590	0.9670	0.9803	0.9950	1.0169	1.1274	1.2339	1.2000	1.1263	1.2153	1.1111	1.0104	0.9974	1.0132	1.0134	0.9600	0.9513
0.95	0.9931	1.0093	1.0526	1.1111	1.3211	1.6696	2.2394	2.2464	1.9223	1.7952	1.7136	1.2550	1.0717	1.0348	1.0640	1.0642	0.9873	0.9682
0.9999	10.143	9.5600	10.565	10.897	11.447	11.831	10.381	9.6942	11.404	10.281	11.127	11.582	10.818	10.020	7.0123	7.0045	7.4906	10.692

Table B-2 (Continued).

	0.538461506	**0.730769038**	**0.800000012**	**0.800000072**	**0.799999714**	**0.778628438**	**0.778808438**	**0.800000191**	**0.730769157**	**0.748705901**	**0.800000012**	**0.730769038**	**0.730769277**	**0.730769157**	
0.0001	0.5385	0.7308	0.8000	0.8000	0.8000	0.7786	0.7788	0.8000	0.7308	0.7487	0.8000	0.7308	0.7308	0.7308	
0.05	0.8333	0.8288	0.8333	0.8451	0.8405	0.8458	0.8556	0.8403	0.8384	0.8671	0.8545	0.8462	0.8572	0.8428	
0.1	0.8464	0.8428	0.8481	0.8571	0.8571	0.8626	0.8696	0.8571	0.8549	0.8824	0.8681	0.8604	0.8728	0.8576	
0.15	0.8566	0.8520	0.8596	0.8696	0.8696	0.8746	0.8818	0.8647	0.8650	0.8952	0.8773	0.8705	0.8837	0.8698	
0.2	0.8636	0.8579	0.8696	0.8799	0.8824	0.8832	0.8896	0.8722	0.8737	0.9038	0.8844	0.8811	0.8945	0.8813	
0.25	0.8699	0.8675	0.8798	0.8853	0.8919	0.8952	0.8960	0.8824	0.8824	0.9092	0.8932	0.8866	0.9014	0.8885	
0.3	0.8765	0.8727	0.8851	0.8955	0.8986	0.9022	0.9046	0.8877	0.8904	0.9168	0.8975	0.8953	0.9091	0.8956	
0.35	0.8824	0.8821	0.8955	0.9009	0.9091	0.9091	0.9095	0.8955	0.8958	0.9231	0.9054	0.9010	0.9159	0.9037	
0.4	0.8880	0.8876	0.9009	0.9091	0.9174	0.9178	0.9176	0.9036	0.9064	0.9231	0.9092	0.9090	0.9228	0.9091	
0.45	0.8949	0.8955	0.9091	0.9144	0.9231	0.9231	0.9231	0.9091	0.9091	0.9231	0.9155	0.9118	0.9231	0.9157	
0.5	0.8980	0.9003	0.9131	0.9231	0.9231	0.9231	0.9231	0.9202	0.9175	0.9231	0.9219	0.9206	0.9231	0.9228	
0.55	0.9061	0.9091	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.6	0.9099	0.9119	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9236	0.9231	0.9231	0.9249	0.9231	
0.65	0.9187	0.9227	0.9231	0.9231	0.9231	0.9235	0.9234	0.9231	0.9231	0.9316	0.9231	0.9231	0.9334	0.9231	
0.7	0.9231	0.9231	0.9231	0.9231	0.9350	0.9332	0.9313	0.9231	0.9231	0.9375	0.9231	0.9231	0.9375	0.9234	
0.75	0.9231	0.9231	0.9231	0.9297	0.9418	0.9377	0.9375	0.9261	0.9231	0.9413	0.9293	0.9294	0.9457	0.9330	
0.8	0.9231	0.9231	0.9261	0.9375	0.9524	0.9517	0.9484	0.9375	0.9319	0.9524	0.9375	0.9375	0.9528	0.9404	
0.85	0.9253	0.9231	0.9375	0.9524	0.9677	0.9646	0.9593	0.9524	0.9407	0.9668	0.9494	0.9515	0.9675	0.9536	
0.9	0.9375	0.9349	0.9524	0.9677	0.9868	0.9835	0.9816	0.9677	0.9592	0.9862	0.9677	0.9679	0.9863	0.9762	
0.95	0.9583	0.9524	0.9712	0.9998	1.0345	1.0353	1.0299	1.0169	1.0134	1.0706	1.0279	1.0188	1.0422	1.0471	
0.9999	11.037	5.5760	8.5203	9.0000	9.5253	10.431	9.1170	9.4330	10.306	19.051	9.9975	10.078	6.8727	11.739	

Table B-3: Travel rate percentiles for all flagged observations during all temporal intervals.

	125N04872	125-04871	125N04871	125-04870	125N04870	125-04869	125N04869	125-04868	125N04868	125-04867	125N04867	125-04866	125N04866	125-04865	125N04865	125-04864	125N04864	125-04863
0.0001	0.7308	0.1314	0.7608	0.6275	0.8000	0.6323	0.8000	0.2846	0.8000	0.6236	0.6200	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
0.05	0.8288	0.8407	0.8290	0.8386	0.8451	0.8463	0.8451	0.8441	0.8451	0.8492	0.8470	0.8486	0.8513	0.8571	0.8451	0.8451	0.8451	0.8381
0.1	0.8451	0.8571	0.8451	0.8571	0.8576	0.8632	0.8597	0.8604	0.8696	0.8696	0.8665	0.8696	0.8701	0.8773	0.8696	0.8654	0.8621	0.8571
0.15	0.8582	0.8690	0.8571	0.8696	0.8697	0.8753	0.8722	0.8727	0.8824	0.8830	0.8806	0.8824	0.8850	0.8929	0.8824	0.8824	0.8802	0.8746
0.2	0.8708	0.8782	0.8696	0.8799	0.8824	0.8846	0.8824	0.8831	0.8955	0.8955	0.8910	0.8955	0.8955	0.9063	0.8955	0.8955	0.8908	0.8872
0.25	0.8824	0.8873	0.8824	0.8893	0.8933	0.8955	0.8933	0.8931	0.9065	0.9062	0.9004	0.9040	0.9091	0.9148	0.9091	0.9039	0.9012	0.8963
0.3	0.8929	0.8955	0.8911	0.8985	0.9009	0.9037	0.9009	0.8994	0.9149	0.9150	0.9091	0.9103	0.9193	0.9231	0.9155	0.9099	0.9091	0.9091
0.35	0.9006	0.9032	0.8989	0.9091	0.9091	0.9096	0.9091	0.9086	0.9231	0.9230	0.9179	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9193
0.4	0.9091	0.9091	0.9091	0.9134	0.9174	0.9194	0.9177	0.9132	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.45	0.9176	0.9162	0.9176	0.9222	0.9231	0.9231	0.9231	0.9206	0.9231	0.9231	0.9231	0.9231	0.9231	0.9349	0.9231	0.9231	0.9231	0.9231
0.5	0.9231	0.9222	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.55	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.6	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9325	0.9375	0.9259	0.9231	0.9231	0.9231
0.65	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9232	0.9325	0.9254	0.9243	0.9268	0.9375	0.9385	0.9375	0.9375	0.9349	0.9259
0.7	0.9231	0.9231	0.9231	0.9231	0.9317	0.9284	0.9287	0.9286	0.9375	0.9346	0.9331	0.9375	0.9498	0.9524	0.9384	0.9404	0.9379	0.9375
0.75	0.9259	0.9240	0.9231	0.9257	0.9375	0.9370	0.9375	0.9364	0.9407	0.9375	0.9375	0.9434	0.9554	0.9559	0.9524	0.9524	0.9524	0.9437
0.8	0.9375	0.9305	0.9318	0.9351	0.9409	0.9405	0.9409	0.9452	0.9524	0.9492	0.9515	0.9524	0.9677	0.9677	0.9677	0.9677	0.9677	0.9556
0.85	0.9434	0.9375	0.9375	0.9410	0.9524	0.9524	0.9524	0.9623	0.9676	0.9596	0.9670	0.9709	0.9852	0.9860	0.9836	0.9836	0.9836	0.9715
0.9	0.9584	0.9522	0.9524	0.9553	0.9677	0.9689	0.9748	0.9892	0.9903	0.9836	0.9998	1.0111	1.0242	1.0239	1.0169	1.0234	1.0178	1.0077
0.95	0.9966	0.9836	0.9899	0.9992	1.0343	1.0456	1.0526	1.1494	1.0909	1.0886	1.1055	1.1334	1.1321	1.1193	1.1111	1.1503	1.1274	1.1049
0.9999	12.000	11.989	13.437	9.9781	13.809	12.011	9.9935	9.8652	8.4565	6.8976	8.7536	12.000	12.000	11.324	11.316	12.000	12.000	9.9569

Table B-3: (Continued).

	125N04863	125-04862	125N04862	125-04861	125N04861	125-04860	125N04860	125-04859	125N04859	125-04858	125N04858	125-04857	125N04857	125-04856	125N04856	125N04966	125-04965	125N04965
0.0001	0.6211	0.6224	0.6521	0.7437	0.6256	0.2601	0.7266	0.5385	0.5581	0.6726	0.7710	0.8000	0.6941	0.8000	0.5619	0.5619	0.3885	0.6349
0.05	0.8266	0.8291	0.8307	0.8343	0.8391	0.8521	0.8505	0.8521	0.8739	0.8704	0.8746	0.8798	0.8573	0.8571	0.8698	0.8698	0.8574	0.8451
0.1	0.8452	0.8455	0.8476	0.8557	0.8572	0.8698	0.8722	0.8711	0.8955	0.8940	0.8957	0.8959	0.8803	0.8773	0.8906	0.8904	0.8746	0.8573
0.15	0.8579	0.8598	0.8618	0.8696	0.8713	0.8826	0.8893	0.8855	0.9091	0.9091	0.9128	0.9149	0.8955	0.8930	0.9084	0.9080	0.8863	0.8697
0.2	0.8700	0.8721	0.8744	0.8824	0.8827	0.8946	0.9023	0.8970	0.9201	0.9195	0.9231	0.9231	0.9075	0.9010	0.9207	0.9204	0.8964	0.8823
0.25	0.8825	0.8840	0.8874	0.8955	0.8955	0.9036	0.9091	0.9091	0.9231	0.9231	0.9231	0.9231	0.9094	0.9091	0.9231	0.9231	0.9069	0.8904
0.3	0.8955	0.8957	0.8962	0.9074	0.9068	0.9111	0.9230	0.9156	0.9231	0.9231	0.9231	0.9231	0.9230	0.9231	0.9231	0.9231	0.9111	0.8957
0.35	0.9047	0.9089	0.9091	0.9119	0.9143	0.9203	0.9231	0.9231	0.9231	0.9231	0.9231	0.9244	0.9231	0.9231	0.9231	0.9231	0.9197	0.9066
0.4	0.9096	0.9122	0.9149	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9353	0.9375	0.9231	0.9231	0.9286	0.9282	0.9231	0.9092
0.45	0.9222	0.9228	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9204
0.5	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9253	0.9238	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231
0.55	0.9231	0.9231	0.9231	0.9231	0.9231	0.9233	0.9307	0.9231	0.9348	0.9335	0.9375	0.9409	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231
0.6	0.9231	0.9231	0.9231	0.9231	0.9231	0.9297	0.9375	0.9288	0.9376	0.9375	0.9494	0.9524	0.9232	0.9231	0.9398	0.9392	0.9231	0.9231
0.65	0.9231	0.9231	0.9231	0.9231	0.9261	0.9375	0.9463	0.9372	0.9482	0.9433	0.9524	0.9585	0.9318	0.9336	0.9502	0.9494	0.9242	0.9231
0.7	0.9231	0.9231	0.9231	0.9288	0.9368	0.9425	0.9525	0.9399	0.9532	0.9524	0.9615	0.9677	0.9375	0.9375	0.9524	0.9524	0.9309	0.9231
0.75	0.9241	0.9293	0.9289	0.9375	0.9387	0.9524	0.9677	0.9521	0.9677	0.9610	0.9710	0.9836	0.9432	0.9524	0.9638	0.9620	0.9375	0.9231
0.8	0.9368	0.9376	0.9375	0.9470	0.9524	0.9637	0.9836	0.9676	0.9834	0.9738	0.9852	0.9917	0.9524	0.9592	0.9707	0.9691	0.9428	0.9345
0.85	0.9495	0.9524	0.9524	0.9627	0.9677	0.9836	1.0169	0.9960	1.0101	0.9980	1.0169	1.0169	0.9679	0.9756	0.9873	0.9845	0.9528	0.9410
0.9	0.9677	0.9759	0.9726	0.9892	0.9992	1.0305	1.1066	1.0628	1.0678	1.0433	1.0681	1.0526	0.9997	1.0000	1.0155	1.0128	0.9742	0.9614
0.95	1.0356	1.0523	1.0508	1.0776	1.1112	1.2576	1.8709	1.5554	1.5970	1.3311	1.3243	1.1538	1.0568	1.0676	1.0785	1.0682	1.0307	1.0067
0.9999	10.395	9.8939	10.420	9.3246	9.4724	10.104	17.665	10.302	10.670	8.8267	11.936	10.126	8.3353	12.083	11.175	4.3727	5.1766	4.5258

Table B-3: (Continued).

	0.538461506	**0.730769038**	**0.800000012**	**0.800000072**	**0.799999714**	**0.778628438**	**0.778808438**	**0.800000191**	**0.730769157**	**0.748705901**	**0.800000012**	**0.730769038**	**0.730769277**	**0.730769157**	
0.0001	0.4761	0.6512	0.8000	0.8000	0.8000	0.6606	0.6282	0.8000	0.6941	0.6753	0.4694	0.6375	0.5590	0.6616	
0.05	0.8371	0.8333	0.8451	0.8523	0.8499	0.8571	0.8577	0.8499	0.8523	0.8678	0.8562	0.8465	0.8553	0.8383	
0.1	0.8536	0.8481	0.8606	0.8696	0.8696	0.8748	0.8805	0.8696	0.8696	0.8879	0.8714	0.8660	0.8731	0.8567	
0.15	0.8640	0.8617	0.8772	0.8824	0.8876	0.8905	0.8943	0.8824	0.8824	0.9017	0.8831	0.8789	0.8857	0.8693	
0.2	0.8732	0.8719	0.8878	0.8955	0.8986	0.9012	0.9033	0.8929	0.8955	0.9112	0.8946	0.8874	0.8972	0.8800	
0.25	0.8824	0.8824	0.8958	0.9063	0.9091	0.9095	0.9101	0.9009	0.9066	0.9227	0.9017	0.8960	0.9086	0.8899	
0.3	0.8914	0.8935	0.9091	0.9119	0.9231	0.9224	0.9221	0.9091	0.9093	0.9231	0.9091	0.9073	0.9170	0.8990	
0.35	0.8955	0.8976	0.9119	0.9231	0.9231	0.9231	0.9231	0.9231	0.9227	0.9231	0.9165	0.9124	0.9231	0.9091	
0.4	0.9041	0.9091	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9223	0.9231	0.9208	
0.45	0.9091	0.9107	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.5	0.9170	0.9224	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.55	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.6	0.9231	0.9231	0.9231	0.9231	0.9231	0.9232	0.9232	0.9231	0.9231	0.9238	0.9231	0.9231	0.9286	0.9231	
0.65	0.9231	0.9231	0.9231	0.9231	0.9375	0.9311	0.9290	0.9231	0.9231	0.9340	0.9235	0.9232	0.9371	0.9231	
0.7	0.9231	0.9231	0.9231	0.9321	0.9406	0.9375	0.9372	0.9288	0.9232	0.9375	0.9295	0.9294	0.9386	0.9236	
0.75	0.9231	0.9231	0.9231	0.9375	0.9524	0.9465	0.9379	0.9375	0.9323	0.9401	0.9370	0.9375	0.9511	0.9331	
0.8	0.9235	0.9231	0.9375	0.9524	0.9594	0.9557	0.9518	0.9463	0.9375	0.9524	0.9397	0.9454	0.9594	0.9375	
0.85	0.9366	0.9236	0.9404	0.9649	0.9757	0.9682	0.9664	0.9588	0.9524	0.9645	0.9537	0.9587	0.9729	0.9518	
0.9	0.9518	0.9375	0.9560	0.9838	1.0000	0.9967	0.9874	0.9836	0.9759	0.9840	0.9795	0.9833	1.0003	0.9684	
0.95	0.9861	0.9677	1.0000	1.0526	1.0714	1.0683	1.0501	1.0526	1.0515	1.0526	1.0526	1.0492	1.0680	1.0343	
0.9999	4.3524	8.0764	9.5986	13.510	13.707	7.2203	8.1709	8.5468	6.7515	5.7589	6.4593	8.6693	9.0876	7.9461	

Table B-4: Travel rate percentiles for all observations during the PM peak period.

	125N04872	125-04871	125N04871	125-04870	125N04870	125-04869	125N04869	125-04868	125N04868	125-04867	125N04867	125-04866	125N04866	125-04865	125N04865	125-04864	125N04864	125-04863
0.0001	0.7308	0.1294	0.7541	0.6200	0.8000	0.6308	0.7852	0.2915	0.8000	0.6558	0.6465	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
0.05	0.8130	0.8233	0.8108	0.8239	0.8330	0.8349	0.8333	0.8340	0.8333	0.8421	0.8424	0.8451	0.8451	0.8571	0.8451	0.8451	0.8452	0.8429
0.1	0.8267	0.8371	0.8226	0.8394	0.8451	0.8486	0.8451	0.8474	0.8502	0.8572	0.8556	0.8596	0.8621	0.8728	0.8646	0.8696	0.8696	0.8617
0.15	0.8358	0.8460	0.8333	0.8491	0.8557	0.8581	0.8571	0.8568	0.8607	0.8682	0.8644	0.8697	0.8722	0.8855	0.8772	0.8824	0.8824	0.8754
0.2	0.8451	0.8537	0.8406	0.8574	0.8621	0.8668	0.8622	0.8634	0.8696	0.8762	0.8711	0.8799	0.8824	0.8955	0.8876	0.8958	0.8955	0.8856
0.25	0.8523	0.8596	0.8455	0.8640	0.8696	0.8722	0.8696	0.8696	0.8787	0.8829	0.8782	0.8851	0.8930	0.9068	0.8958	0.9091	0.9079	0.8955
0.3	0.8571	0.8655	0.8533	0.8702	0.8750	0.8793	0.8748	0.8746	0.8831	0.8897	0.8838	0.8934	0.9009	0.9152	0.9069	0.9204	0.9176	0.9046
0.35	0.8654	0.8709	0.8582	0.8769	0.8824	0.8834	0.8824	0.8801	0.8910	0.8955	0.8914	0.8996	0.9091	0.9231	0.9148	0.9297	0.9258	0.9114
0.4	0.8698	0.8767	0.8666	0.8826	0.8873	0.8899	0.8853	0.8844	0.8955	0.9015	0.8962	0.9069	0.9176	0.9341	0.9231	0.9381	0.9375	0.9204
0.45	0.8780	0.8823	0.8707	0.8886	0.8933	0.8955	0.8929	0.8896	0.9014	0.9086	0.9030	0.9120	0.9239	0.9404	0.9326	0.9524	0.9434	0.9244
0.5	0.8826	0.8870	0.8784	0.8954	0.8967	0.9004	0.8961	0.8948	0.9091	0.9134	0.9091	0.9207	0.9350	0.9498	0.9406	0.9618	0.9524	0.9346
0.55	0.8910	0.8932	0.8850	0.9010	0.9039	0.9065	0.9038	0.8996	0.9128	0.9201	0.9144	0.9259	0.9432	0.9585	0.9524	0.9756	0.9646	0.9404
0.6	0.8958	0.8978	0.8932	0.9082	0.9091	0.9103	0.9091	0.9052	0.9214	0.9239	0.9220	0.9346	0.9524	0.9677	0.9653	0.9935	0.9778	0.9524
0.65	0.9051	0.9030	0.8986	0.9123	0.9155	0.9174	0.9149	0.9097	0.9244	0.9312	0.9261	0.9404	0.9625	0.9836	0.9831	1.0144	0.9961	0.9618
0.7	0.9095	0.9087	0.9091	0.9202	0.9231	0.9231	0.9231	0.9156	0.9347	0.9375	0.9355	0.9524	0.9762	1.0000	1.0010	1.0425	1.0169	0.9774
0.75	0.9204	0.9136	0.9146	0.9231	0.9261	0.9271	0.9265	0.9224	0.9385	0.9444	0.9433	0.9653	0.9970	1.0283	1.0377	1.0925	1.0545	0.9992
0.8	0.9231	0.9203	0.9231	0.9319	0.9375	0.9367	0.9375	0.9284	0.9524	0.9532	0.9556	0.9836	1.0276	1.0715	1.1015	1.2000	1.1198	1.0313
0.85	0.9349	0.9254	0.9317	0.9396	0.9434	0.9456	0.9465	0.9375	0.9646	0.9680	0.9780	1.0211	1.0909	1.1810	1.2500	1.3953	1.2208	1.0790
0.9	0.9463	0.9362	0.9441	0.9531	0.9562	0.9577	0.9631	0.9524	0.9838	0.9972	1.0328	1.1316	1.3333	1.4484	1.5156	1.6304	1.3831	1.1561
0.95	0.9713	0.9527	0.9729	0.9832	0.9851	0.9902	1.0035	0.9923	1.0491	1.0909	1.2999	1.5360	1.8651	1.8844	1.9278	2.0555	1.6588	1.3761
0.9999	7.7654	7.0939	12.000	9.5475	12.000	9.4327	10.613	9.8537	9.7319	7.9431	8.8750	8.7194	7.8378	7.7798	10.929	11.783	11.333	11.027

Table B-4: (Continued).

	125N04863	125-04862	125N04862	125-04861	125N04861	125-04860	125N04860	125-04859	125N04859	125-04858	125N04858	125-04857	125N04857	125-04856	125N04856	125N04966	125-04965	125N04965
0.0001	0.6200	0.6500	0.6453	0.7726	0.6665	0.2168	0.7308	0.4300	0.3949	0.6665	0.7710	0.8000	0.6941	0.8000	0.5592	0.5592	0.3885	0.6826
0.05	0.8227	0.8197	0.8219	0.8333	0.8403	0.8616	0.8676	0.8696	0.8959	0.8870	0.9091	0.9091	0.8749	0.8672	0.8841	0.8841	0.8580	0.8395
0.1	0.8341	0.8295	0.8333	0.8478	0.8567	0.8774	0.8851	0.8866	0.9179	0.9094	0.9375	0.9375	0.8928	0.8824	0.9023	0.9023	0.8703	0.8523
0.15	0.8431	0.8361	0.8426	0.8588	0.8677	0.8877	0.8993	0.8999	0.9331	0.9239	0.9524	0.9557	0.9028	0.8927	0.9138	0.9138	0.8783	0.8596
0.2	0.8477	0.8440	0.8499	0.8682	0.8771	0.8969	0.9120	0.9124	0.9447	0.9375	0.9677	0.9693	0.9099	0.9001	0.9232	0.9232	0.8840	0.8671
0.25	0.8546	0.8484	0.8572	0.8748	0.8849	0.9055	0.9232	0.9239	0.9553	0.9512	0.9836	0.9836	0.9215	0.9091	0.9310	0.9310	0.8893	0.8700
0.3	0.8574	0.8553	0.8646	0.8824	0.8934	0.9135	0.9375	0.9366	0.9681	0.9628	1.0002	1.0000	0.9288	0.9155	0.9375	0.9375	0.8946	0.8751
0.35	0.8627	0.8599	0.8714	0.8903	0.9012	0.9231	0.9500	0.9478	0.9850	0.9809	1.0218	1.0130	0.9375	0.9231	0.9440	0.9440	0.8984	0.8808
0.4	0.8693	0.8674	0.8800	0.8982	0.9096	0.9336	0.9675	0.9664	1.0136	1.0035	1.0528	1.0274	0.9438	0.9292	0.9519	0.9519	0.9031	0.8830
0.45	0.8727	0.8745	0.8880	0.9091	0.9207	0.9440	0.9908	1.0011	1.0693	1.0436	1.0915	1.0458	0.9524	0.9375	0.9559	0.9559	0.9074	0.8878
0.5	0.8806	0.8824	0.8965	0.9165	0.9315	0.9596	1.0415	1.0918	1.1695	1.0994	1.1408	1.0655	0.9617	0.9437	0.9633	0.9633	0.9109	0.8930
0.55	0.8862	0.8925	0.9089	0.9244	0.9426	0.9884	1.1717	1.3092	1.3158	1.1809	1.2212	1.0874	0.9684	0.9524	0.9681	0.9681	0.9155	0.8957
0.6	0.8955	0.9014	0.9206	0.9375	0.9616	1.0499	1.4381	1.6029	1.4821	1.3035	1.3128	1.1111	0.9809	0.9566	0.9745	0.9745	0.9203	0.9010
0.65	0.9049	0.9120	0.9317	0.9555	1.0007	1.1969	1.7535	1.8654	1.6459	1.4528	1.4184	1.1407	0.9902	0.9660	0.9827	0.9827	0.9237	0.9065
0.7	0.9148	0.9232	0.9518	0.9870	1.1111	1.4745	2.0934	2.0861	1.7996	1.6303	1.5331	1.1765	1.0008	0.9715	0.9893	0.9893	0.9289	0.9093
0.75	0.9235	0.9380	0.9920	1.0725	1.3898	1.7593	2.4163	2.2623	1.9573	1.7850	1.6336	1.2148	1.0167	0.9836	0.9993	0.9993	0.9349	0.9157
0.8	0.9386	0.9674	1.0895	1.3342	1.8960	2.0453	2.7213	2.4531	2.1136	1.9416	1.7397	1.2521	1.0344	0.9967	1.0115	1.0115	0.9399	0.9230
0.85	0.9665	1.0367	1.5108	1.9944	2.4572	2.3406	3.0513	2.6785	2.2940	2.1336	1.8511	1.3034	1.0565	1.0147	1.0278	1.0278	0.9499	0.9290
0.9	1.0230	1.4393	2.8649	2.7083	3.0113	2.6837	3.4910	2.9605	2.5221	2.3675	1.9988	1.3589	1.0985	1.0415	1.0529	1.0529	0.9657	0.9410
0.95	1.3317	3.1043	4.3453	3.5845	3.7610	3.1424	4.1158	3.3884	2.9268	2.7573	2.2831	1.4898	1.2190	1.1107	1.1351	1.1351	1.0138	0.9692
0.9999	10.968	11.837	11.779	11.863	11.824	9.0217	16.994	10.675	11.770	11.610	9.0989	8.4837	11.753	9.5972	7.6092	7.6092	7.6368	11.301

Table B-4: (Continued).

	0.538461506	**0.730769038**	**0.800000012**	**0.800000072**	**0.799999714**	**0.778628438**	**0.778808438**	**0.800000191**	**0.730769157**	**0.748705901**	**0.800000012**	**0.730769038**	**0.730769277**	**0.730769157**	
0.0001	0.4486	0.6253	0.8000	0.7805	0.8000	0.6397	0.6307	0.8000	0.6857	0.6641	0.4885	0.6756	0.5619	0.6482	
0.05	0.8271	0.8219	0.8288	0.8333	0.8332	0.8381	0.8458	0.8310	0.8333	0.8694	0.8583	0.8506	0.8572	0.8316	
0.1	0.8392	0.8328	0.8427	0.8475	0.8451	0.8514	0.8606	0.8451	0.8500	0.8864	0.8721	0.8643	0.8714	0.8451	
0.15	0.8463	0.8383	0.8503	0.8571	0.8556	0.8599	0.8700	0.8548	0.8606	0.9007	0.8824	0.8720	0.8820	0.8559	
0.2	0.8529	0.8450	0.8571	0.8623	0.8622	0.8691	0.8782	0.8617	0.8697	0.9098	0.8896	0.8802	0.8887	0.8653	
0.25	0.8575	0.8479	0.8637	0.8696	0.8696	0.8744	0.8845	0.8696	0.8796	0.9209	0.8960	0.8855	0.8955	0.8728	
0.3	0.8620	0.8535	0.8696	0.8746	0.8764	0.8814	0.8907	0.8748	0.8854	0.9240	0.9020	0.8922	0.9014	0.8822	
0.35	0.8668	0.8572	0.8746	0.8798	0.8824	0.8856	0.8957	0.8824	0.8954	0.9325	0.9083	0.8963	0.9080	0.8901	
0.4	0.8703	0.8604	0.8798	0.8824	0.8894	0.8927	0.9013	0.8877	0.9009	0.9377	0.9138	0.9027	0.9127	0.8979	
0.45	0.8744	0.8657	0.8826	0.8877	0.8955	0.8964	0.9074	0.8955	0.9089	0.9467	0.9198	0.9089	0.9193	0.9081	
0.5	0.8788	0.8696	0.8882	0.8931	0.9024	0.9037	0.9116	0.9009	0.9138	0.9547	0.9246	0.9144	0.9245	0.9166	
0.55	0.8826	0.8740	0.8955	0.8963	0.9091	0.9093	0.9179	0.9091	0.9225	0.9677	0.9319	0.9218	0.9322	0.9249	
0.6	0.8871	0.8793	0.8983	0.9036	0.9165	0.9169	0.9232	0.9146	0.9235	0.9836	0.9384	0.9267	0.9382	0.9374	
0.65	0.8922	0.8827	0.9063	0.9091	0.9231	0.9231	0.9303	0.9231	0.9341	1.0041	0.9501	0.9373	0.9495	0.9513	
0.7	0.8966	0.8892	0.9094	0.9148	0.9317	0.9310	0.9375	0.9279	0.9404	1.0412	0.9658	0.9504	0.9636	0.9755	
0.75	0.9030	0.8955	0.9176	0.9231	0.9404	0.9395	0.9460	0.9375	0.9532	1.1154	0.9990	0.9702	0.9859	1.0331	
0.8	0.9091	0.9024	0.9231	0.9302	0.9524	0.9520	0.9561	0.9524	0.9805	1.2912	1.1151	1.0135	1.0383	1.2001	
0.85	0.9167	0.9095	0.9336	0.9388	0.9677	0.9677	0.9786	0.9836	1.0413	1.8695	1.3413	1.1145	1.1838	1.5009	
0.9	0.9277	0.9229	0.9465	0.9557	0.9935	1.0008	1.0342	1.1371	1.4701	2.6068	1.6154	1.4077	1.4570	1.8474	
0.95	0.9564	0.9461	0.9748	1.0006	1.0793	1.1501	1.5824	2.5961	3.0201	3.3166	2.0926	1.9777	1.9096	2.4032	
0.9999	11.227	8.0042	8.9101	9.9239	11.682	10.947	9.4079	11.082	9.1222	16.813	10.110	10.762	9.0713	11.448	

Table B-5: Travel rate percentiles for all unflagged observations during the PM peak period.

	125N04872	125-04871	125N04871	125-04870	125N04870	125-04869	125N04869	125-04868	125N04868	125-04867	125N04867	125-04866	125N04866	125-04865	125N04865	125-04864	125N04864	125-04863
0.0001	0.7308	0.1294	0.7570	0.6295	0.8000	0.6393	0.7852	0.2915	0.8000	0.6606	0.6609	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
0.05	0.8131	0.8251	0.8108	0.8242	0.8311	0.8342	0.8333	0.8334	0.8333	0.8410	0.8405	0.8439	0.8431	0.8499	0.8421	0.8358	0.8343	0.8333
0.1	0.8288	0.8400	0.8242	0.8409	0.8451	0.8493	0.8452	0.8482	0.8499	0.8571	0.8557	0.8571	0.8582	0.8696	0.8574	0.8571	0.8571	0.8547
0.15	0.8392	0.8497	0.8333	0.8512	0.8571	0.8593	0.8571	0.8577	0.8614	0.8691	0.8651	0.8696	0.8701	0.8824	0.8721	0.8746	0.8725	0.8696
0.2	0.8475	0.8579	0.8451	0.8595	0.8647	0.8694	0.8648	0.8654	0.8696	0.8775	0.8724	0.8798	0.8824	0.8942	0.8824	0.8877	0.8851	0.8803
0.25	0.8571	0.8649	0.8502	0.8684	0.8711	0.8754	0.8721	0.8715	0.8808	0.8839	0.8809	0.8851	0.8930	0.9028	0.8955	0.8986	0.8955	0.8902
0.3	0.8646	0.8714	0.8571	0.8749	0.8800	0.8824	0.8798	0.8777	0.8867	0.8922	0.8867	0.8938	0.8996	0.9104	0.9036	0.9094	0.9079	0.8982
0.35	0.8696	0.8781	0.8657	0.8824	0.8850	0.8881	0.8850	0.8830	0.8955	0.8976	0.8947	0.9002	0.9091	0.9218	0.9091	0.9231	0.9155	0.9070
0.4	0.8798	0.8842	0.8721	0.8890	0.8931	0.8954	0.8929	0.8887	0.8986	0.9055	0.8994	0.9091	0.9165	0.9264	0.9204	0.9288	0.9231	0.9125
0.45	0.8851	0.8907	0.8821	0.8958	0.8982	0.9007	0.8963	0.8946	0.9069	0.9099	0.9067	0.9120	0.9231	0.9375	0.9242	0.9375	0.9310	0.9231
0.5	0.8955	0.8961	0.8877	0.9032	0.9065	0.9075	0.9044	0.8996	0.9119	0.9172	0.9105	0.9208	0.9317	0.9406	0.9350	0.9458	0.9375	0.9231
0.55	0.9010	0.9018	0.8955	0.9091	0.9099	0.9113	0.9091	0.9057	0.9204	0.9231	0.9178	0.9231	0.9375	0.9524	0.9376	0.9524	0.9464	0.9324
0.6	0.9091	0.9076	0.9036	0.9155	0.9181	0.9194	0.9174	0.9101	0.9231	0.9265	0.9231	0.9317	0.9458	0.9562	0.9500	0.9677	0.9527	0.9375
0.65	0.9152	0.9115	0.9091	0.9222	0.9231	0.9231	0.9231	0.9160	0.9317	0.9342	0.9261	0.9375	0.9524	0.9677	0.9595	0.9820	0.9677	0.9474
0.7	0.9231	0.9179	0.9190	0.9231	0.9261	0.9263	0.9259	0.9222	0.9375	0.9375	0.9346	0.9437	0.9642	0.9807	0.9740	1.0000	0.9836	0.9571
0.75	0.9231	0.9231	0.9231	0.9285	0.9375	0.9347	0.9350	0.9245	0.9415	0.9434	0.9383	0.9524	0.9755	1.0000	0.9945	1.0265	1.0037	0.9715
0.8	0.9346	0.9245	0.9259	0.9368	0.9375	0.9381	0.9376	0.9314	0.9524	0.9523	0.9516	0.9677	0.9970	1.0263	1.0304	1.0714	1.0386	0.9944
0.85	0.9375	0.9324	0.9375	0.9414	0.9494	0.9497	0.9524	0.9390	0.9651	0.9637	0.9666	0.9932	1.0325	1.0826	1.0961	1.1839	1.1111	1.0344
0.9	0.9523	0.9384	0.9495	0.9529	0.9617	0.9616	0.9677	0.9524	0.9836	0.9836	1.0000	1.0506	1.1296	1.2456	1.3043	1.4496	1.2587	1.0974
0.95	0.9746	0.9570	0.9735	0.9815	0.9901	0.9901	1.0033	0.9831	1.0338	1.0389	1.1222	1.2911	1.6000	1.6828	1.7267	1.8571	1.5159	1.2500
0.9999	7.7431	6.6877	10.570	9.5115	12.000	9.2874	10.167	6.4851	9.5318	7.6612	8.7294	7.0983	6.8711	7.2491	10.681	11.984	10.993	10.776

Table B-5: (Continued).

	125N04863	125-04862	125N04862	125-04861	125N04861	125-04860	125N04860	125-04859	125N04859	125-04858	125N04858	125-04857	125N04857	125-04856	125N04856	125N04966	125-04965	125N04965
0.0001	0.6209	0.6500	0.6500	0.7859	0.6717	0.2909	0.7308	0.5378	0.4250	0.6716	0.7710	0.8000	0.6941	0.8000	0.5619	0.5619	0.3898	0.6826
0.05	0.8219	0.8192	0.8200	0.8310	0.8339	0.8549	0.8571	0.8576	0.8830	0.8806	0.8902	0.8916	0.8696	0.8571	0.8789	0.8789	0.8534	0.8333
0.1	0.8337	0.8311	0.8333	0.8451	0.8527	0.8717	0.8754	0.8777	0.9066	0.9012	0.9156	0.9174	0.8835	0.8772	0.8966	0.8966	0.8678	0.8490
0.15	0.8429	0.8381	0.8429	0.8571	0.8651	0.8832	0.8906	0.8916	0.9209	0.9173	0.9324	0.9375	0.8956	0.8876	0.9101	0.9102	0.8761	0.8573
0.2	0.8483	0.8452	0.8522	0.8673	0.8750	0.8932	0.9027	0.9020	0.9285	0.9238	0.9404	0.9507	0.9070	0.8955	0.9215	0.9215	0.8828	0.8653
0.25	0.8566	0.8524	0.8596	0.8748	0.8832	0.9015	0.9120	0.9107	0.9375	0.9364	0.9524	0.9585	0.9120	0.9065	0.9266	0.9266	0.8886	0.8699
0.3	0.8597	0.8578	0.8694	0.8824	0.8932	0.9091	0.9231	0.9219	0.9433	0.9377	0.9585	0.9677	0.9230	0.9119	0.9354	0.9355	0.8947	0.8771
0.35	0.8671	0.8669	0.8763	0.8906	0.9008	0.9164	0.9318	0.9262	0.9524	0.9466	0.9678	0.9715	0.9232	0.9214	0.9378	0.9378	0.8988	0.8823
0.4	0.8717	0.8727	0.8830	0.8983	0.9091	0.9232	0.9376	0.9363	0.9598	0.9524	0.9836	0.9836	0.9323	0.9231	0.9440	0.9442	0.9041	0.8851
0.45	0.8800	0.8824	0.8951	0.9091	0.9174	0.9318	0.9498	0.9412	0.9709	0.9664	1.0000	1.0000	0.9375	0.9288	0.9517	0.9518	0.9088	0.8905
0.5	0.8854	0.8910	0.9021	0.9149	0.9232	0.9375	0.9602	0.9532	0.9890	0.9830	1.0238	1.0144	0.9439	0.9375	0.9532	0.9532	0.9121	0.8955
0.55	0.8953	0.8984	0.9093	0.9231	0.9345	0.9482	0.9793	0.9758	1.0189	1.0064	1.0569	1.0318	0.9524	0.9385	0.9604	0.9605	0.9171	0.8993
0.6	0.9029	0.9091	0.9219	0.9271	0.9384	0.9606	1.0129	1.0279	1.0913	1.0535	1.1107	1.0526	0.9617	0.9485	0.9672	0.9673	0.9220	0.9063
0.65	0.9094	0.9175	0.9231	0.9375	0.9524	0.9836	1.0915	1.2113	1.2424	1.1345	1.1956	1.0773	0.9705	0.9524	0.9728	0.9730	0.9231	0.9091
0.7	0.9207	0.9231	0.9329	0.9523	0.9764	1.0455	1.3932	1.5808	1.4539	1.2752	1.3182	1.1111	0.9836	0.9618	0.9820	0.9822	0.9276	0.9147
0.75	0.9231	0.9315	0.9481	0.9700	1.0313	1.2515	1.8150	1.9259	1.6627	1.4718	1.4582	1.1507	0.9971	0.9693	0.9899	0.9902	0.9336	0.9228
0.8	0.9365	0.9442	0.9781	1.0274	1.2500	1.6420	2.2573	2.1818	1.8709	1.6974	1.6054	1.2000	1.0129	0.9836	1.0004	1.0008	0.9375	0.9231
0.85	0.9524	0.9739	1.0724	1.2961	1.8309	2.0314	2.6808	2.4328	2.0825	1.9043	1.7480	1.2500	1.0345	1.0000	1.0168	1.0169	0.9459	0.9311
0.9	0.9877	1.0738	1.7150	2.1905	2.6250	2.4482	3.1386	2.7449	2.3249	2.1598	1.9078	1.3157	1.0685	1.0208	1.0400	1.0410	0.9575	0.9403
0.95	1.1468	2.2544	3.7422	3.1928	3.4774	2.9607	3.8028	3.2168	2.7336	2.5562	2.1984	1.4296	1.1612	1.0714	1.1078	1.1116	0.9894	0.9643
0.9999	10.924	11.702	11.685	11.793	11.708	8.9761	11.713	10.117	11.640	11.546	8.7764	8.3373	11.713	9.5593	6.2329	7.4726	7.6019	10.807

Table B-5: (Continued).

	0.538461506	**0.730769038**	**0.800000012**	**0.800000072**	**0.799999714**	**0.778628438**	**0.778808438**	**0.800000191**	**0.730769157**	**0.748705901**	**0.800000012**	**0.730769038**	**0.730769277**	**0.730769157**	
0.0001	0.4489	0.6300	0.8000	0.7583	0.8000	0.6397	0.6397	0.8000	0.6885	0.6714	0.5059	0.6795	0.5619	0.6554	
0.05	0.8235	0.8217	0.8264	0.8333	0.8304	0.8355	0.8451	0.8287	0.8336	0.8696	0.8571	0.8485	0.8542	0.8317	
0.1	0.8374	0.8332	0.8406	0.8451	0.8451	0.8506	0.8595	0.8451	0.8524	0.8882	0.8710	0.8626	0.8698	0.8454	
0.15	0.8459	0.8389	0.8502	0.8571	0.8571	0.8605	0.8699	0.8571	0.8647	0.9027	0.8820	0.8713	0.8810	0.8573	
0.2	0.8531	0.8453	0.8571	0.8633	0.8646	0.8697	0.8792	0.8627	0.8747	0.9099	0.8896	0.8805	0.8886	0.8676	
0.25	0.8581	0.8508	0.8653	0.8696	0.8707	0.8769	0.8852	0.8696	0.8824	0.9211	0.8963	0.8865	0.8958	0.8761	
0.3	0.8638	0.8570	0.8698	0.8759	0.8802	0.8828	0.8930	0.8795	0.8927	0.9231	0.9030	0.8939	0.9027	0.8840	
0.35	0.8689	0.8599	0.8773	0.8824	0.8863	0.8903	0.8979	0.8838	0.8982	0.9270	0.9091	0.8985	0.9091	0.8940	
0.4	0.8728	0.8665	0.8824	0.8870	0.8955	0.8957	0.9049	0.8930	0.9066	0.9357	0.9146	0.9060	0.9149	0.9014	
0.45	0.8779	0.8698	0.8878	0.8930	0.9012	0.9034	0.9093	0.8982	0.9096	0.9375	0.9206	0.9099	0.9223	0.9093	
0.5	0.8824	0.8751	0.8955	0.8967	0.9091	0.9091	0.9152	0.9068	0.9180	0.9444	0.9231	0.9173	0.9258	0.9186	
0.55	0.8872	0.8821	0.8989	0.9040	0.9160	0.9162	0.9223	0.9119	0.9231	0.9524	0.9284	0.9231	0.9337	0.9231	
0.6	0.8932	0.8860	0.9074	0.9091	0.9231	0.9231	0.9236	0.9231	0.9231	0.9582	0.9351	0.9241	0.9375	0.9289	
0.65	0.8974	0.8942	0.9119	0.9156	0.9288	0.9263	0.9315	0.9231	0.9289	0.9677	0.9376	0.9340	0.9451	0.9375	
0.7	0.9043	0.8981	0.9202	0.9231	0.9375	0.9366	0.9375	0.9281	0.9374	0.9850	0.9471	0.9406	0.9528	0.9461	
0.75	0.9091	0.9081	0.9231	0.9259	0.9438	0.9394	0.9440	0.9375	0.9443	1.0137	0.9589	0.9524	0.9674	0.9653	
0.8	0.9154	0.9119	0.9288	0.9375	0.9524	0.9520	0.9531	0.9495	0.9600	1.0720	0.9836	0.9686	0.9848	1.0043	
0.85	0.9231	0.9227	0.9375	0.9406	0.9676	0.9667	0.9702	0.9677	0.9909	1.2643	1.0885	1.0123	1.0366	1.1707	
0.9	0.9297	0.9244	0.9494	0.9554	0.9852	0.9939	1.0130	1.0246	1.1151	2.0707	1.3960	1.1652	1.2368	1.5670	
0.95	0.9516	0.9461	0.9712	0.9954	1.0604	1.0929	1.2516	1.8908	2.3176	3.0176	1.8657	1.7093	1.6896	2.1106	
0.9999	11.087	6.0101	8.5644	9.8507	11.638	10.918	9.5711	11.668	8.7774	16.790	10.044	10.290	7.3009	11.207	

Table B-6: Travel rate percentiles for flagged observations during the PM peak period.

	125N04872	125-04871	125N04871	125-04870	125N04870	125-04869	125N04869	125-04868	125N04868	125-04867	125N04867	125-04866	125N04866	125-04865	125N04865	125-04864	125N04864	125-04863
0.0001	0.1120	0.0209	0.1224	0.0952	0.1219	0.1005	0.1237	0.0370	0.0838	0.0773	0.0716	0.0796	0.0780	0.0772	0.0786	0.0774	0.0788	0.0797
0.05	0.8133	0.8290	0.8183	0.8279	0.8345	0.8369	0.8333	0.8436	0.8461	0.8476	0.8504	0.8496	0.8571	0.8625	0.8571	0.8593	0.8571	0.8460
0.1	0.8300	0.8427	0.8333	0.8451	0.8451	0.8502	0.8453	0.8580	0.8693	0.8665	0.8665	0.8676	0.8725	0.8798	0.8774	0.8824	0.8824	0.8703
0.15	0.8403	0.8511	0.8409	0.8564	0.8571	0.8598	0.8571	0.8664	0.8799	0.8822	0.8791	0.8824	0.8850	0.8955	0.8934	0.8977	0.8955	0.8883
0.2	0.8513	0.8596	0.8476	0.8636	0.8635	0.8693	0.8672	0.8756	0.8876	0.8889	0.8863	0.8955	0.8955	0.9103	0.9036	0.9091	0.9091	0.8996
0.25	0.8571	0.8667	0.8571	0.8702	0.8706	0.8781	0.8746	0.8824	0.8955	0.8960	0.8955	0.9024	0.9091	0.9231	0.9091	0.9231	0.9121	0.9091
0.3	0.8694	0.8722	0.8647	0.8786	0.8821	0.8835	0.8824	0.8902	0.9045	0.9057	0.9035	0.9091	0.9165	0.9234	0.9231	0.9231	0.9231	0.9230
0.35	0.8768	0.8794	0.8703	0.8847	0.8902	0.8918	0.8877	0.8978	0.9091	0.9144	0.9093	0.9174	0.9231	0.9353	0.9231	0.9340	0.9344	0.9231
0.4	0.8833	0.8862	0.8803	0.8932	0.8965	0.8975	0.8955	0.9079	0.9183	0.9231	0.9159	0.9231	0.9288	0.9406	0.9346	0.9386	0.9375	0.9259
0.45	0.8929	0.8933	0.8867	0.8991	0.9043	0.9056	0.9009	0.9135	0.9231	0.9231	0.9230	0.9240	0.9375	0.9524	0.9404	0.9524	0.9465	0.9375
0.5	0.8983	0.8989	0.8955	0.9075	0.9092	0.9104	0.9091	0.9199	0.9318	0.9286	0.9231	0.9346	0.9437	0.9527	0.9524	0.9628	0.9524	0.9379
0.55	0.9091	0.9056	0.8983	0.9123	0.9202	0.9184	0.9180	0.9231	0.9375	0.9360	0.9286	0.9375	0.9524	0.9632	0.9594	0.9739	0.9651	0.9498
0.6	0.9176	0.9095	0.9091	0.9223	0.9231	0.9231	0.9231	0.9248	0.9375	0.9375	0.9365	0.9494	0.9602	0.9695	0.9715	0.9836	0.9772	0.9592
0.65	0.9231	0.9166	0.9136	0.9231	0.9264	0.9260	0.9241	0.9338	0.9524	0.9487	0.9425	0.9557	0.9691	0.9845	0.9868	1.0042	0.9950	0.9712
0.7	0.9263	0.9231	0.9231	0.9259	0.9375	0.9341	0.9351	0.9423	0.9617	0.9530	0.9535	0.9728	0.9871	1.0000	1.0047	1.0313	1.0169	0.9945
0.75	0.9375	0.9254	0.9259	0.9358	0.9390	0.9387	0.9384	0.9566	0.9774	0.9671	0.9677	1.0000	1.0144	1.0344	1.0444	1.0776	1.0619	1.0171
0.8	0.9440	0.9337	0.9375	0.9425	0.9524	0.9511	0.9524	0.9726	0.9903	0.9884	1.0009	1.0499	1.0644	1.0714	1.1006	1.1427	1.1009	1.0635
0.85	0.9577	0.9456	0.9524	0.9553	0.9677	0.9634	0.9677	1.0237	1.0178	1.0263	1.0570	1.1635	1.1538	1.1607	1.2078	1.2934	1.2000	1.1196
0.9	0.9911	0.9677	0.9774	0.9836	0.9936	0.9862	0.9944	1.1210	1.1044	1.1522	1.3011	1.5296	1.4740	1.4498	1.4634	1.5553	1.4009	1.2518
0.95	1.1028	1.0313	1.0643	1.0809	1.0723	1.0575	1.0782	1.5234	1.4506	1.7849	2.1589	3.0482	2.3179	2.2716	2.1681	2.0229	1.8181	1.5800
0.9999	10.731	2.1277	12.000	6.1440	11.874	5.1931	2.1895	9.9454	7.5205	6.8377	8.0861	9.6949	8.1716	7.7793	8.1330	6.4077	5.1661	2.8955

Table B-6: (Continued).

	125N04863	125-04862	125N04862	125-04861	125N04861	125-04860	125N04860	125-04859	125N04859	125-04858	125N04858	125-04857	125N04857	125-04856	125N04856	125N04966	125-04965	125N04965
0.0001	0.0784	0.0805	0.0802	0.0862	0.0781	0.0450	0.1054	0.0746	0.0769	0.0962	0.1008	0.1015	0.0916	0.1020	0.0731	0.0698	0.0524	0.0667
0.05	0.8256	0.8242	0.8313	0.8385	0.8451	0.8579	0.8571	0.8596	0.8960	0.8909	0.9062	0.9012	0.8774	0.8599	0.8774	0.8770	0.8573	0.8386
0.1	0.8423	0.8390	0.8451	0.8547	0.8575	0.8756	0.8761	0.8782	0.9144	0.9095	0.9251	0.9231	0.8955	0.8824	0.8929	0.8924	0.8732	0.8568
0.15	0.8524	0.8459	0.8547	0.8647	0.8700	0.8890	0.8982	0.8938	0.9231	0.9231	0.9375	0.9375	0.9036	0.8955	0.9084	0.9070	0.8844	0.8658
0.2	0.8581	0.8572	0.8611	0.8721	0.8826	0.8983	0.9091	0.9091	0.9299	0.9278	0.9495	0.9524	0.9091	0.8987	0.9224	0.9213	0.8939	0.8727
0.25	0.8668	0.8646	0.8698	0.8824	0.8944	0.9081	0.9231	0.9129	0.9379	0.9375	0.9524	0.9524	0.9187	0.9100	0.9293	0.9280	0.9000	0.8822
0.3	0.8724	0.8729	0.8824	0.8955	0.9013	0.9122	0.9346	0.9231	0.9516	0.9445	0.9524	0.9677	0.9231	0.9231	0.9375	0.9375	0.9082	0.8877
0.35	0.8824	0.8830	0.8910	0.9085	0.9091	0.9226	0.9376	0.9321	0.9613	0.9524	0.9677	0.9718	0.9286	0.9237	0.9411	0.9396	0.9099	0.8955
0.4	0.8849	0.8955	0.9013	0.9091	0.9228	0.9295	0.9527	0.9382	0.9742	0.9676	0.9836	0.9836	0.9374	0.9349	0.9501	0.9490	0.9150	0.8959
0.45	0.8961	0.9044	0.9091	0.9231	0.9239	0.9375	0.9704	0.9555	0.9918	0.9836	1.0090	1.0000	0.9441	0.9404	0.9535	0.9527	0.9221	0.9038
0.5	0.9082	0.9091	0.9226	0.9231	0.9370	0.9498	1.0014	0.9827	1.0216	1.0022	1.0381	1.0169	0.9524	0.9524	0.9615	0.9590	0.9231	0.9091
0.55	0.9116	0.9204	0.9231	0.9317	0.9378	0.9647	1.0684	1.0183	1.0757	1.0345	1.0682	1.0353	0.9621	0.9556	0.9677	0.9674	0.9275	0.9148
0.6	0.9231	0.9231	0.9296	0.9375	0.9536	0.9936	1.1886	1.0848	1.1999	1.0900	1.1108	1.0645	0.9741	0.9677	0.9760	0.9725	0.9348	0.9231
0.65	0.9259	0.9345	0.9432	0.9524	0.9711	1.0571	1.4570	1.2629	1.4457	1.2220	1.2088	1.0909	0.9872	0.9774	0.9838	0.9829	0.9388	0.9231
0.7	0.9378	0.9468	0.9575	0.9728	0.9994	1.1541	1.8339	1.5895	1.7116	1.5020	1.3359	1.1167	1.0040	0.9934	0.9981	0.9926	0.9506	0.9346
0.75	0.9522	0.9610	0.9923	1.0169	1.0568	1.4274	2.3053	2.0311	1.9599	1.7829	1.5084	1.1690	1.0295	1.0110	1.0137	1.0073	0.9637	0.9408
0.8	0.9677	0.9916	1.0586	1.1315	1.2716	1.8388	2.6000	2.3492	2.1865	2.0526	1.6636	1.2455	1.0568	1.0313	1.0344	1.0273	0.9825	0.9532
0.85	1.0210	1.0535	1.2264	1.3672	1.7691	2.1603	2.9873	2.6409	2.4035	2.2578	1.8200	1.3038	1.0892	1.0714	1.0686	1.0519	1.0236	0.9875
0.9	1.0999	1.2293	2.1250	2.2157	2.4466	2.5680	3.5857	2.9079	2.7410	2.5109	1.9494	1.3658	1.1499	1.1337	1.1321	1.0956	1.0911	1.0345
0.95	1.3373	2.1698	3.7851	3.5334	3.2505	3.1965	4.5094	3.5208	3.3481	2.9229	2.2049	1.5084	1.2993	1.2765	1.2451	1.1754	1.2205	1.1036
0.9999	10.710	10.363	11.848	9.7974	10.005	8.9652	18.733	10.410	9.9009	8.6777	5.1390	4.3812	3.0537	6.3502	8.0138	1.7555	5.4199	8.0244

Table B-6: (Continued).

	0.538461506	**0.730769038**	**0.800000012**	**0.800000072**	**0.799999714**	**0.778628438**	**0.778808438**	**0.800000191**	**0.730769157**	**0.748705901**	**0.800000012**	**0.730769038**	**0.730769277**	**0.730769157**	
0.0001	0.0498	0.0731	0.0837	0.0864	0.0842	0.0712	0.0778	0.0870	0.0777	0.0858	0.0498	0.0736	0.0572	0.0687	
0.05	0.8333	0.8262	0.8380	0.8447	0.8428	0.8459	0.8484	0.8428	0.8451	0.8623	0.8594	0.8579	0.8627	0.8354	
0.1	0.8473	0.8450	0.8525	0.8596	0.8596	0.8632	0.8702	0.8571	0.8631	0.8827	0.8775	0.8700	0.8811	0.8540	
0.15	0.8571	0.8537	0.8623	0.8696	0.8700	0.8757	0.8826	0.8697	0.8754	0.8980	0.8876	0.8824	0.8891	0.8661	
0.2	0.8629	0.8585	0.8721	0.8797	0.8850	0.8857	0.8932	0.8824	0.8858	0.9091	0.8964	0.8896	0.8966	0.8748	
0.25	0.8699	0.8667	0.8805	0.8844	0.8955	0.8950	0.8981	0.8919	0.8955	0.9209	0.9059	0.8959	0.9052	0.8847	
0.3	0.8768	0.8715	0.8876	0.8929	0.9044	0.9036	0.9061	0.8955	0.9043	0.9248	0.9106	0.9026	0.9103	0.8944	
0.35	0.8824	0.8802	0.8955	0.8985	0.9098	0.9094	0.9091	0.9045	0.9091	0.9353	0.9178	0.9091	0.9187	0.9011	
0.4	0.8869	0.8824	0.8959	0.9063	0.9200	0.9191	0.9149	0.9091	0.9146	0.9375	0.9231	0.9138	0.9239	0.9098	
0.45	0.8937	0.8877	0.9036	0.9091	0.9232	0.9231	0.9231	0.9176	0.9231	0.9420	0.9283	0.9205	0.9340	0.9218	
0.5	0.8955	0.8955	0.9091	0.9177	0.9336	0.9239	0.9237	0.9231	0.9232	0.9523	0.9366	0.9231	0.9375	0.9231	
0.55	0.9018	0.8983	0.9119	0.9231	0.9375	0.9350	0.9318	0.9231	0.9319	0.9578	0.9389	0.9286	0.9413	0.9275	
0.6	0.9087	0.9088	0.9231	0.9231	0.9464	0.9379	0.9375	0.9375	0.9375	0.9700	0.9520	0.9375	0.9524	0.9372	
0.65	0.9143	0.9101	0.9231	0.9291	0.9524	0.9513	0.9432	0.9478	0.9494	0.9876	0.9629	0.9482	0.9663	0.9497	
0.7	0.9231	0.9215	0.9303	0.9375	0.9610	0.9595	0.9561	0.9617	0.9673	1.0175	0.9836	0.9641	0.9876	0.9693	
0.75	0.9249	0.9231	0.9375	0.9524	0.9695	0.9719	0.9767	0.9836	0.9927	1.0581	1.0148	0.9872	1.0078	1.0230	
0.8	0.9381	0.9355	0.9464	0.9677	0.9872	0.9991	0.9991	1.0176	1.0179	1.1332	1.0808	1.0191	1.0480	1.1144	
0.85	0.9546	0.9524	0.9652	0.9932	1.0172	1.0342	1.0267	1.0640	1.0841	1.2967	1.2214	1.0781	1.1388	1.4023	
0.9	1.0041	0.9983	0.9876	1.0396	1.0709	1.1069	1.0956	1.2000	1.3002	2.1916	1.5000	1.3251	1.3947	1.8582	
0.95	1.0862	1.0815	1.0586	1.1700	1.1765	1.2957	1.2259	2.0284	2.4637	3.2509	2.2977	2.1502	2.2280	2.8553	
0.9999	1.4606	8.2945	1.3287	3.4428	6.1616	7.3221	8.9283	9.0037	6.8876	6.1866	5.8139	8.6029	9.5479	8.3386	

Table B-7: Travel rate percentiles for all incident observations during all intervals.

	125N04872	125-04871	125N04871	125-04870	125N04870	125-04869	125N04869	125-04868	125N04868	125-04867	125N04867	125-04866	125N04866	125-04865	125N04865	125-04864	125N04864	125-04863
0.0001	0.0154	0.0154	0.0162	0.0191	0.0197	0.0267	0.0271	0.0311	0.0234	0.0924	0.1596	0.1761	0.1658	0.2350	0.2359	0.1642	0.1723	0.1138
0.05	0.8101	0.8286	0.8174	0.8333	0.8451	0.8514	0.8596	0.8759	0.8633	0.8646	0.8699	0.8696	0.8696	0.8697	0.8607	0.8571	0.8571	0.8514
0.1	0.8341	0.8576	0.8331	0.8562	0.8621	0.8749	0.8766	0.9020	0.8832	0.8835	0.8955	0.8933	0.8955	0.8955	0.8905	0.8824	0.8824	0.8764
0.15	0.8648	0.8694	0.8410	0.8675	0.8783	0.9000	0.8985	0.9215	0.9086	0.8996	0.9093	0.9091	0.9176	0.9155	0.9091	0.8966	0.8955	0.8955
0.2	0.8796	0.8798	0.8534	0.8869	0.8962	0.9212	0.9169	0.9231	0.9200	0.9110	0.9220	0.9231	0.9231	0.9288	0.9192	0.9120	0.9091	0.9091
0.25	0.8889	0.8886	0.8749	0.9002	0.9091	0.9231	0.9231	0.9361	0.9282	0.9225	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.3	0.9038	0.8989	0.8835	0.9123	0.9231	0.9231	0.9231	0.9580	0.9375	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.35	0.9149	0.9055	0.8930	0.9225	0.9234	0.9293	0.9295	1.0244	0.9404	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.4	0.9231	0.9114	0.8998	0.9231	0.9375	0.9377	0.9375	1.1124	0.9524	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.45	0.9231	0.9201	0.9091	0.9231	0.9487	0.9524	0.9549	1.1804	0.9662	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.5	0.9317	0.9231	0.9204	0.9237	0.9677	1.0558	1.0163	1.3015	0.9818	0.9231	0.9231	0.9231	0.9304	0.9375	0.9231	0.9231	0.9231	0.9231
0.55	0.9375	0.9231	0.9231	0.9347	1.2920	1.4632	1.1772	1.4411	0.9836	0.9244	0.9234	0.9231	0.9385	0.9375	0.9320	0.9255	0.9288	0.9231
0.6	0.9405	0.9252	0.9231	0.9435	1.8687	1.8165	1.3578	1.6900	1.0111	0.9336	0.9287	0.9358	0.9524	0.9404	0.9376	0.9375	0.9375	0.9302
0.65	0.9509	0.9314	0.9267	0.9852	2.3227	2.1884	1.7742	1.8497	1.0538	0.9380	0.9374	0.9473	0.9677	0.9524	0.9524	0.9524	0.9524	0.9475
0.7	0.9636	0.9378	0.9375	1.1065	2.6505	2.5353	2.0261	2.2511	1.1059	0.9524	0.9486	0.9615	0.9836	0.9649	0.9677	0.9677	0.9677	0.9596
0.75	1.1433	0.9557	0.9529	1.2706	3.2126	3.1580	2.3077	2.6571	1.2048	0.9635	0.9628	0.9836	1.0113	0.9836	0.9836	0.9836	0.9836	0.9836
0.8	1.5706	1.0218	1.0749	2.2383	3.8866	4.4112	2.7030	3.7008	1.3596	0.9823	0.9868	1.0242	1.0345	1.0000	1.0004	1.0169	1.0169	1.0169
0.85	3.2824	1.2053	1.4946	2.7020	5.4380	5.4805	3.1391	4.7290	1.6287	1.0309	1.0311	1.0754	1.0714	1.0347	1.0345	1.0688	1.0543	1.0714
0.9	5.7829	1.4109	3.6046	3.5913	7.4184	6.3150	4.0801	5.9062	1.8920	1.1153	1.1538	1.3619	1.1540	1.0910	1.0839	1.1692	1.1672	1.1909
0.95	9.1516	3.2416	6.7879	4.4497	10.019	7.9951	6.3598	7.6467	2.3132	1.5959	2.0737	3.2428	1.4704	1.2624	1.2744	1.3989	1.4584	1.9334
0.9999	10.831	6.5511	12.000	9.8428	12.000	10.550	10.113	9.9513	8.8050	8.2133	9.2182	12.000	12.000	11.544	11.843	12.000	12.000	10.000

Table B-7: (Continued).

	125N04863	125-04862	125N04862	125-04861	125N04861	125-04860	125N04860	125-04859	125N04859	125-04858	125N04858	125-04857	125N04857	125-04856	125N04856	125N04966	125-04965	125N04965
0.0001	0.1074	0.0931	0.0836	0.0794	0.0101	0.0240	0.0372	0.0337	0.0292	0.0094	0.0082	0.0043	0.0012	0.0050	0.0082	0.0000	0.0103	0.0069
0.05	0.8431	0.8336	0.8409	0.8333	0.8955	0.8567	0.9122	0.9231	0.9231	0.9207	0.9249	1.0909	0.6208	0.9087	0.9129	0.0000	0.8805	0.8664
0.1	0.8582	0.8677	0.8573	0.8552	0.9230	0.8752	0.9465	0.9231	0.9231	0.9413	0.9434	1.2450	1.0377	0.9231	0.9228	0.0000	0.8867	0.8826
0.15	0.8773	0.8824	0.8721	0.8696	0.9262	0.8910	0.9903	0.9231	0.9357	0.9675	0.9522	1.2723	1.0467	0.9802	0.9456	0.0000	0.8938	0.9226
0.2	0.8922	0.8958	0.8889	0.8841	0.9371	0.9019	1.1027	0.9243	0.9718	1.0250	0.9598	1.2974	1.1029	1.0320	0.9810	0.0000	0.9199	0.9231
0.25	0.9065	0.9092	0.9013	0.9007	0.9494	0.9091	1.2190	0.9375	1.0197	1.0892	0.9742	1.3563	1.1827	1.0551	1.0164	0.0000	0.9231	0.9231
0.3	0.9170	0.9228	0.9176	0.9117	0.9524	0.9166	1.4889	0.9538	1.0512	1.1671	1.0192	1.3683	1.4341	1.1302	1.0326	0.0000	0.9231	0.9231
0.35	0.9231	0.9231	0.9231	0.9231	0.9838	0.9240	1.6319	0.9776	1.0696	1.2458	1.0887	1.3879	1.7585	1.2341	1.0927	0.0000	0.9231	0.9231
0.4	0.9231	0.9231	0.9231	0.9231	1.0002	0.9381	1.8270	1.0052	1.1117	1.3884	1.1348	1.4582	2.2293	1.4831	1.1642	0.0000	0.9231	0.9231
0.45	0.9231	0.9231	0.9231	0.9231	1.0898	0.9524	2.0169	1.0483	1.1688	1.4905	1.2200	1.5529	2.4644	2.2437	1.2210	0.0000	0.9231	0.9231
0.5	0.9231	0.9231	0.9231	0.9231	1.1853	0.9889	2.2966	1.1630	1.2777	1.5974	1.3007	2.1033	2.5816	2.8760	1.2837	0.0000	0.9231	0.9231
0.55	0.9231	0.9231	0.9231	0.9231	1.2780	1.1927	2.5048	1.2887	1.3457	1.7453	1.5956	2.3920	2.6449	3.2788	1.4981	0.0000	0.9231	0.9231
0.6	0.9231	0.9231	0.9231	0.9231	1.7120	1.5866	2.7459	1.4955	1.5109	1.9308	1.7604	2.5667	2.6887	3.4307	1.9540	0.0000	0.9231	0.9231
0.65	0.9231	0.9259	0.9231	0.9231	1.9569	1.9002	2.9966	1.7590	1.7046	2.0675	1.9013	2.6544	2.6933	3.6443	2.8503	0.0000	0.9231	0.9231
0.7	0.9317	0.9375	0.9318	0.9231	2.4289	2.0885	3.4296	1.9679	1.9516	2.4608	2.1672	3.1912	2.7534	4.0339	4.6693	0.0000	0.9383	0.9231
0.75	0.9445	0.9522	0.9478	0.9375	2.5920	2.4307	3.7618	2.3295	2.3440	2.6334	2.2859	3.5547	2.8413	4.7273	5.2811	0.0000	0.9698	0.9231
0.8	0.9677	0.9769	0.9657	0.9529	2.9267	2.8360	4.2258	2.5708	2.8514	2.9408	2.4961	3.6571	2.8484	4.9849	6.0705	0.0000	1.5502	0.9623
0.85	1.0141	1.0100	0.9835	0.9835	3.8737	3.2299	4.6956	3.0241	3.2621	3.6767	2.9591	4.9379	2.8756	5.0992	6.6288	0.0000	2.2546	1.0990
0.9	1.0692	1.0791	1.0331	1.0163	5.4586	3.8273	5.6495	3.6018	4.2602	3.9921	4.1763	6.4711	2.9429	5.5854	7.0832	0.0000	2.5307	1.4310
0.95	1.3852	1.9126	1.9332	1.3552	7.4362	5.5365	6.3166	4.8935	6.7379	4.5780	6.0904	9.9396	3.0057	6.1942	7.8421	0.0000	3.2517	3.2197
0.9999	10.706	10.376	10.434	9.3387	9.4848	8.4571	9.8248	8.8485	10.699	5.9965	12.374	10.670	3.0663	6.3502	11.638	0.0000	5.4451	8.7502

Table B-7: (Continued).

	0.538461506	**0.730769038**	**0.800000012**	**0.800000072**	**0.799999714**	**0.778628438**	**0.778808438**	**0.800000191**	**0.730769157**	**0.748705901**	**0.800000012**	**0.730769038**	**0.730769277**	**0.730769157**	
0.0001	0.0088	0.0177	0.0002	0.0078	0.0034	0.0067	0.0034	0.0117	0.0103	0.0095	0.0043	0.0026	0.0046	0.0041	
0.05	0.8790	0.8428	0.0862	0.8653	0.9091	0.8962	0.9375	0.8571	0.8679	0.8554	0.9380	0.8968	1.0101	0.8783	
0.1	0.8846	0.8524	0.1724	0.8733	0.9311	0.9231	0.9830	0.8696	0.8817	0.8727	0.9704	0.9551	1.3931	0.9279	
0.15	0.8967	0.8630	0.2586	0.8846	0.9787	0.9309	1.0094	0.8824	0.8955	0.8797	1.0934	1.3558	1.4390	0.9646	
0.2	0.9037	0.8818	0.3448	0.9019	1.0432	0.9722	1.0428	0.8955	0.9004	0.8824	1.1252	1.4558	1.4959	1.0392	
0.25	0.9091	0.8831	0.4310	0.9091	1.1354	1.0308	1.1305	0.9091	0.9091	0.8897	1.1556	1.5684	1.5000	1.1816	
0.3	0.9123	0.8947	0.5172	0.9155	1.3861	1.1422	1.4697	0.9231	0.9159	0.9070	1.2887	1.7521	1.6091	1.3094	
0.35	0.9156	0.9008	0.6034	0.9295	1.4484	1.4433	2.0518	0.9231	0.9230	0.9174	1.4619	1.9646	1.6667	1.4300	
0.4	0.9199	0.9093	0.6897	0.9349	1.6734	1.5924	2.4093	0.9231	0.9231	0.9231	1.5323	2.3368	2.0381	1.7352	
0.45	0.9226	0.9146	0.7759	0.9506	2.1668	1.8977	2.5437	0.9231	0.9231	0.9295	1.9169	2.3633	2.2097	1.8883	
0.5	0.9231	0.9218	0.8621	0.9647	2.8614	2.6044	2.6969	0.9259	0.9231	0.9395	2.1722	2.5247	2.2742	1.9939	
0.55	0.9231	0.9231	0.8644	0.9836	3.2261	2.9268	3.2017	0.9375	0.9231	0.9521	2.4794	2.7450	2.7038	2.0600	
0.6	0.9231	0.9231	0.8668	1.0744	4.0515	3.8657	3.4275	0.9524	0.9231	0.9853	2.5862	2.8828	2.9084	2.3078	
0.65	0.9231	0.9231	0.8691	1.2056	4.6147	4.4955	3.6724	0.9774	0.9250	1.0174	2.6536	2.9966	3.1295	2.9869	
0.7	0.9231	0.9231	0.8714	1.7183	5.6509	5.0564	3.8788	1.0453	0.9375	1.0449	3.0263	3.2375	3.2692	4.1704	
0.75	0.9231	0.9241	0.8738	1.9611	6.1682	5.1878	4.2048	1.2934	0.9584	1.1685	3.5325	3.6704	3.9633	4.6745	
0.8	0.9231	0.9436	0.8761	2.1408	6.6327	5.6939	4.7730	1.9536	1.3216	2.0067	4.6176	3.9238	4.5990	5.0454	
0.85	0.9342	1.0030	0.8785	2.5075	7.1599	6.0336	5.2864	2.5000	1.6984	2.4495	4.7754	4.0224	6.0240	5.9026	
0.9	1.0431	1.3628	0.8808	3.2111	7.9159	6.3660	5.9771	3.0000	1.9369	2.9492	5.5308	4.7028	7.8370	6.2649	
0.95	1.2081	4.9957	0.8831	3.7399	9.2247	6.5893	7.7680	7.2409	2.9399	3.5436	6.1705	6.5307	8.1430	7.0008	
0.9999	1.6456	8.3136	0.8855	5.3360	9.9389	7.3288	9.0730	9.0497	4.8644	5.7587	7.1897	9.4976	9.5932	7.9477	

Table B-8: Travel rate percentiles for weather observations during all temporal intervals.

	125N04872	125-04871	125N04871	125-04870	125N04870	125-04869	125N04869	125-04868	125N04868	125-04867	125N04867	125-04866	125N04866	125-04865	125N04865	125-04864	125N04864	125-04863
0.0001	0.7308	0.1298	0.7581	0.6215	0.8000	0.6302	0.8000	0.2837	0.8000	0.6206	0.6200	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
0.05	0.8315	0.8421	0.8333	0.8416	0.8451	0.8471	0.8451	0.8429	0.8451	0.8479	0.8451	0.8451	0.8476	0.8532	0.8451	0.8451	0.8409	0.8361
0.1	0.8493	0.8586	0.8476	0.8586	0.8600	0.8658	0.8623	0.8593	0.8696	0.8676	0.8620	0.8646	0.8696	0.8722	0.8646	0.8616	0.8571	0.8571
0.15	0.8643	0.8715	0.8621	0.8706	0.8727	0.8779	0.8762	0.8711	0.8824	0.8824	0.8750	0.8798	0.8824	0.8851	0.8803	0.8792	0.8732	0.8720
0.2	0.8771	0.8824	0.8722	0.8825	0.8825	0.8874	0.8850	0.8824	0.8955	0.8948	0.8849	0.8884	0.8955	0.8982	0.8903	0.8904	0.8850	0.8825
0.25	0.8850	0.8915	0.8835	0.8945	0.8955	0.8964	0.8955	0.8914	0.9065	0.9036	0.8955	0.8967	0.9039	0.9091	0.8987	0.8985	0.8955	0.8955
0.3	0.8955	0.8990	0.8955	0.9034	0.9039	0.9069	0.9044	0.8980	0.9148	0.9123	0.9070	0.9091	0.9114	0.9202	0.9091	0.9091	0.9091	0.9069
0.35	0.9054	0.9082	0.9068	0.9092	0.9091	0.9122	0.9101	0.9072	0.9231	0.9225	0.9110	0.9149	0.9231	0.9231	0.9204	0.9177	0.9148	0.9148
0.4	0.9101	0.9122	0.9120	0.9179	0.9208	0.9216	0.9231	0.9111	0.9231	0.9231	0.9216	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.45	0.9230	0.9193	0.9231	0.9231	0.9231	0.9231	0.9231	0.9192	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.5	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9317	0.9231	0.9231	0.9231	0.9231
0.55	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.6	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9289	0.9375	0.9231	0.9231	0.9231	0.9231
0.65	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9317	0.9240	0.9235	0.9241	0.9375	0.9375	0.9320	0.9325	0.9296	0.9231
0.7	0.9231	0.9231	0.9231	0.9231	0.9320	0.9286	0.9288	0.9263	0.9375	0.9325	0.9304	0.9347	0.9435	0.9477	0.9375	0.9375	0.9375	0.9349
0.75	0.9288	0.9253	0.9231	0.9264	0.9375	0.9367	0.9375	0.9341	0.9375	0.9375	0.9375	0.9375	0.9524	0.9524	0.9459	0.9498	0.9473	0.9404
0.8	0.9375	0.9327	0.9352	0.9369	0.9419	0.9399	0.9409	0.9400	0.9524	0.9456	0.9471	0.9524	0.9647	0.9677	0.9539	0.9594	0.9585	0.9524
0.85	0.9463	0.9379	0.9375	0.9421	0.9524	0.9524	0.9524	0.9524	0.9615	0.9553	0.9593	0.9647	0.9774	0.9807	0.9680	0.9741	0.9712	0.9677
0.9	0.9608	0.9524	0.9524	0.9565	0.9677	0.9677	0.9715	0.9735	0.9836	0.9783	0.9838	0.9893	1.0000	1.0033	1.0000	1.0005	1.0000	1.0000
0.95	0.9994	0.9889	0.9978	0.9985	1.0240	1.0169	1.0344	1.0441	1.0616	1.0591	1.0561	1.0621	1.0830	1.0898	1.0760	1.0909	1.0817	1.0714
0.9999	12.000	11.997	13.812	9.9957	14.187	2.4425	4.1876	3.2743	4.1445	6.1842	7.8192	6.4187	7.8432	6.6516	7.3885	4.4348	3.9951	3.5256

Table B-8: (Continued).

	125N04863	125-04862	125N04862	125-04861	125N04861	125-04860	125N04860	125-04859	125N04859	125-04858	125N04858	125-04857	125N04857	125-04856	125N04856	125N04966	125-04965	125N04965
0.0001	0.6210	0.6206	0.6506	0.7437	0.6233	0.2568	0.7264	0.5385	0.5581	0.6725	0.7710	0.8000	0.6941	0.8000	0.5619	0.5619	0.3885	0.6758
0.05	0.8237	0.8268	0.8274	0.8334	0.8382	0.8513	0.8499	0.8510	0.8730	0.8703	0.8740	0.8792	0.8574	0.8571	0.8698	0.8698	0.8573	0.8451
0.1	0.8448	0.8451	0.8456	0.8548	0.8571	0.8696	0.8701	0.8703	0.8955	0.8936	0.8955	0.8958	0.8803	0.8773	0.8904	0.8904	0.8746	0.8573
0.15	0.8571	0.8574	0.8596	0.8696	0.8701	0.8824	0.8876	0.8843	0.9091	0.9089	0.9123	0.9148	0.8955	0.8932	0.9081	0.9081	0.8863	0.8697
0.2	0.8693	0.8697	0.8721	0.8824	0.8824	0.8941	0.9009	0.8961	0.9188	0.9185	0.9231	0.9231	0.9089	0.9012	0.9205	0.9205	0.8965	0.8823
0.25	0.8815	0.8824	0.8851	0.8955	0.8953	0.9031	0.9091	0.9081	0.9231	0.9231	0.9231	0.9231	0.9094	0.9091	0.9231	0.9231	0.9071	0.8904
0.3	0.8929	0.8955	0.8956	0.9065	0.9059	0.9107	0.9204	0.9133	0.9231	0.9231	0.9231	0.9231	0.9230	0.9231	0.9231	0.9231	0.9111	0.8957
0.35	0.8992	0.9042	0.9088	0.9095	0.9120	0.9200	0.9231	0.9229	0.9231	0.9231	0.9231	0.9234	0.9231	0.9231	0.9231	0.9231	0.9197	0.9066
0.4	0.9091	0.9091	0.9119	0.9231	0.9229	0.9231	0.9231	0.9231	0.9231	0.9231	0.9349	0.9375	0.9231	0.9231	0.9281	0.9281	0.9231	0.9092
0.45	0.9174	0.9202	0.9228	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9203
0.5	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9241	0.9235	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231
0.55	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9259	0.9231	0.9324	0.9319	0.9375	0.9406	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231
0.6	0.9231	0.9231	0.9231	0.9231	0.9231	0.9288	0.9375	0.9262	0.9375	0.9375	0.9472	0.9524	0.9232	0.9231	0.9390	0.9390	0.9231	0.9231
0.65	0.9231	0.9231	0.9231	0.9231	0.9251	0.9371	0.9404	0.9355	0.9442	0.9417	0.9524	0.9583	0.9318	0.9320	0.9493	0.9493	0.9244	0.9231
0.7	0.9231	0.9231	0.9231	0.9289	0.9354	0.9408	0.9523	0.9375	0.9524	0.9524	0.9594	0.9677	0.9375	0.9375	0.9524	0.9524	0.9310	0.9231
0.75	0.9234	0.9271	0.9285	0.9375	0.9378	0.9517	0.9615	0.9487	0.9640	0.9585	0.9682	0.9809	0.9424	0.9498	0.9619	0.9619	0.9375	0.9231
0.8	0.9335	0.9375	0.9375	0.9472	0.9521	0.9618	0.9747	0.9615	0.9767	0.9705	0.9836	0.9901	0.9524	0.9585	0.9687	0.9687	0.9426	0.9345
0.85	0.9431	0.9515	0.9521	0.9618	0.9675	0.9793	0.9998	0.9832	0.9990	0.9924	1.0152	1.0135	0.9677	0.9728	0.9842	0.9842	0.9524	0.9407
0.9	0.9602	0.9677	0.9686	0.9874	0.9938	1.0163	1.0431	1.0292	1.0382	1.0343	1.0577	1.0526	0.9995	1.0000	1.0123	1.0123	0.9725	0.9611
0.95	1.0165	1.0322	1.0373	1.0714	1.0940	1.1570	1.2646	1.2958	1.3093	1.2497	1.2766	1.1450	1.0532	1.0539	1.0671	1.0671	1.0280	1.0032
0.9999	7.7859	9.0720	8.9552	9.0072	9.2544	10.112	17.758	10.305	9.8611	8.8314	8.7345	9.4226	8.3559	12.106	4.3731	4.3731	2.8961	4.3478

Table B-8: (Continued).

	0.538461506	**0.730769038**	**0.800000012**	**0.800000072**	**0.799999714**	**0.778628438**	**0.778808438**	**0.800000191**	**0.730769157**	**0.748705901**	**0.800000012**	**0.730769038**	**0.730769277**	**0.730769157**	
0.0001	0.4761	0.6509	0.8000	0.8000	0.8000	0.6606	0.6272	0.8000	0.6941	0.6743	0.4692	0.6373	0.5590	0.6614	
0.05	0.8368	0.8333	0.8451	0.8516	0.8499	0.8571	0.8577	0.8486	0.8523	0.8682	0.8560	0.8466	0.8554	0.8385	
0.1	0.8531	0.8479	0.8606	0.8696	0.8696	0.8746	0.8804	0.8696	0.8696	0.8890	0.8712	0.8664	0.8734	0.8568	
0.15	0.8638	0.8615	0.8772	0.8824	0.8872	0.8904	0.8941	0.8824	0.8824	0.9033	0.8829	0.8791	0.8859	0.8694	
0.2	0.8730	0.8719	0.8880	0.8955	0.8983	0.9012	0.9033	0.8929	0.8955	0.9117	0.8948	0.8875	0.8973	0.8800	
0.25	0.8824	0.8824	0.8961	0.9064	0.9091	0.9095	0.9100	0.9010	0.9069	0.9229	0.9017	0.8961	0.9086	0.8899	
0.3	0.8914	0.8946	0.9091	0.9119	0.9231	0.9225	0.9221	0.9091	0.9094	0.9231	0.9091	0.9075	0.9169	0.8990	
0.35	0.8955	0.8981	0.9120	0.9231	0.9231	0.9231	0.9231	0.9231	0.9228	0.9231	0.9168	0.9126	0.9231	0.9091	
0.4	0.9040	0.9091	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9224	0.9231	0.9208	
0.45	0.9091	0.9116	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.5	0.9170	0.9225	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.55	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.6	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9232	0.9231	0.9231	0.9236	0.9231	0.9231	0.9284	0.9231	
0.65	0.9231	0.9231	0.9231	0.9231	0.9350	0.9294	0.9288	0.9231	0.9231	0.9329	0.9235	0.9232	0.9369	0.9231	
0.7	0.9231	0.9231	0.9231	0.9318	0.9404	0.9375	0.9372	0.9275	0.9232	0.9375	0.9292	0.9292	0.9382	0.9235	
0.75	0.9231	0.9231	0.9231	0.9375	0.9524	0.9450	0.9377	0.9375	0.9324	0.9388	0.9368	0.9375	0.9507	0.9319	
0.8	0.9235	0.9231	0.9375	0.9498	0.9586	0.9544	0.9515	0.9443	0.9375	0.9521	0.9392	0.9445	0.9581	0.9375	
0.85	0.9366	0.9235	0.9404	0.9620	0.9726	0.9677	0.9655	0.9582	0.9524	0.9612	0.9527	0.9578	0.9710	0.9509	
0.9	0.9518	0.9375	0.9563	0.9836	1.0000	0.9910	0.9851	0.9836	0.9743	0.9826	0.9776	0.9829	0.9996	0.9677	
0.95	0.9858	0.9668	1.0000	1.0412	1.0606	1.0507	1.0450	1.0453	1.0498	1.0430	1.0450	1.0434	1.0606	1.0251	
0.9999	4.3708	5.9885	9.6044	3.5294	5.4545	6.2090	6.9974	5.0917	6.7565	5.7292	5.1328	7.6793	5.8212	7.8195	

Table B-9: Travel rate percentiles for weather and incident combined observations during all temporal intervals.

	125N04872	125-04871	125N04871	125-04870	125N04870	125-04869	125N04869	125-04868	125N04868	125-04867	125N04867	125-04866	125N04866	125-04865	125N04865	125-04864	125N04864	125-04863
0.0001			0.0005			0.0054	0.0008	0.0028	0.0005	0.0045	0.0074	0.0064	0.0040	0.0126	0.0132	0.0125	0.0136	0.0107
0.05			0.2329			0.9091	0.4030	0.8483	0.2553	0.8553	0.8737	0.8911	0.9091	0.8451	0.8571	0.8451	0.8475	0.8418
0.1			0.4658			0.9226	0.8060	0.8544	0.5106	0.8801	0.9078	0.9007	0.9091	0.8820	0.8696	0.8668	0.8721	0.8616
0.15			0.6988			0.9273	0.9266	0.8687	0.7660	0.9100	0.9231	0.9214	0.9210	0.8925	0.8901	0.8824	0.9002	0.8721
0.2			0.9317			0.9438	0.9666	0.8882	1.0213	0.9227	0.9231	0.9231	0.9231	0.9091	0.9091	0.8998	0.9091	0.8867
0.25			2.4731			0.9872	1.0239	0.8966	1.2766	0.9231	0.9231	0.9231	0.9231	0.9183	0.9175	0.9091	0.9203	0.8996
0.3			4.0146			1.0101	1.0951	0.9126	1.5858	0.9231	0.9231	0.9231	0.9231	0.9323	0.9231	0.9174	0.9231	0.9152
0.35			5.5561			1.0676	1.4534	0.9214	1.8950	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.4			7.0975			1.1569	2.3859	0.9253	2.2042	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.45			7.2977			1.1893	3.3042	0.9376	2.5134	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.5			7.4979			1.2197	4.1090	0.9412	2.8226	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9231
0.55			7.6981			1.2790	4.9138	0.9432	3.1641	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9231	0.9231	0.9259
0.6			7.8983			1.3988	5.1837	0.9539	3.5057	0.9231	0.9233	0.9231	0.9231	0.9375	0.9231	0.9248	0.9349	0.9350
0.65			7.9352			1.5400	5.3868	1.0470	3.8472	0.9231	0.9295	0.9231	0.9231	0.9375	0.9317	0.9375	0.9409	0.9467
0.7			7.9721			1.7196	5.5715	1.2022	4.1888	0.9244	0.9354	0.9231	0.9231	0.9464	0.9375	0.9472	0.9588	0.9604
0.75			8.0090			1.7768	5.7469	1.4512	4.5303	0.9309	0.9533	0.9347	0.9231	0.9494	0.9404	0.9524	0.9772	0.9704
0.8			8.0459			2.6053	5.8713	1.5627	5.1436	0.9521	1.0269	0.9419	0.9232	0.9524	0.9524	0.9695	0.9930	0.9878
0.85			8.0787			3.6911	5.9319	1.7822	5.7569	0.9593	1.2053	0.9825	0.9438	0.9572	0.9546	0.9889	1.0169	1.0170
0.9			8.1115			5.8284	6.8162	3.7667	6.3702	0.9662	1.3431	1.0526	0.9620	0.9682	0.9680	1.0151	1.0526	1.0553
0.95			8.1444			8.7432	10.583	4.6955	6.9835	1.3475	1.6242	1.1561	0.9806	0.9933	0.9764	1.5807	1.0779	1.0909
0.9999			8.1771			14.451	14.343	6.2438	7.5955	2.8870	3.9819	1.7504	1.0169	1.0909	1.0595	3.8069	2.4685	1.3564

Table B-9: (Continued).

	125N04863	125-04862	125N04862	125-04861	125N04861	125-04860	125N04860	125-04859	125N04859	125-04858	125N04858	125-04857	125N04857	125-04856	125N04856	125N04966	125-04965	125N04965
0.0001	0.0144	0.0137	0.0041	0.0040	0.0011	0.0177	0.0012	0.0012	0.0008	0.0003	0.0003	0.0009						0.0004
0.05	0.8413	0.8571	0.8708	0.8556	0.5538	0.8659	0.5935	0.6105	0.3976	0.1673	0.1576	0.4381						0.1853
0.1	0.8637	0.8713	0.8792	0.8613	0.9231	0.8892	0.8627	0.8929	0.7952	0.3346	0.3151	0.8761						0.3706
0.15	0.8826	0.8828	0.8842	0.8696	0.9231	0.9061	0.8888	0.9261	1.1928	0.5018	0.4727	1.3142						0.5559
0.2	0.8912	0.9017	0.8966	0.8699	0.9231	0.9091	0.9155	0.9402	1.5904	0.6691	0.6303	1.7523						0.7412
0.25	0.9032	0.9091	0.9090	0.8766	0.9231	0.9193	0.9303	0.9495	1.9880	0.8364	0.7879	2.1903						0.9265
0.3	0.9091	0.9198	0.9155	0.8806	0.9231	0.9231	0.9375	0.9811	2.3856	1.0037	0.9454	2.6284						0.9719
0.35	0.9202	0.9229	0.9229	0.8887	0.9231	0.9231	0.9375	1.0732	2.6794	1.1710	1.1030	3.0665						1.0174
0.4	0.9228	0.9231	0.9231	0.8968	0.9231	0.9231	1.0031	1.1711	2.7657	1.3383	1.2606	3.5045						1.0629
0.45	0.9231	0.9231	0.9231	0.8985	0.9231	0.9231	1.0609	1.2625	2.8520	1.5055	1.4181	3.9426						1.1084
0.5	0.9231	0.9231	0.9231	0.9002	0.9231	0.9231	1.0937	1.3441	2.9382	1.6728	1.5757	4.3807						1.1538
0.55	0.9231	0.9231	0.9231	0.9113	0.9231	0.9231	1.1145	1.3444	3.0245	1.7077	1.6736	4.8187						1.1813
0.6	0.9231	0.9231	0.9231	0.9231	0.9249	0.9231	1.1266	1.3556	3.1108	1.7425	1.7716	5.2568						1.2088
0.65	0.9231	0.9233	0.9237	0.9231	0.9304	0.9280	1.1663	1.3768	3.1970	1.7774	1.8695	5.6948						1.2363
0.7	0.9259	0.9291	0.9267	0.9231	1.1326	0.9364	1.4105	1.4084	3.2536	1.8122	1.9674	6.1329						1.2638
0.75	0.9334	0.9353	0.9324	0.9231	1.4331	0.9444	1.4932	1.4709	3.2953	1.8470	2.0653	6.5710						1.2913
0.8	0.9467	0.9436	0.9441	0.9231	1.5061	0.9524	1.5351	1.5313	3.3371	1.8819	2.1633	7.0090						1.3259
0.85	0.9629	0.9524	0.9532	0.9274	1.5683	0.9660	1.6365	1.5556	3.3788	1.9167	2.2612	7.4471						1.3606
0.9	0.9814	1.1027	0.9618	0.9375	1.6089	1.0092	1.9457	1.8014	3.4205	1.9516	2.3591	7.8852						1.3952
0.95	1.0418	1.3111	0.9927	0.9455	1.7202	1.3537	2.2948	2.1201	3.4622	1.9864	2.4571	8.3232						1.4298
0.9999	1.1930	5.1476	1.0000	0.9835	1.8665	9.0140	2.6505	2.4864	3.5039	2.0212	2.5548	8.7604						1.4644

Table B-9: (Continued).

	0.538461506	0.730769038	0.800000012	0.800000072	0.799999714	0.778628438	0.778808438	0.800000191	0.730769157	0.748705901	0.800000012	0.730769038	0.730769277	0.730769157	
0.0001				0.0025	0.0018	0.0014		0.0033	0.0036						
0.05				1.2289	0.9096	0.6999		0.8524	0.9203						
0.1				2.0445	1.3376	0.8877		0.8571	0.9231						
0.15				2.3905	1.5454	0.9149		0.8692	0.9231						
0.2				2.7310	1.7697	0.9429		0.9231	0.9231						
0.25				4.0506	2.2222	0.9437		0.9231	0.9231						
0.3				4.1065	3.1111	0.9452		0.9231	0.9231						
0.35				4.2088	3.9869	0.9516		0.9231	0.9231						
0.4				4.4004	4.4731	0.9965		0.9231	0.9231						
0.45				4.6750	4.6304	1.0641		0.9231	0.9231						
0.5				4.9772	4.9560	1.0892		0.9231	0.9231						
0.55				5.0460	5.3305	1.1589		0.9231	0.9231						
0.6				5.4669	5.7465	1.2015		0.9231	0.9231						
0.65				6.2745	6.1098	1.2266		0.9231	0.9231						
0.7				7.7258	6.3357	1.2493		0.9231	0.9231						
0.75				10.299	6.3480	1.2905		0.9231	0.9231						
0.8				10.301	12.011	1.3197		0.9231	0.9231						
0.85				11.561	13.588	1.6010		0.9231	0.9231						
0.9				12.894	13.701	1.8939		0.9677	0.9236						
0.95				13.757	13.293	2.3187		1.0947	0.9717						
0.9999				14.248	14.811	3.3543		1.1494	0.9836						

Appendix C: I-40 WB Additional Datasets

Table C-1: Travel rate percentiles for all observations.

	125+04836	125P04836	125+04837	125P04837	125+04838	125P04838	125+04961	125P04961	125+04962	125P04962	125+04963	125P04963	125+04964	125P04964	125+04965	125P04965	125+04966	125P04966
0.0001	0.8000	0.7410	0.5385	0.7308	0.5385	0.7308	0.8000	0.7516	0.7516	0.7410	0.8000	0.7437	0.8000	0.7738	0.5767	0.7908	0.5385	0.5385
0.05	0.8305	0.8417	0.8311	0.8301	0.8474	0.8571	0.8451	0.8453	0.8565	0.8475	0.8451	0.8499	0.8428	0.8451	0.8663	0.8598	0.8664	0.8759
0.1	0.8434	0.8573	0.8451	0.8447	0.8636	0.8730	0.8621	0.8582	0.8698	0.8646	0.8597	0.8648	0.8571	0.8582	0.8824	0.8779	0.8824	0.8955
0.15	0.8525	0.8699	0.8545	0.8530	0.8742	0.8880	0.8723	0.8697	0.8824	0.8750	0.8722	0.8761	0.8696	0.8698	0.8940	0.8893	0.8940	0.9083
0.2	0.8602	0.8822	0.8624	0.8599	0.8828	0.8984	0.8824	0.8798	0.8919	0.8835	0.8829	0.8854	0.8772	0.8823	0.9022	0.8972	0.9020	0.9164
0.25	0.8680	0.8920	0.8703	0.8696	0.8913	0.9091	0.8934	0.8870	0.8988	0.8955	0.8955	0.8955	0.8850	0.8903	0.9098	0.9071	0.9096	0.9231
0.3	0.8751	0.9007	0.8788	0.8767	0.8974	0.9158	0.8987	0.8955	0.9090	0.9036	0.9063	0.9061	0.8955	0.8965	0.9177	0.9125	0.9179	0.9231
0.35	0.8824	0.9092	0.8850	0.8829	0.9059	0.9231	0.9091	0.9034	0.9154	0.9091	0.9132	0.9120	0.9017	0.9087	0.9231	0.9221	0.9231	0.9231
0.4	0.8889	0.9189	0.8936	0.8928	0.9111	0.9231	0.9124	0.9092	0.9231	0.9203	0.9231	0.9230	0.9092	0.9138	0.9231	0.9231	0.9231	0.9231
0.45	0.8960	0.9231	0.8988	0.8981	0.9189	0.9231	0.9231	0.9178	0.9231	0.9231	0.9231	0.9231	0.9208	0.9229	0.9231	0.9231	0.9231	0.9231
0.5	0.9037	0.9231	0.9079	0.9085	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9238	0.9231	0.9231	0.9290
0.55	0.9094	0.9231	0.9121	0.9137	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9303	0.9231	0.9254	0.9372
0.6	0.9174	0.9231	0.9205	0.9226	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9370	0.9283	0.9322	0.9375
0.65	0.9231	0.9251	0.9231	0.9231	0.9231	0.9287	0.9231	0.9231	0.9251	0.9231	0.9259	0.9231	0.9231	0.9231	0.9375	0.9371	0.9375	0.9461
0.7	0.9231	0.9354	0.9231	0.9231	0.9239	0.9374	0.9231	0.9231	0.9347	0.9318	0.9375	0.9311	0.9231	0.9261	0.9442	0.9382	0.9425	0.9524
0.75	0.9231	0.9377	0.9231	0.9231	0.9316	0.9383	0.9317	0.9242	0.9375	0.9375	0.9409	0.9375	0.9356	0.9373	0.9524	0.9500	0.9524	0.9656
0.8	0.9231	0.9495	0.9231	0.9235	0.9375	0.9519	0.9375	0.9354	0.9485	0.9464	0.9524	0.9404	0.9375	0.9400	0.9577	0.9542	0.9635	0.9803
0.85	0.9291	0.9570	0.9310	0.9369	0.9474	0.9554	0.9486	0.9401	0.9537	0.9529	0.9677	0.9524	0.9524	0.9524	0.9686	0.9678	0.9811	1.0052
0.9	0.9426	0.9732	0.9452	0.9520	0.9645	0.9682	0.9585	0.9528	0.9680	0.9679	0.9809	0.9671	0.9677	0.9677	0.9910	0.9963	1.0218	1.0714
0.95	0.9921	1.0121	0.9746	0.9852	1.0000	1.0000	0.9836	0.9828	0.9989	1.0000	1.0104	0.9930	1.0000	1.0060	1.0447	1.0885	1.4572	2.0465
0.9999	6.1976	8.4834	8.1203	9.0432	8.4664	6.9129	10.329	13.351	12.985	12.832	13.269	5.5925	9.1489	10.297	9.6720	14.461	11.892	12.256

Table C-1: (Continued).

	125P04856	125+04857	125P04857	125+04858	125P04858	125+04859	125P04859	125+04860	125P04860	125+04861	125P04861	125+04862	125P04862	125+04863	125P04863	125+04864	125P04864	125+04865
0.0001	0.8000	0.7625	0.8000	0.8000	0.7437	0.7308	0.7308	0.5385	0.7308	0.3462	0.7308	0.7308	0.8000	0.7308	0.7182	0.8000	0.8000	0.8000
0.05	0.8748	0.8701	0.8798	0.8696	0.8600	0.8574	0.8656	0.8542	0.8452	0.8404	0.8383	0.8382	0.8403	0.8431	0.8430	0.8451	0.8451	0.8451
0.1	0.8955	0.8901	0.8982	0.8919	0.8801	0.8750	0.8826	0.8691	0.8624	0.8543	0.8528	0.8547	0.8552	0.8571	0.8574	0.8645	0.8646	0.8573
0.15	0.9091	0.9029	0.9119	0.9063	0.8929	0.8872	0.8955	0.8790	0.8749	0.8636	0.8624	0.8646	0.8667	0.8696	0.8696	0.8772	0.8768	0.8696
0.2	0.9155	0.9118	0.9231	0.9146	0.9014	0.8967	0.9059	0.8864	0.8843	0.8714	0.8700	0.8721	0.8746	0.8824	0.8794	0.8855	0.8850	0.8824
0.25	0.9231	0.9229	0.9231	0.9231	0.9093	0.9089	0.9121	0.8955	0.8954	0.8786	0.8799	0.8824	0.8824	0.8907	0.8868	0.8955	0.8955	0.8877
0.3	0.9231	0.9231	0.9231	0.9231	0.9208	0.9149	0.9213	0.9022	0.9014	0.8842	0.8853	0.8893	0.8903	0.8985	0.8955	0.9051	0.9017	0.8955
0.35	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9091	0.9091	0.8909	0.8953	0.8955	0.8963	0.9091	0.9035	0.9119	0.9091	0.9036
0.4	0.9231	0.9231	0.9288	0.9231	0.9231	0.9231	0.9231	0.9158	0.9175	0.8963	0.9009	0.9050	0.9068	0.9149	0.9095	0.9216	0.9174	0.9091
0.45	0.9231	0.9231	0.9375	0.9289	0.9231	0.9231	0.9231	0.9225	0.9231	0.9028	0.9091	0.9094	0.9119	0.9231	0.9199	0.9231	0.9231	0.9176
0.5	0.9288	0.9284	0.9375	0.9375	0.9231	0.9231	0.9233	0.9231	0.9231	0.9091	0.9146	0.9203	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.55	0.9375	0.9374	0.9503	0.9375	0.9233	0.9231	0.9295	0.9231	0.9231	0.9125	0.9229	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.6	0.9375	0.9387	0.9524	0.9494	0.9345	0.9243	0.9374	0.9231	0.9231	0.9199	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.65	0.9464	0.9510	0.9676	0.9527	0.9375	0.9346	0.9410	0.9244	0.9279	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9291	0.9261	0.9231
0.7	0.9524	0.9551	0.9715	0.9677	0.9492	0.9375	0.9513	0.9322	0.9373	0.9231	0.9231	0.9231	0.9231	0.9317	0.9259	0.9375	0.9375	0.9265
0.75	0.9653	0.9677	0.9836	0.9772	0.9564	0.9491	0.9585	0.9375	0.9431	0.9231	0.9231	0.9236	0.9288	0.9375	0.9364	0.9464	0.9407	0.9375
0.8	0.9807	0.9836	1.0010	0.9967	0.9750	0.9619	0.9704	0.9488	0.9524	0.9234	0.9287	0.9372	0.9375	0.9466	0.9404	0.9524	0.9524	0.9464
0.85	1.0040	1.0156	1.0345	1.0256	1.0078	0.9836	0.9906	0.9614	0.9647	0.9330	0.9375	0.9411	0.9471	0.9553	0.9524	0.9677	0.9646	0.9557
0.9	1.0714	1.0958	1.1287	1.0949	1.1011	1.0335	1.0247	0.9836	0.9808	0.9458	0.9524	0.9529	0.9615	0.9695	0.9675	0.9836	0.9836	0.9715
0.95	2.0690	2.0631	1.5384	1.3796	1.5365	1.2377	1.1229	1.0536	1.0159	0.9752	0.9806	0.9836	0.9875	1.0060	0.9996	1.0204	1.0169	1.0113
0.9999	12.451	10.983	17.686	13.980	12.000	11.793	11.697	9.0792	9.6631	4.7859	5.1444	4.8517	6.2271	6.0733	6.3289	6.5477	5.8240	6.7755

Table C-1: (Continued).

	125P04865	125+04866	125P04866	125+04867	125P04867	125+04868	125P04868	125+04869	125P04869	125+04870	125P04870	125+04871	125P04871	125+04872	125P04872	
0.0001	0.8000	0.8000	0.8000	0.8000	0.7308	0.7308	0.8000	0.3462	0.8000	0.7308	0.7308	0.7308	0.8000	0.1538	0.8000	
0.05	0.8427	0.8409	0.8333	0.8451	0.8453	0.8452	0.8333	0.8472	0.8219	0.8222	0.8219	0.8393	0.8383	0.8460	0.8360	
0.1	0.8571	0.8571	0.8499	0.8571	0.8600	0.8624	0.8513	0.8624	0.8360	0.8382	0.8381	0.8563	0.8571	0.8601	0.8548	
0.15	0.8696	0.8672	0.8596	0.8696	0.8715	0.8735	0.8623	0.8732	0.8481	0.8497	0.8500	0.8670	0.8696	0.8704	0.8671	
0.2	0.8774	0.8749	0.8696	0.8798	0.8824	0.8828	0.8721	0.8824	0.8573	0.8595	0.8597	0.8751	0.8787	0.8801	0.8749	
0.25	0.8835	0.8824	0.8780	0.8853	0.8909	0.8932	0.8824	0.8900	0.8696	0.8696	0.8696	0.8829	0.8853	0.8871	0.8831	
0.3	0.8934	0.8919	0.8835	0.8955	0.8973	0.8996	0.8884	0.8967	0.8773	0.8780	0.8780	0.8922	0.8955	0.8954	0.8955	
0.35	0.8983	0.8982	0.8934	0.9010	0.9071	0.9090	0.8955	0.9042	0.8850	0.8844	0.8850	0.8975	0.9038	0.9011	0.9028	
0.4	0.9091	0.9068	0.8986	0.9091	0.9126	0.9147	0.9051	0.9104	0.8955	0.8947	0.8955	0.9071	0.9094	0.9090	0.9091	
0.45	0.9121	0.9110	0.9091	0.9149	0.9217	0.9228	0.9091	0.9181	0.9036	0.9019	0.9010	0.9116	0.9210	0.9137	0.9204	
0.5	0.9231	0.9204	0.9120	0.9231	0.9231	0.9231	0.9202	0.9231	0.9091	0.9097	0.9091	0.9211	0.9231	0.9207	0.9231	
0.55	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9206	0.9176	0.9231	0.9231	0.9231	0.9231	
0.6	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.65	0.9231	0.9231	0.9231	0.9231	0.9231	0.9235	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.7	0.9231	0.9231	0.9231	0.9231	0.9265	0.9326	0.9231	0.9264	0.9231	0.9231	0.9231	0.9231	0.9265	0.9231	0.9234	
0.75	0.9352	0.9292	0.9261	0.9346	0.9362	0.9375	0.9295	0.9348	0.9231	0.9231	0.9231	0.9245	0.9375	0.9249	0.9375	
0.8	0.9431	0.9375	0.9375	0.9375	0.9385	0.9475	0.9375	0.9393	0.9291	0.9287	0.9261	0.9347	0.9388	0.9327	0.9404	
0.85	0.9524	0.9524	0.9498	0.9524	0.9518	0.9557	0.9524	0.9513	0.9375	0.9375	0.9375	0.9401	0.9523	0.9379	0.9524	
0.9	0.9677	0.9677	0.9677	0.9677	0.9669	0.9734	0.9677	0.9659	0.9524	0.9517	0.9522	0.9524	0.9646	0.9516	0.9708	
0.95	1.0025	1.0000	1.0000	1.0015	1.0052	1.0149	1.0091	0.9995	0.9738	0.9730	0.9742	0.9779	0.9925	0.9753	1.0169	
0.9999	6.4013	7.1363	8.9844	6.6781	7.4094	6.4961	9.9233	6.6360	8.3355	6.7811	12.105	5.9737	6.6318	6.6987	11.979	

Table C-2: Travel rate percentiles for unflagged observations over all temporal intervals.

	125+04836	125P04836	125+04837	125P04837	125+04838	125P04838	125+04961	125P04961	125+04962	125P04962	125+04963	125P04963	125+04964	125P04964	125+04965	125P04965	125+04966	125P04966
0.0001	0.8000	0.7382	0.5385	0.7308	0.5464	0.7560	0.8000	0.7638	0.7641	0.7370	0.8000	0.7437	0.8000	0.8000	0.5708	0.8000	0.5385	0.5882
0.05	0.8299	0.8390	0.8296	0.8289	0.8465	0.8553	0.8451	0.8453	0.8551	0.8454	0.8432	0.8475	0.8405	0.8451	0.8644	0.8586	0.8649	0.8720
0.1	0.8426	0.8569	0.8438	0.8430	0.8622	0.8703	0.8601	0.8579	0.8696	0.8626	0.8571	0.8637	0.8571	0.8573	0.8814	0.8764	0.8815	0.8910
0.15	0.8514	0.8687	0.8528	0.8512	0.8729	0.8850	0.8721	0.8696	0.8819	0.8746	0.8696	0.8746	0.8671	0.8696	0.8925	0.8875	0.8916	0.9029
0.2	0.8590	0.8794	0.8608	0.8583	0.8824	0.8959	0.8824	0.8785	0.8904	0.8824	0.8824	0.8833	0.8748	0.8799	0.9000	0.8958	0.8991	0.9108
0.25	0.8665	0.8878	0.8696	0.8680	0.8896	0.9089	0.8930	0.8853	0.8978	0.8934	0.8931	0.8955	0.8824	0.8876	0.9089	0.9050	0.9084	0.9211
0.3	0.8733	0.8964	0.8766	0.8740	0.8961	0.9126	0.8982	0.8954	0.9076	0.9009	0.9017	0.9036	0.8930	0.8956	0.9152	0.9098	0.9144	0.9231
0.35	0.8805	0.9074	0.8831	0.8824	0.9035	0.9229	0.9091	0.9009	0.9137	0.9091	0.9092	0.9094	0.8987	0.9055	0.9224	0.9190	0.9220	0.9231
0.4	0.8868	0.9142	0.8910	0.8890	0.9093	0.9231	0.9098	0.9091	0.9225	0.9176	0.9211	0.9215	0.9091	0.9108	0.9231	0.9231	0.9231	0.9231
0.45	0.8943	0.9226	0.8963	0.8956	0.9160	0.9231	0.9214	0.9145	0.9231	0.9231	0.9231	0.9231	0.9176	0.9206	0.9231	0.9231	0.9231	0.9231
0.5	0.9011	0.9231	0.9046	0.9054	0.9223	0.9231	0.9231	0.9228	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9275
0.55	0.9089	0.9231	0.9091	0.9095	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9262	0.9231	0.9246	0.9358
0.6	0.9133	0.9231	0.9168	0.9201	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9336	0.9267	0.9309	0.9375
0.65	0.9211	0.9234	0.9231	0.9231	0.9231	0.9287	0.9231	0.9231	0.9262	0.9232	0.9259	0.9232	0.9231	0.9231	0.9375	0.9364	0.9375	0.9428
0.7	0.9231	0.9323	0.9231	0.9231	0.9236	0.9373	0.9231	0.9231	0.9358	0.9345	0.9375	0.9317	0.9232	0.9259	0.9427	0.9376	0.9402	0.9521
0.75	0.9231	0.9375	0.9231	0.9231	0.9307	0.9377	0.9317	0.9243	0.9378	0.9375	0.9408	0.9375	0.9353	0.9369	0.9514	0.9487	0.9508	0.9602
0.8	0.9231	0.9446	0.9231	0.9231	0.9375	0.9503	0.9375	0.9353	0.9488	0.9464	0.9524	0.9405	0.9375	0.9381	0.9555	0.9526	0.9594	0.9730
0.85	0.9252	0.9525	0.9277	0.9338	0.9450	0.9525	0.9464	0.9396	0.9534	0.9526	0.9677	0.9524	0.9524	0.9523	0.9677	0.9676	0.9752	0.9953
0.9	0.9375	0.9677	0.9393	0.9467	0.9604	0.9677	0.9554	0.9524	0.9677	0.9677	0.9794	0.9675	0.9675	0.9677	0.9854	0.9889	1.0080	1.0402
0.95	0.9677	0.9986	0.9655	0.9750	0.9920	0.9958	0.9836	0.9770	0.9945	0.9979	1.0050	0.9942	0.9972	0.9998	1.0339	1.0676	1.3751	1.5803
0.9999	5.7745	2.8897	5.1489	6.3533	5.7833	7.3484	8.2221	4.5934	5.7091	3.3561	2.5027	5.8724	8.7017	10.343	10.019	14.611	11.906	11.317

Table C-2: (Continued).

	125P04856	125+04857	125P04857	125+04858	125P04858	125+04859	125P04859	125+04860	125P04860	125+04861	125P04861	125+04862	125P04862	125+04863	125P04863	125+04864	125P04864	125+04865
0.0001	0.8000	0.7709	0.8000	0.8000	0.7690	0.7278	0.7308	0.5385	0.7308	0.3462	0.7396	0.7308	0.8000	0.7345	0.7367	0.8000	0.8000	0.8000
0.05	0.8698	0.8677	0.8726	0.8696	0.8572	0.8569	0.8622	0.8508	0.8451	0.8383	0.8379	0.8360	0.8380	0.8427	0.8430	0.8451	0.8451	0.8440
0.1	0.8905	0.8835	0.8955	0.8872	0.8748	0.8705	0.8800	0.8660	0.8602	0.8520	0.8523	0.8524	0.8546	0.8571	0.8578	0.8629	0.8646	0.8571
0.15	0.9017	0.8963	0.9091	0.9009	0.8867	0.8827	0.8927	0.8755	0.8726	0.8612	0.8609	0.8622	0.8646	0.8696	0.8696	0.8763	0.8754	0.8696
0.2	0.9095	0.9091	0.9214	0.9091	0.8958	0.8952	0.9010	0.8834	0.8825	0.8696	0.8697	0.8697	0.8721	0.8821	0.8797	0.8853	0.8850	0.8800
0.25	0.9208	0.9171	0.9231	0.9231	0.9089	0.9022	0.9091	0.8922	0.8929	0.8759	0.8780	0.8808	0.8824	0.8902	0.8863	0.8955	0.8955	0.8863
0.3	0.9231	0.9231	0.9231	0.9231	0.9146	0.9093	0.9161	0.8981	0.8988	0.8824	0.8832	0.8876	0.8877	0.8975	0.8955	0.9039	0.9010	0.8955
0.35	0.9231	0.9231	0.9231	0.9231	0.9230	0.9185	0.9230	0.9063	0.9087	0.8879	0.8928	0.8955	0.8955	0.9074	0.9026	0.9094	0.9091	0.9010
0.4	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9112	0.9140	0.8943	0.8981	0.9017	0.9044	0.9125	0.9092	0.9202	0.9151	0.9091
0.45	0.9231	0.9231	0.9325	0.9231	0.9231	0.9231	0.9231	0.9192	0.9228	0.8987	0.9067	0.9091	0.9091	0.9231	0.9173	0.9231	0.9231	0.9149
0.5	0.9261	0.9244	0.9375	0.9320	0.9231	0.9231	0.9231	0.9231	0.9231	0.9053	0.9103	0.9172	0.9179	0.9231	0.9231	0.9231	0.9231	0.9231
0.55	0.9352	0.9346	0.9464	0.9375	0.9231	0.9231	0.9256	0.9231	0.9231	0.9091	0.9202	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.6	0.9375	0.9375	0.9524	0.9434	0.9267	0.9231	0.9342	0.9231	0.9231	0.9143	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.65	0.9434	0.9439	0.9589	0.9524	0.9374	0.9287	0.9375	0.9231	0.9260	0.9215	0.9231	0.9231	0.9231	0.9231	0.9231	0.9320	0.9288	0.9231
0.7	0.9524	0.9524	0.9677	0.9594	0.9391	0.9373	0.9454	0.9282	0.9351	0.9231	0.9231	0.9231	0.9231	0.9335	0.9281	0.9375	0.9375	0.9281
0.75	0.9606	0.9613	0.9810	0.9677	0.9522	0.9401	0.9524	0.9366	0.9402	0.9231	0.9231	0.9232	0.9266	0.9375	0.9372	0.9473	0.9434	0.9375
0.8	0.9740	0.9724	0.9957	0.9836	0.9640	0.9522	0.9640	0.9418	0.9520	0.9231	0.9261	0.9348	0.9375	0.9491	0.9412	0.9533	0.9524	0.9443
0.85	0.9970	0.9962	1.0169	1.0037	0.9836	0.9677	0.9772	0.9529	0.9585	0.9282	0.9374	0.9391	0.9464	0.9556	0.9524	0.9677	0.9646	0.9539
0.9	1.0435	1.0345	1.0638	1.0493	1.0288	0.9992	1.0000	0.9700	0.9709	0.9380	0.9509	0.9524	0.9585	0.9712	0.9676	0.9836	0.9836	0.9688
0.95	1.7067	1.6528	1.3537	1.2097	1.2212	1.0797	1.0526	1.0169	0.9996	0.9607	0.9698	0.9803	0.9836	1.0005	0.9973	1.0169	1.0135	1.0002
0.9999	12.000	10.543	11.769	11.153	11.547	10.331	11.020	9.1911	8.4784	2.6937	5.7303	4.9432	7.0476	6.3519	5.3507	8.1182	7.9168	7.2841

Table C-2: (Continued).

	125P04865	125+04866	125P04866	125+04867	125P04867	125+04868	125P04868	125+04869	125P04869	125+04870	125P04870	125+04871	125P04871	125+04872	125P04872	
0.0001	0.8000	0.8000	0.8000	0.8000	0.7456	0.7308	0.8000	0.3462	0.8000	0.7308	0.7680	0.7308	0.8000	0.1538	0.8000	
0.05	0.8428	0.8409	0.8333	0.8451	0.8451	0.8452	0.8333	0.8473	0.8200	0.8211	0.8219	0.8386	0.8383	0.8458	0.8344	
0.1	0.8571	0.8568	0.8485	0.8571	0.8593	0.8621	0.8501	0.8622	0.8333	0.8354	0.8360	0.8554	0.8571	0.8596	0.8528	
0.15	0.8696	0.8653	0.8573	0.8696	0.8705	0.8727	0.8621	0.8728	0.8451	0.8470	0.8479	0.8659	0.8679	0.8698	0.8646	
0.2	0.8772	0.8727	0.8696	0.8785	0.8819	0.8827	0.8703	0.8823	0.8571	0.8573	0.8573	0.8739	0.8773	0.8790	0.8726	
0.25	0.8824	0.8824	0.8772	0.8850	0.8886	0.8928	0.8824	0.8890	0.8648	0.8670	0.8683	0.8824	0.8850	0.8860	0.8824	
0.3	0.8929	0.8903	0.8824	0.8953	0.8956	0.8984	0.8876	0.8955	0.8722	0.8741	0.8749	0.8901	0.8955	0.8936	0.8929	
0.35	0.8967	0.8955	0.8910	0.8987	0.9037	0.9082	0.8955	0.9027	0.8824	0.8824	0.8824	0.8960	0.9010	0.8991	0.8992	
0.4	0.9065	0.9040	0.8957	0.9091	0.9097	0.9126	0.9036	0.9092	0.8903	0.8902	0.8910	0.9041	0.9091	0.9065	0.9091	
0.45	0.9099	0.9091	0.9063	0.9124	0.9183	0.9221	0.9091	0.9161	0.8967	0.8971	0.8982	0.9095	0.9176	0.9111	0.9148	
0.5	0.9204	0.9174	0.9091	0.9231	0.9231	0.9231	0.9174	0.9226	0.9079	0.9074	0.9080	0.9176	0.9231	0.9178	0.9231	
0.55	0.9231	0.9231	0.9176	0.9231	0.9231	0.9231	0.9231	0.9231	0.9139	0.9146	0.9124	0.9231	0.9231	0.9231	0.9231	
0.6	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9227	0.9230	0.9231	0.9231	0.9231	0.9231	
0.65	0.9231	0.9231	0.9231	0.9231	0.9231	0.9242	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.7	0.9234	0.9231	0.9231	0.9234	0.9264	0.9343	0.9231	0.9263	0.9231	0.9231	0.9231	0.9231	0.9264	0.9231	0.9234	
0.75	0.9350	0.9297	0.9261	0.9346	0.9356	0.9375	0.9317	0.9342	0.9231	0.9231	0.9231	0.9246	0.9375	0.9242	0.9374	
0.8	0.9418	0.9375	0.9375	0.9375	0.9381	0.9475	0.9375	0.9392	0.9262	0.9269	0.9259	0.9345	0.9389	0.9312	0.9399	
0.85	0.9524	0.9505	0.9494	0.9524	0.9511	0.9557	0.9524	0.9507	0.9375	0.9375	0.9375	0.9403	0.9523	0.9375	0.9524	
0.9	0.9677	0.9677	0.9676	0.9677	0.9661	0.9723	0.9677	0.9644	0.9524	0.9492	0.9494	0.9524	0.9624	0.9501	0.9678	
0.95	1.0000	0.9944	0.9966	1.0000	0.9997	1.0083	1.0033	0.9942	0.9677	0.9677	0.9678	0.9772	0.9868	0.9703	1.0099	
0.9999	6.5787	7.1056	8.3759	6.8894	6.9688	6.3414	6.5890	7.2450	8.4104	6.6776	13.048	6.0432	4.1230	6.5781	12.127	

Table C-3: Travel rate percentiles for flagged observations during all temporal intervals.

	125+04836	125P04836	125+04837	125P04837	125+04838	125P04838	125+04961	125P04961	125+04962	125P04962	125+04963	125P04963	125+04964	125P04964	125+04965	125P04965	125+04966	125P04966
0.0001	0.4393	0.5932	0.4445	0.6505	0.4526	0.6629	0.8000	0.6640	0.6714	0.7182	0.8000	0.6934	0.8000	0.6739	0.5072	0.6714	0.0956	0.4955
0.05	0.8367	0.8560	0.8368	0.8346	0.8519	0.8620	0.8552	0.8469	0.8577	0.8523	0.8499	0.8525	0.8475	0.8477	0.8662	0.8615	0.8696	0.8827
0.1	0.8524	0.8761	0.8544	0.8523	0.8707	0.8806	0.8696	0.8655	0.8755	0.8696	0.8696	0.8696	0.8648	0.8677	0.8848	0.8825	0.8905	0.9065
0.15	0.8630	0.8920	0.8667	0.8654	0.8832	0.8938	0.8824	0.8768	0.8882	0.8824	0.8824	0.8824	0.8772	0.8823	0.8984	0.8958	0.9029	0.9213
0.2	0.8733	0.9036	0.8765	0.8760	0.8947	0.9037	0.8955	0.8858	0.8980	0.8930	0.8955	0.8955	0.8876	0.8929	0.9095	0.9088	0.9120	0.9231
0.25	0.8824	0.9119	0.8853	0.8850	0.9034	0.9114	0.9040	0.8955	0.9090	0.9010	0.9074	0.9036	0.8955	0.9011	0.9187	0.9172	0.9218	0.9231
0.3	0.8906	0.9219	0.8949	0.8955	0.9112	0.9227	0.9091	0.9062	0.9168	0.9091	0.9174	0.9120	0.9091	0.9092	0.9231	0.9231	0.9231	0.9231
0.35	0.8996	0.9231	0.9018	0.9054	0.9202	0.9231	0.9231	0.9118	0.9231	0.9202	0.9231	0.9230	0.9158	0.9209	0.9231	0.9231	0.9231	0.9231
0.4	0.9086	0.9231	0.9094	0.9119	0.9231	0.9231	0.9231	0.9227	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.45	0.9153	0.9231	0.9176	0.9222	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9297	0.9231	0.9231	0.9231
0.5	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9369	0.9231	0.9231	0.9280
0.55	0.9231	0.9258	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9375	0.9234	0.9283	0.9375
0.6	0.9231	0.9347	0.9231	0.9231	0.9231	0.9235	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9375	0.9312	0.9362	0.9375
0.65	0.9231	0.9377	0.9231	0.9231	0.9238	0.9345	0.9231	0.9231	0.9258	0.9231	0.9288	0.9231	0.9231	0.9234	0.9395	0.9375	0.9375	0.9477
0.7	0.9231	0.9469	0.9231	0.9231	0.9315	0.9377	0.9265	0.9231	0.9363	0.9324	0.9375	0.9322	0.9272	0.9344	0.9492	0.9429	0.9475	0.9531
0.75	0.9252	0.9524	0.9242	0.9291	0.9375	0.9496	0.9375	0.9288	0.9379	0.9375	0.9465	0.9375	0.9375	0.9375	0.9529	0.9524	0.9547	0.9677
0.8	0.9352	0.9657	0.9356	0.9375	0.9451	0.9528	0.9409	0.9375	0.9514	0.9521	0.9527	0.9463	0.9409	0.9510	0.9669	0.9652	0.9712	0.9861
0.85	0.9493	0.9798	0.9469	0.9524	0.9578	0.9677	0.9524	0.9482	0.9577	0.9585	0.9677	0.9524	0.9527	0.9671	0.9836	0.9834	1.0000	1.0331
0.9	0.9865	1.0066	0.9677	0.9820	0.9825	0.9838	0.9715	0.9667	0.9774	0.9774	0.9836	0.9677	0.9785	0.9886	1.0169	1.0289	1.0714	1.1834
0.95	1.2376	1.0916	1.0526	1.0887	1.0488	1.0338	1.0169	1.0002	1.0158	1.0176	1.0267	1.0000	1.0345	1.0700	1.1185	1.1991	1.7916	2.8930
0.9999	7.6303	9.1018	9.2768	10.649	8.6959	7.3164	14.433	14.034	13.406	14.303	18.415	7.8749	11.465	10.923	9.6087	13.267	11.792	13.404

Table C-3: (Continued).

	125P04856	125+04857	125P04857	125+04858	125P04858	125+04859	125P04859	125+04860	125P04860	125+04861	125P04861	125+04862	125P04862	125+04863	125P04863	125+04864	125P04864	125+04865
0.0001	0.8000	0.6754	0.8000	0.8000	0.6826	0.6827	0.6304	0.4873	0.6721	0.3176	0.6500	0.7137	0.8000	0.7308	0.6620	0.8000	0.8000	0.8000
0.05	0.8824	0.8779	0.8824	0.8782	0.8616	0.8578	0.8648	0.8569	0.8478	0.8455	0.8451	0.8451	0.8486	0.8523	0.8524	0.8571	0.8571	0.8505
0.1	0.9063	0.8963	0.9091	0.8955	0.8824	0.8802	0.8838	0.8713	0.8696	0.8616	0.8598	0.8637	0.8696	0.8696	0.8707	0.8822	0.8754	0.8696
0.15	0.9204	0.9115	0.9231	0.9091	0.8956	0.8948	0.8968	0.8839	0.8824	0.8721	0.8721	0.8773	0.8824	0.8876	0.8860	0.8955	0.8903	0.8824
0.2	0.9231	0.9231	0.9231	0.9231	0.9091	0.9064	0.9091	0.8949	0.8932	0.8821	0.8828	0.8877	0.8933	0.8991	0.8979	0.9065	0.9009	0.8955
0.25	0.9231	0.9231	0.9231	0.9231	0.9177	0.9148	0.9201	0.9035	0.9032	0.8892	0.8955	0.8963	0.9010	0.9119	0.9091	0.9174	0.9099	0.9070
0.3	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9103	0.9119	0.8967	0.9031	0.9091	0.9091	0.9231	0.9212	0.9231	0.9231	0.9149
0.35	0.9231	0.9231	0.9318	0.9231	0.9231	0.9231	0.9231	0.9197	0.9229	0.9047	0.9093	0.9182	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.4	0.9231	0.9231	0.9375	0.9349	0.9231	0.9231	0.9231	0.9231	0.9231	0.9097	0.9202	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.45	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9231	0.9231	0.9231	0.9165	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.5	0.9231	0.9250	0.9375	0.9375	0.9231	0.9231	0.9233	0.9231	0.9231	0.9225	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.55	0.9375	0.9371	0.9497	0.9375	0.9231	0.9231	0.9307	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.6	0.9375	0.9401	0.9524	0.9497	0.9287	0.9233	0.9375	0.9233	0.9245	0.9231	0.9231	0.9231	0.9231	0.9231	0.9234	0.9313	0.9261	0.9231
0.65	0.9434	0.9520	0.9618	0.9524	0.9375	0.9315	0.9447	0.9293	0.9372	0.9231	0.9231	0.9231	0.9231	0.9348	0.9312	0.9375	0.9375	0.9291
0.7	0.9524	0.9553	0.9677	0.9677	0.9403	0.9375	0.9524	0.9373	0.9429	0.9231	0.9231	0.9233	0.9291	0.9375	0.9375	0.9473	0.9379	0.9375
0.75	0.9646	0.9677	0.9836	0.9742	0.9524	0.9448	0.9647	0.9439	0.9524	0.9263	0.9301	0.9357	0.9375	0.9514	0.9461	0.9525	0.9524	0.9465
0.8	0.9836	0.9842	1.0000	0.9940	0.9676	0.9588	0.9795	0.9532	0.9670	0.9368	0.9375	0.9386	0.9467	0.9556	0.9530	0.9677	0.9623	0.9562
0.85	1.0153	1.0291	1.0347	1.0325	0.9985	0.9836	1.0001	0.9725	0.9833	0.9503	0.9517	0.9524	0.9554	0.9677	0.9680	0.9836	0.9785	0.9740
0.9	1.0909	1.1627	1.1415	1.1074	1.0815	1.0447	1.0453	1.0072	1.0160	0.9771	0.9677	0.9677	0.9740	0.9962	1.0000	1.0204	1.0104	1.0037
0.95	2.0601	2.2408	1.5420	1.4075	1.4283	1.2706	1.1897	1.1307	1.1594	1.0909	1.0256	1.0182	1.0341	1.0708	1.1111	1.1583	1.0909	1.0909
0.9999	14.452	13.413	25.608	18.247	13.513	12.084	16.203	9.5771	10.640	8.5229	6.0554	6.3128	11.944	11.816	7.7100	11.702	12.000	8.3188

Table C-3: (Continued).

	125P04865	125+04866	125P04866	125+04867	125P04867	125+04868	125P04868	125+04869	125P04869	125+04870	125P04870	125+04871	125P04871	125+04872	125P04872	
0.0001	0.8000	0.8000	0.8000	0.8000	0.6468	0.6606	0.8000	0.1453	0.7745	0.6323	0.7308	0.6632	0.7391	0.1455	0.7375	
0.05	0.8478	0.8499	0.8451	0.8525	0.8527	0.8462	0.8431	0.8486	0.8333	0.8324	0.8290	0.8446	0.8451	0.8497	0.8451	
0.1	0.8696	0.8696	0.8624	0.8696	0.8717	0.8696	0.8596	0.8686	0.8500	0.8478	0.8451	0.8603	0.8646	0.8671	0.8607	
0.15	0.8824	0.8824	0.8772	0.8824	0.8845	0.8825	0.8746	0.8824	0.8647	0.8624	0.8596	0.8724	0.8780	0.8793	0.8748	
0.2	0.8955	0.8934	0.8850	0.8955	0.8962	0.8954	0.8825	0.8934	0.8772	0.8726	0.8697	0.8833	0.8889	0.8888	0.8860	
0.25	0.9039	0.9016	0.8955	0.9065	0.9089	0.9041	0.8955	0.9017	0.8851	0.8827	0.8824	0.8953	0.8983	0.8969	0.8955	
0.3	0.9120	0.9091	0.9091	0.9146	0.9177	0.9115	0.9063	0.9100	0.8955	0.8939	0.8929	0.9033	0.9091	0.9065	0.9091	
0.35	0.9231	0.9207	0.9137	0.9231	0.9231	0.9223	0.9119	0.9182	0.9068	0.9024	0.8987	0.9096	0.9202	0.9129	0.9174	
0.4	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9148	0.9106	0.9091	0.9204	0.9231	0.9201	0.9231	
0.45	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9215	0.9175	0.9231	0.9231	0.9231	0.9231	
0.5	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.55	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.6	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.65	0.9279	0.9231	0.9231	0.9259	0.9264	0.9259	0.9231	0.9244	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.7	0.9375	0.9291	0.9288	0.9375	0.9368	0.9363	0.9231	0.9307	0.9231	0.9231	0.9231	0.9234	0.9345	0.9247	0.9259	
0.75	0.9455	0.9375	0.9375	0.9406	0.9384	0.9378	0.9320	0.9372	0.9259	0.9238	0.9231	0.9315	0.9375	0.9313	0.9375	
0.8	0.9539	0.9523	0.9499	0.9524	0.9513	0.9515	0.9375	0.9418	0.9375	0.9344	0.9345	0.9375	0.9434	0.9375	0.9405	
0.85	0.9677	0.9677	0.9677	0.9677	0.9610	0.9600	0.9524	0.9524	0.9406	0.9375	0.9375	0.9455	0.9524	0.9436	0.9524	
0.9	1.0000	0.9933	0.9934	1.0000	0.9833	0.9828	0.9709	0.9698	0.9539	0.9530	0.9559	0.9551	0.9677	0.9559	0.9830	
0.95	1.0756	1.0766	1.0832	1.1011	1.0484	1.0393	1.0237	1.0226	0.9934	0.9932	0.9996	0.9888	1.0095	0.9920	1.0423	
0.9999	9.7980	9.9836	12.000	6.4285	8.0005	6.4183	11.975	6.0140	7.1065	6.8268	7.2819	5.5329	7.8478	10.872	11.989	

Table C-4: Travel rate percentiles for all observations during the AM peak period.

	125+04836	125P04836	125+04837	125P04837	125+04838	125P04838	125+04961	125P04961	125+04962	125P04962	125+04963	125P04963	125+04964	125P04964	125+04965	125P04965	125+04966	125P04966
0.0001	0.8000	0.6631	0.8000	0.8000	0.6826	0.6714	0.6065	0.4957	0.6714	0.3176	0.6500	0.7088	0.8000	0.7308	0.6552	0.8000	0.8000	0.8000
0.05	0.8824	0.8839	0.8982	0.8883	0.8597	0.8599	0.8710	0.8543	0.8451	0.8409	0.8334	0.8358	0.8403	0.8403	0.8366	0.8451	0.8451	0.8382
0.1	0.9010	0.9087	0.9231	0.9091	0.8789	0.8775	0.8883	0.8667	0.8572	0.8520	0.8452	0.8499	0.8523	0.8529	0.8500	0.8600	0.8583	0.8548
0.15	0.9174	0.9231	0.9375	0.9231	0.8917	0.8884	0.8990	0.8745	0.8671	0.8589	0.8545	0.8573	0.8600	0.8622	0.8580	0.8725	0.8696	0.8647
0.2	0.9297	0.9374	0.9524	0.9346	0.9037	0.8984	0.9090	0.8821	0.8724	0.8649	0.8595	0.8660	0.8681	0.8696	0.8657	0.8824	0.8781	0.8721
0.25	0.9409	0.9514	0.9623	0.9435	0.9145	0.9091	0.9166	0.8880	0.8799	0.8698	0.8647	0.8707	0.8722	0.8762	0.8716	0.8903	0.8853	0.8798
0.3	0.9530	0.9646	0.9715	0.9525	0.9235	0.9175	0.9237	0.8944	0.8850	0.8740	0.8697	0.8773	0.8777	0.8824	0.8775	0.8963	0.8931	0.8850
0.35	0.9679	0.9805	0.9836	0.9660	0.9373	0.9259	0.9321	0.8998	0.8903	0.8783	0.8745	0.8824	0.8824	0.8876	0.8826	0.9039	0.8983	0.8906
0.4	0.9880	1.0001	1.0000	0.9775	0.9497	0.9373	0.9391	0.9062	0.8955	0.8823	0.8784	0.8876	0.8876	0.8930	0.8878	0.9094	0.9063	0.8955
0.45	1.0169	1.0317	1.0211	0.9989	0.9675	0.9490	0.9484	0.9116	0.8990	0.8856	0.8825	0.8929	0.8913	0.8958	0.8932	0.9174	0.9110	0.9012
0.5	1.0718	1.0950	1.0604	1.0276	0.9901	0.9608	0.9553	0.9178	0.9047	0.8899	0.8873	0.8957	0.8955	0.9014	0.8970	0.9231	0.9174	0.9068
0.55	1.2248	1.3358	1.1282	1.0641	1.0173	0.9746	0.9654	0.9231	0.9094	0.8941	0.8907	0.9010	0.8989	0.9070	0.9027	0.9291	0.9231	0.9119
0.6	1.5718	1.6890	1.2247	1.1078	1.0540	0.9941	0.9750	0.9286	0.9151	0.8979	0.8955	0.9065	0.9040	0.9120	0.9081	0.9375	0.9289	0.9174
0.65	2.1278	1.9056	1.3106	1.1567	1.0962	1.0175	0.9870	0.9363	0.9228	0.9028	0.9003	0.9104	0.9091	0.9177	0.9122	0.9434	0.9361	0.9231
0.7	2.6036	2.0911	1.3863	1.2103	1.1475	1.0502	1.0022	0.9437	0.9288	0.9075	0.9062	0.9174	0.9146	0.9231	0.9197	0.9512	0.9407	0.9288
0.75	2.9751	2.2542	1.4634	1.2761	1.2249	1.0947	1.0217	0.9536	0.9371	0.9127	0.9110	0.9231	0.9204	0.9306	0.9248	0.9586	0.9497	0.9375
0.8	3.3339	2.4330	1.5684	1.3666	1.3382	1.1604	1.0501	0.9670	0.9441	0.9193	0.9182	0.9288	0.9244	0.9375	0.9338	0.9677	0.9585	0.9434
0.85	3.7279	2.6555	1.7142	1.5020	1.4974	1.2531	1.0838	0.9882	0.9554	0.9261	0.9243	0.9374	0.9349	0.9483	0.9422	0.9836	0.9684	0.9524
0.9	4.2357	2.9563	1.9125	1.6863	1.7043	1.3717	1.1423	1.0276	0.9710	0.9375	0.9372	0.9496	0.9454	0.9615	0.9555	1.0007	0.9875	0.9677
0.95	5.0815	3.5378	2.3579	2.0535	2.0384	1.5789	1.3036	1.1282	1.0103	0.9677	0.9646	0.9768	0.9706	0.9902	0.9878	1.0453	1.0241	1.0000
0.9999	14.2962	13.2913	25.5371	18.1129	13.4871	12.0806	16.0825	8.4627	9.5235	7.2441	6.0527	5.2464	4.6418	5.4558	6.6809	3.7481	3.4763	3.5441

Table C-4: (Continued).

	125P04856	125+04857	125P04857	125+04858	125P04858	125+04859	125P04859	125+04860	125P04860	125+04861	125P04861	125+04862	125P04862	125+04863	125P04863	125+04864	125P04864	125+04865
0.0001	0.8000	0.6754	0.8000	0.8000	0.6826	0.6827	0.6304	0.4873	0.6721	0.3176	0.6500	0.7137	0.8000	0.7308	0.6620	0.8000	0.8000	0.8000
0.05	0.8824	0.8779	0.8824	0.8782	0.8616	0.8578	0.8648	0.8569	0.8478	0.8455	0.8451	0.8451	0.8486	0.8523	0.8524	0.8571	0.8571	0.8505
0.1	0.9063	0.8963	0.9091	0.8955	0.8824	0.8802	0.8838	0.8713	0.8696	0.8616	0.8598	0.8637	0.8696	0.8696	0.8707	0.8822	0.8754	0.8696
0.15	0.9204	0.9115	0.9231	0.9091	0.8956	0.8948	0.8968	0.8839	0.8824	0.8721	0.8721	0.8773	0.8824	0.8876	0.8860	0.8955	0.8903	0.8824
0.2	0.9231	0.9231	0.9231	0.9231	0.9091	0.9064	0.9091	0.8949	0.8932	0.8821	0.8828	0.8877	0.8933	0.8991	0.8979	0.9065	0.9009	0.8955
0.25	0.9231	0.9231	0.9231	0.9231	0.9177	0.9148	0.9201	0.9035	0.9032	0.8892	0.8955	0.8963	0.9010	0.9119	0.9091	0.9174	0.9099	0.9070
0.3	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9103	0.9119	0.8967	0.9031	0.9091	0.9091	0.9231	0.9212	0.9231	0.9231	0.9149
0.35	0.9231	0.9231	0.9318	0.9231	0.9231	0.9231	0.9231	0.9197	0.9229	0.9047	0.9093	0.9182	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.4	0.9231	0.9231	0.9375	0.9349	0.9231	0.9231	0.9231	0.9231	0.9231	0.9097	0.9202	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.45	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9231	0.9231	0.9231	0.9165	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.5	0.9231	0.9250	0.9375	0.9375	0.9231	0.9231	0.9233	0.9231	0.9231	0.9225	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.55	0.9375	0.9371	0.9497	0.9375	0.9231	0.9231	0.9307	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.6	0.9375	0.9401	0.9524	0.9497	0.9287	0.9233	0.9375	0.9233	0.9245	0.9231	0.9231	0.9231	0.9231	0.9231	0.9234	0.9313	0.9261	0.9231
0.65	0.9434	0.9520	0.9618	0.9524	0.9375	0.9315	0.9447	0.9293	0.9372	0.9231	0.9231	0.9231	0.9231	0.9348	0.9312	0.9375	0.9375	0.9291
0.7	0.9524	0.9553	0.9677	0.9677	0.9403	0.9375	0.9524	0.9373	0.9429	0.9231	0.9231	0.9233	0.9291	0.9375	0.9375	0.9473	0.9379	0.9375
0.75	0.9646	0.9677	0.9836	0.9742	0.9524	0.9448	0.9647	0.9439	0.9524	0.9263	0.9301	0.9357	0.9375	0.9514	0.9461	0.9525	0.9524	0.9465
0.8	0.9836	0.9842	1.0000	0.9940	0.9676	0.9588	0.9795	0.9532	0.9670	0.9368	0.9375	0.9386	0.9467	0.9556	0.9530	0.9677	0.9623	0.9562
0.85	1.0153	1.0291	1.0347	1.0325	0.9985	0.9836	1.0001	0.9725	0.9833	0.9503	0.9517	0.9524	0.9554	0.9677	0.9680	0.9836	0.9785	0.9740
0.9	1.0909	1.1627	1.1415	1.1074	1.0815	1.0447	1.0453	1.0072	1.0160	0.9771	0.9677	0.9677	0.9740	0.9962	1.0000	1.0204	1.0104	1.0037
0.95	2.0601	2.2408	1.5420	1.4075	1.4283	1.2706	1.1897	1.1307	1.1594	1.0909	1.0256	1.0182	1.0341	1.0708	1.1111	1.1583	1.0909	1.0909
0.9999	14.452	13.413	25.608	18.247	13.513	12.084	16.203	9.5771	10.640	8.5229	6.0554	6.3128	11.944	11.816	7.7100	11.702	12.000	8.3188

Table C-4: (Continued).

	125P04865	125+04866	125P04866	125+04867	125P04867	125+04868	125P04868	125+04869	125P04869	125+04870	125P04870	125+04871	125P04871	125+04872	125P04872	
0.0001	0.8000	0.8000	0.8000	0.8000	0.6246	0.6525	0.8000	0.3000	0.8000	0.6271	0.7244	0.6246	0.7394	0.1455	0.7437	
0.05	0.8336	0.8333	0.8242	0.8315	0.8313	0.8287	0.8219	0.8287	0.8108	0.8128	0.8108	0.8259	0.8287	0.8333	0.8219	
0.1	0.8499	0.8451	0.8360	0.8451	0.8444	0.8450	0.8333	0.8419	0.8228	0.8249	0.8219	0.8397	0.8428	0.8458	0.8357	
0.15	0.8573	0.8550	0.8451	0.8547	0.8521	0.8538	0.8432	0.8500	0.8333	0.8340	0.8330	0.8480	0.8524	0.8538	0.8451	
0.2	0.8659	0.8621	0.8523	0.8597	0.8581	0.8603	0.8493	0.8571	0.8403	0.8416	0.8381	0.8565	0.8596	0.8597	0.8524	
0.25	0.8708	0.8672	0.8571	0.8671	0.8644	0.8677	0.8571	0.8621	0.8451	0.8469	0.8451	0.8615	0.8676	0.8654	0.8571	
0.3	0.8774	0.8721	0.8622	0.8701	0.8696	0.8723	0.8600	0.8678	0.8523	0.8528	0.8500	0.8680	0.8727	0.8704	0.8646	
0.35	0.8824	0.8773	0.8674	0.8763	0.8741	0.8790	0.8671	0.8725	0.8571	0.8576	0.8571	0.8722	0.8804	0.8752	0.8696	
0.4	0.8876	0.8824	0.8707	0.8824	0.8796	0.8827	0.8696	0.8775	0.8601	0.8626	0.8597	0.8781	0.8850	0.8803	0.8735	
0.45	0.8929	0.8876	0.8772	0.8850	0.8828	0.8880	0.8750	0.8819	0.8671	0.8680	0.8653	0.8824	0.8925	0.8839	0.8802	
0.5	0.8957	0.8929	0.8824	0.8902	0.8875	0.8936	0.8816	0.8856	0.8696	0.8716	0.8696	0.8868	0.8957	0.8887	0.8826	
0.55	0.9017	0.8955	0.8850	0.8955	0.8929	0.8975	0.8850	0.8905	0.8749	0.8771	0.8748	0.8925	0.9036	0.8935	0.8903	
0.6	0.9091	0.9010	0.8902	0.8986	0.8966	0.9036	0.8905	0.8952	0.8817	0.8821	0.8805	0.8962	0.9091	0.8971	0.8955	
0.65	0.9120	0.9065	0.8955	0.9054	0.9019	0.9091	0.8955	0.8999	0.8851	0.8863	0.8850	0.9021	0.9146	0.9021	0.9009	
0.7	0.9186	0.9119	0.9012	0.9092	0.9081	0.9146	0.9033	0.9059	0.8929	0.8928	0.8910	0.9081	0.9231	0.9072	0.9091	
0.75	0.9232	0.9179	0.9091	0.9174	0.9137	0.9222	0.9091	0.9113	0.8982	0.8980	0.8961	0.9131	0.9261	0.9114	0.9123	
0.8	0.9318	0.9232	0.9149	0.9231	0.9210	0.9282	0.9190	0.9183	0.9065	0.9062	0.9063	0.9214	0.9374	0.9182	0.9231	
0.85	0.9405	0.9346	0.9231	0.9318	0.9273	0.9373	0.9261	0.9253	0.9149	0.9142	0.9130	0.9271	0.9434	0.9231	0.9261	
0.9	0.9528	0.9465	0.9375	0.9434	0.9375	0.9492	0.9409	0.9375	0.9231	0.9231	0.9231	0.9375	0.9555	0.9323	0.9375	
0.95	0.9836	0.9687	0.9585	0.9666	0.9566	0.9690	0.9709	0.9583	0.9406	0.9386	0.9404	0.9584	0.9832	0.9473	0.9587	
0.9999	4.2395	6.7748	5.9132	6.4719	7.9967	6.4026	11.933	5.9588	4.4581	4.9390	2.1162	2.9614	1.9369	1.5546	3.2591	

Table C-5: Travel rate percentiles for unflagged observations during the AM peak period.

	125+04836	125P04836	125+04837	125P04837	125+04838	125P04838	125+04961	125P04961	125+04962	125P04962	125+04963	125P04963	125+04964	125P04964	125+04965	125P04965	125+04966	125P04966
0.0001	0.7433	0.6329	0.4400	0.6345	0.4578	0.6571	0.8000	0.6594	0.6703	0.7159	0.8000	0.7060	0.8000	0.6599	0.5157	0.7116	0.5475	0.5385
0.05	0.8333	0.8461	0.8324	0.8241	0.8524	0.8525	0.8381	0.8379	0.8499	0.8427	0.8406	0.8405	0.8357	0.8381	0.8635	0.8570	0.8672	0.8827
0.1	0.8439	0.8631	0.8443	0.8363	0.8675	0.8696	0.8502	0.8473	0.8621	0.8524	0.8531	0.8523	0.8452	0.8497	0.8779	0.8698	0.8826	0.9028
0.15	0.8517	0.8739	0.8515	0.8457	0.8764	0.8802	0.8573	0.8552	0.8700	0.8596	0.8621	0.8596	0.8547	0.8572	0.8870	0.8810	0.8931	0.9153
0.2	0.8584	0.8825	0.8581	0.8543	0.8834	0.8903	0.8651	0.8598	0.8773	0.8672	0.8696	0.8671	0.8596	0.8637	0.8946	0.8880	0.9012	0.9231
0.25	0.8647	0.8917	0.8642	0.8604	0.8898	0.8961	0.8697	0.8652	0.8827	0.8721	0.8749	0.8701	0.8661	0.8696	0.9002	0.8955	0.9091	0.9301
0.3	0.8705	0.8986	0.8698	0.8677	0.8955	0.9063	0.8772	0.8697	0.8883	0.8776	0.8824	0.8772	0.8696	0.8747	0.9066	0.9016	0.9162	0.9375
0.35	0.8761	0.9071	0.8749	0.8728	0.9010	0.9093	0.8824	0.8745	0.8943	0.8824	0.8880	0.8824	0.8750	0.8802	0.9114	0.9090	0.9231	0.9375
0.4	0.8821	0.9132	0.8806	0.8800	0.9068	0.9173	0.8851	0.8797	0.8983	0.8878	0.8955	0.8875	0.8824	0.8850	0.9176	0.9146	0.9259	0.9468
0.45	0.8877	0.9211	0.8846	0.8849	0.9115	0.9231	0.8929	0.8828	0.9040	0.8949	0.9006	0.8930	0.8853	0.8907	0.9231	0.9219	0.9328	0.9563
0.5	0.8949	0.9242	0.8908	0.8920	0.9174	0.9232	0.8955	0.8882	0.9091	0.8983	0.9067	0.8958	0.8929	0.8957	0.9280	0.9233	0.9375	0.9715
0.55	0.9019	0.9318	0.8961	0.8984	0.9231	0.9287	0.9036	0.8949	0.9141	0.9047	0.9120	0.9036	0.8958	0.9034	0.9339	0.9299	0.9389	0.9955
0.6	0.9093	0.9375	0.9023	0.9074	0.9259	0.9361	0.9091	0.8984	0.9205	0.9092	0.9202	0.9091	0.9039	0.9091	0.9375	0.9373	0.9489	1.0345
0.65	0.9186	0.9403	0.9091	0.9143	0.9326	0.9375	0.9148	0.9061	0.9231	0.9174	0.9231	0.9156	0.9095	0.9169	0.9407	0.9403	0.9591	1.1469
0.7	0.9231	0.9491	0.9155	0.9231	0.9375	0.9403	0.9231	0.9111	0.9278	0.9231	0.9288	0.9231	0.9207	0.9231	0.9479	0.9514	0.9790	1.4814
0.75	0.9315	0.9527	0.9231	0.9281	0.9439	0.9487	0.9231	0.9201	0.9347	0.9260	0.9375	0.9236	0.9231	0.9285	0.9524	0.9590	1.0215	2.1667
0.8	0.9429	0.9653	0.9275	0.9375	0.9524	0.9524	0.9318	0.9231	0.9375	0.9373	0.9375	0.9346	0.9317	0.9374	0.9628	0.9806	1.2058	2.7980
0.85	0.9994	0.9792	0.9375	0.9517	0.9649	0.9552	0.9375	0.9287	0.9459	0.9375	0.9489	0.9376	0.9375	0.9404	0.9807	1.0388	1.7764	3.2630
0.9	1.2637	1.0035	0.9540	0.9831	0.9929	0.9677	0.9465	0.9375	0.9524	0.9523	0.9592	0.9522	0.9524	0.9556	1.0241	1.3539	2.6677	3.7639
0.95	1.8060	1.0861	1.0290	1.1880	1.0798	0.9990	0.9615	0.9524	0.9713	0.9688	0.9836	0.9682	0.9825	1.0066	1.2456	2.4330	3.5664	4.4698
0.9999	6.0214	7.2881	6.0474	7.3906	6.2610	8.3601	8.5149	10.027	8.1394	1.9743	3.5688	5.4011	10.951	11.353	9.3969	11.992	11.827	12.136

Table C-5: (Continued).

	125P04856	125+04857	125P04857	125+04858	125P04858	125+04859	125P04859	125+04860	125P04860	125+04861	125P04861	125+04862	125P04862	125+04863	125P04863	125+04864	125P04864	125+04865
0.0001	0.8000	0.6811	0.8000	0.8000	0.6878	0.6714	0.6118	0.4877	0.6684	0.3176	0.6646	0.7060	0.8000	0.7429	0.6714	0.8000	0.8000	0.8000
0.05	0.8824	0.8781	0.8851	0.8824	0.8572	0.8573	0.8690	0.8523	0.8427	0.8392	0.8333	0.8333	0.8386	0.8381	0.8382	0.8437	0.8427	0.8358
0.1	0.9017	0.8967	0.9091	0.9012	0.8759	0.8746	0.8842	0.8653	0.8571	0.8516	0.8453	0.8482	0.8525	0.8524	0.8522	0.8596	0.8571	0.8538
0.15	0.9149	0.9118	0.9231	0.9149	0.8904	0.8859	0.8959	0.8742	0.8670	0.8591	0.8551	0.8571	0.8621	0.8622	0.8601	0.8721	0.8696	0.8646
0.2	0.9231	0.9231	0.9375	0.9238	0.9012	0.8962	0.9063	0.8824	0.8726	0.8656	0.8610	0.8671	0.8696	0.8697	0.8693	0.8824	0.8786	0.8722
0.25	0.9297	0.9293	0.9388	0.9375	0.9119	0.9072	0.9121	0.8888	0.8806	0.8706	0.8676	0.8722	0.8748	0.8774	0.8748	0.8903	0.8855	0.8802
0.3	0.9375	0.9375	0.9524	0.9404	0.9231	0.9145	0.9212	0.8955	0.8856	0.8753	0.8722	0.8798	0.8824	0.8829	0.8820	0.8961	0.8955	0.8851
0.35	0.9375	0.9459	0.9524	0.9524	0.9264	0.9231	0.9239	0.9016	0.8929	0.8803	0.8774	0.8835	0.8851	0.8903	0.8866	0.9043	0.8990	0.8930
0.4	0.9467	0.9524	0.9651	0.9524	0.9374	0.9240	0.9320	0.9083	0.8969	0.8839	0.8824	0.8902	0.8905	0.8955	0.8931	0.9096	0.9070	0.8967
0.45	0.9559	0.9647	0.9740	0.9617	0.9433	0.9342	0.9375	0.9132	0.9037	0.8886	0.8873	0.8955	0.8955	0.9010	0.8969	0.9177	0.9123	0.9038
0.5	0.9717	0.9815	0.9872	0.9712	0.9554	0.9377	0.9414	0.9199	0.9091	0.8937	0.8926	0.9009	0.9009	0.9081	0.9034	0.9231	0.9202	0.9091
0.55	0.9984	1.0045	1.0067	0.9901	0.9744	0.9498	0.9509	0.9231	0.9148	0.8976	0.8958	0.9067	0.9065	0.9123	0.9090	0.9288	0.9232	0.9146
0.6	1.0381	1.0501	1.0345	1.0169	1.0000	0.9615	0.9564	0.9277	0.9229	0.9027	0.9016	0.9118	0.9103	0.9204	0.9141	0.9375	0.9310	0.9214
0.65	1.1712	1.2039	1.1070	1.0571	1.0347	0.9772	0.9674	0.9348	0.9269	0.9077	0.9089	0.9176	0.9176	0.9231	0.9210	0.9406	0.9375	0.9234
0.7	1.5550	1.6386	1.2283	1.1152	1.0818	1.0008	0.9805	0.9380	0.9353	0.9107	0.9139	0.9231	0.9231	0.9317	0.9234	0.9495	0.9397	0.9318
0.75	2.2910	1.9433	1.3375	1.1769	1.1374	1.0345	0.9976	0.9474	0.9395	0.9168	0.9224	0.9260	0.9259	0.9375	0.9313	0.9554	0.9494	0.9375
0.8	2.8577	2.1686	1.4303	1.2500	1.2408	1.0866	1.0210	0.9574	0.9496	0.9228	0.9231	0.9346	0.9350	0.9435	0.9375	0.9677	0.9534	0.9441
0.85	3.3387	2.3917	1.5583	1.3636	1.4020	1.1697	1.0573	0.9732	0.9549	0.9249	0.9289	0.9375	0.9375	0.9524	0.9438	0.9743	0.9677	0.9524
0.9	3.8621	2.6963	1.7596	1.5484	1.6151	1.3004	1.1105	1.0049	0.9677	0.9353	0.9375	0.9492	0.9498	0.9619	0.9527	0.9934	0.9836	0.9677
0.95	4.7223	3.1587	2.0982	1.8493	1.9490	1.4830	1.2325	1.0970	0.9940	0.9528	0.9575	0.9677	0.9677	0.9868	0.9801	1.0287	1.0163	0.9929
0.9999	12.185	10.545	12.000	10.180	11.960	10.806	11.309	7.7326	8.1363	7.2181	3.5120	6.5734	8.5268	5.3343	3.2153	3.4206	3.4542	3.5260

Table C-5: (Continued).

	125P04865	125+04866	125P04866	125+04867	125P04867	125+04868	125P04868	125+04869	125P04869	125+04870	125P04870	125+04871	125P04871	125+04872	125P04872	
0.0001	0.8000	0.8000	0.8000	0.8000	0.6423	0.6540	0.8000	0.3000	0.8000	0.6200	0.7202	0.6271	0.7394	0.1455	0.7450	
0.05	0.8333	0.8333	0.8251	0.8333	0.8332	0.8315	0.8219	0.8303	0.8131	0.8140	0.8130	0.8276	0.8310	0.8358	0.8245	
0.1	0.8483	0.8451	0.8386	0.8451	0.8460	0.8457	0.8353	0.8445	0.8272	0.8279	0.8256	0.8432	0.8451	0.8490	0.8394	
0.15	0.8573	0.8571	0.8475	0.8571	0.8561	0.8572	0.8451	0.8536	0.8358	0.8376	0.8343	0.8527	0.8571	0.8577	0.8478	
0.2	0.8672	0.8633	0.8551	0.8626	0.8621	0.8651	0.8524	0.8606	0.8451	0.8456	0.8433	0.8595	0.8653	0.8647	0.8571	
0.25	0.8725	0.8696	0.8598	0.8696	0.8694	0.8704	0.8579	0.8671	0.8523	0.8522	0.8499	0.8675	0.8722	0.8708	0.8637	
0.3	0.8800	0.8751	0.8672	0.8748	0.8744	0.8779	0.8651	0.8727	0.8571	0.8577	0.8571	0.8725	0.8820	0.8771	0.8696	
0.35	0.8840	0.8824	0.8703	0.8824	0.8807	0.8827	0.8696	0.8785	0.8622	0.8639	0.8621	0.8795	0.8856	0.8824	0.8763	
0.4	0.8903	0.8855	0.8772	0.8851	0.8844	0.8898	0.8763	0.8832	0.8696	0.8696	0.8687	0.8835	0.8939	0.8873	0.8824	
0.45	0.8955	0.8929	0.8824	0.8910	0.8904	0.8955	0.8824	0.8882	0.8726	0.8748	0.8722	0.8899	0.8983	0.8933	0.8884	
0.5	0.8996	0.8955	0.8856	0.8955	0.8955	0.9005	0.8876	0.8940	0.8800	0.8812	0.8799	0.8955	0.9065	0.8975	0.8955	
0.55	0.9065	0.9013	0.8929	0.9012	0.9008	0.9069	0.8934	0.8985	0.8850	0.8851	0.8845	0.9005	0.9099	0.9030	0.9010	
0.6	0.9103	0.9091	0.8958	0.9091	0.9075	0.9107	0.8983	0.9053	0.8929	0.8926	0.8929	0.9073	0.9184	0.9090	0.9091	
0.65	0.9177	0.9119	0.9039	0.9121	0.9117	0.9185	0.9068	0.9101	0.8982	0.8974	0.8963	0.9117	0.9231	0.9135	0.9146	
0.7	0.9231	0.9190	0.9091	0.9204	0.9195	0.9231	0.9120	0.9167	0.9068	0.9064	0.9065	0.9201	0.9288	0.9202	0.9231	
0.75	0.9272	0.9231	0.9177	0.9231	0.9231	0.9287	0.9231	0.9231	0.9146	0.9130	0.9120	0.9231	0.9375	0.9231	0.9231	
0.8	0.9375	0.9285	0.9231	0.9317	0.9289	0.9372	0.9231	0.9258	0.9231	0.9225	0.9230	0.9298	0.9375	0.9271	0.9289	
0.85	0.9434	0.9375	0.9317	0.9375	0.9374	0.9404	0.9346	0.9351	0.9237	0.9234	0.9231	0.9375	0.9466	0.9352	0.9375	
0.9	0.9534	0.9489	0.9404	0.9482	0.9434	0.9523	0.9464	0.9407	0.9375	0.9364	0.9349	0.9431	0.9525	0.9378	0.9464	
0.95	0.9836	0.9677	0.9656	0.9677	0.9582	0.9677	0.9677	0.9596	0.9524	0.9490	0.9497	0.9590	0.9770	0.9514	0.9645	
0.9999	2.5290	1.9989	1.6896	1.7930	1.5882	2.7371	8.1978	1.7037	4.3830	2.0317	2.2907	2.9613	1.9063	1.7978	3.4076	

Table C-6: Travel rate percentiles for flagged observations during the AM peak period.

	125+04836	125P04836	125+04837	125P04837	125+04838	125P04838	125+04961	125P04961	125+04962	125P04962	125+04963	125P04963	125+04964	125P04964	125+04965	125P04965	125+04966	125P04966
0.0001	0.1130	0.2544	0.1171	0.1754	0.1323	0.4083	0.2228	0.2109	0.2201	0.2203	0.2438	0.2219	0.2202	0.1937	0.1484	0.1891	0.0140	0.1395
0.05	0.8320	0.8619	0.8346	0.8333	0.8469	0.8573	0.8405	0.8382	0.8480	0.8427	0.8403	0.8427	0.8343	0.8333	0.8564	0.8473	0.8545	0.8678
0.1	0.8451	0.8824	0.8492	0.8456	0.8627	0.8702	0.8547	0.8498	0.8621	0.8553	0.8530	0.8551	0.8476	0.8455	0.8696	0.8630	0.8706	0.8837
0.15	0.8548	0.8953	0.8584	0.8571	0.8735	0.8824	0.8624	0.8573	0.8703	0.8637	0.8623	0.8621	0.8571	0.8572	0.8821	0.8730	0.8842	0.8965
0.2	0.8630	0.9037	0.8687	0.8668	0.8824	0.8906	0.8696	0.8648	0.8794	0.8696	0.8696	0.8696	0.8626	0.8649	0.8894	0.8830	0.8955	0.9091
0.25	0.8708	0.9094	0.8734	0.8721	0.8887	0.8958	0.8773	0.8697	0.8850	0.8772	0.8798	0.8772	0.8696	0.8720	0.8973	0.8929	0.9026	0.9137
0.3	0.8780	0.9179	0.8814	0.8822	0.8955	0.9039	0.8824	0.8750	0.8929	0.8824	0.8851	0.8824	0.8772	0.8800	0.9056	0.8982	0.9091	0.9231
0.35	0.8824	0.9231	0.8859	0.8877	0.9009	0.9092	0.8835	0.8821	0.8962	0.8877	0.8930	0.8878	0.8824	0.8850	0.9107	0.9066	0.9150	0.9259
0.4	0.8885	0.9281	0.8934	0.8955	0.9088	0.9152	0.8905	0.8849	0.9033	0.8955	0.8983	0.8955	0.8879	0.8930	0.9171	0.9123	0.9224	0.9357
0.45	0.8953	0.9348	0.8963	0.9010	0.9141	0.9230	0.8955	0.8927	0.9090	0.8982	0.9069	0.8961	0.8955	0.8958	0.9231	0.9210	0.9231	0.9375
0.5	0.9022	0.9378	0.9038	0.9092	0.9210	0.9233	0.9012	0.8956	0.9116	0.9061	0.9146	0.9063	0.8963	0.9037	0.9275	0.9231	0.9285	0.9426
0.55	0.9091	0.9441	0.9103	0.9200	0.9231	0.9302	0.9091	0.9021	0.9197	0.9091	0.9231	0.9091	0.9055	0.9091	0.9354	0.9289	0.9360	0.9524
0.6	0.9186	0.9512	0.9194	0.9231	0.9258	0.9375	0.9091	0.9090	0.9231	0.9146	0.9231	0.9171	0.9091	0.9118	0.9375	0.9372	0.9375	0.9673
0.65	0.9231	0.9564	0.9231	0.9260	0.9346	0.9417	0.9204	0.9124	0.9235	0.9230	0.9308	0.9231	0.9192	0.9205	0.9422	0.9431	0.9483	0.9884
0.7	0.9295	0.9666	0.9268	0.9375	0.9402	0.9521	0.9231	0.9228	0.9328	0.9231	0.9375	0.9260	0.9231	0.9231	0.9517	0.9524	0.9599	1.0345
0.75	0.9436	0.9768	0.9375	0.9508	0.9524	0.9564	0.9302	0.9231	0.9375	0.9299	0.9434	0.9374	0.9289	0.9292	0.9577	0.9583	0.9861	1.1861
0.8	0.9867	0.9900	0.9492	0.9672	0.9680	0.9678	0.9375	0.9303	0.9443	0.9375	0.9533	0.9403	0.9375	0.9375	0.9735	0.9780	1.0374	1.7455
0.85	1.1148	1.0174	0.9811	1.0148	0.9942	0.9830	0.9524	0.9375	0.9524	0.9522	0.9677	0.9524	0.9435	0.9522	0.9967	1.0245	1.2018	2.7539
0.9	1.4033	1.0714	1.0736	1.2013	1.0500	1.0040	0.9677	0.9526	0.9740	0.9677	0.9836	0.9675	0.9677	0.9835	1.0502	1.1249	1.8284	3.5201
0.95	2.2180	1.3326	1.5096	1.7937	1.2050	1.0594	1.0169	1.0000	1.0164	1.0162	1.0345	1.0132	1.0345	1.0619	1.2304	1.8650	3.3089	4.6143
0.9999	7.4068	9.5590	10.068	10.926	8.8956	7.3544	8.8797	10.786	7.8703	10.896	10.735	9.0703	11.422	10.555	8.3561	12.000	11.091	12.114

Table C-6: (Continued).

	125P04856	125+04857	125P04857	125+04858	125P04858	125+04859	125P04859	125+04860	125P04860	125+04861	125P04861	125+04862	125P04862	125+04863	125P04863	125+04864	125P04864	125+04865
0.0001	0.8000	0.6811	0.8000	0.8000	0.6878	0.6714	0.6118	0.4877	0.6684	0.3176	0.6646	0.7060	0.8000	0.7429	0.6714	0.8000	0.8000	0.8000
0.05	0.8824	0.8781	0.8851	0.8824	0.8572	0.8573	0.8690	0.8523	0.8427	0.8392	0.8333	0.8333	0.8386	0.8381	0.8382	0.8437	0.8427	0.8358
0.1	0.9017	0.8967	0.9091	0.9012	0.8759	0.8746	0.8842	0.8653	0.8571	0.8516	0.8453	0.8482	0.8525	0.8524	0.8522	0.8596	0.8571	0.8538
0.15	0.9149	0.9118	0.9231	0.9149	0.8904	0.8859	0.8959	0.8742	0.8670	0.8591	0.8551	0.8571	0.8621	0.8622	0.8601	0.8721	0.8696	0.8646
0.2	0.9231	0.9231	0.9375	0.9238	0.9012	0.8962	0.9063	0.8824	0.8726	0.8656	0.8610	0.8671	0.8696	0.8697	0.8693	0.8824	0.8786	0.8722
0.25	0.9297	0.9293	0.9388	0.9375	0.9119	0.9072	0.9121	0.8888	0.8806	0.8706	0.8676	0.8722	0.8748	0.8774	0.8748	0.8903	0.8855	0.8802
0.3	0.9375	0.9375	0.9524	0.9404	0.9231	0.9145	0.9212	0.8955	0.8856	0.8753	0.8722	0.8798	0.8824	0.8829	0.8820	0.8961	0.8955	0.8851
0.35	0.9375	0.9459	0.9524	0.9524	0.9264	0.9231	0.9239	0.9016	0.8929	0.8803	0.8774	0.8835	0.8851	0.8903	0.8866	0.9043	0.8990	0.8930
0.4	0.9467	0.9524	0.9651	0.9524	0.9374	0.9240	0.9320	0.9083	0.8969	0.8839	0.8824	0.8902	0.8905	0.8955	0.8931	0.9096	0.9070	0.8967
0.45	0.9559	0.9647	0.9740	0.9617	0.9433	0.9342	0.9375	0.9132	0.9037	0.8886	0.8873	0.8955	0.8955	0.9010	0.8969	0.9177	0.9123	0.9038
0.5	0.9717	0.9815	0.9872	0.9712	0.9554	0.9377	0.9414	0.9199	0.9091	0.8937	0.8926	0.9009	0.9009	0.9081	0.9034	0.9231	0.9202	0.9091
0.55	0.9984	1.0045	1.0067	0.9901	0.9744	0.9498	0.9509	0.9231	0.9148	0.8976	0.8958	0.9067	0.9065	0.9123	0.9090	0.9288	0.9232	0.9146
0.6	1.0381	1.0501	1.0345	1.0169	1.0000	0.9615	0.9564	0.9277	0.9229	0.9027	0.9016	0.9118	0.9103	0.9204	0.9141	0.9375	0.9310	0.9214
0.65	1.1712	1.2039	1.1070	1.0571	1.0347	0.9772	0.9674	0.9348	0.9269	0.9077	0.9089	0.9176	0.9176	0.9231	0.9210	0.9406	0.9375	0.9234
0.7	1.5550	1.6386	1.2283	1.1152	1.0818	1.0008	0.9805	0.9380	0.9353	0.9107	0.9139	0.9231	0.9231	0.9317	0.9234	0.9495	0.9397	0.9318
0.75	2.2910	1.9433	1.3375	1.1769	1.1374	1.0345	0.9976	0.9474	0.9395	0.9168	0.9224	0.9260	0.9259	0.9375	0.9313	0.9554	0.9494	0.9375
0.8	2.8577	2.1686	1.4303	1.2500	1.2408	1.0866	1.0210	0.9574	0.9496	0.9228	0.9231	0.9346	0.9350	0.9435	0.9375	0.9677	0.9534	0.9441
0.85	3.3387	2.3917	1.5583	1.3636	1.4020	1.1697	1.0573	0.9732	0.9549	0.9249	0.9289	0.9375	0.9375	0.9524	0.9438	0.9743	0.9677	0.9524
0.9	3.8621	2.6963	1.7596	1.5484	1.6151	1.3004	1.1105	1.0049	0.9677	0.9353	0.9375	0.9492	0.9498	0.9619	0.9527	0.9934	0.9836	0.9677
0.95	4.7223	3.1587	2.0982	1.8493	1.9490	1.4830	1.2325	1.0970	0.9940	0.9528	0.9575	0.9677	0.9677	0.9868	0.9801	1.0287	1.0163	0.9929
0.9999	12.185	10.545	12.000	10.180	11.960	10.806	11.309	7.7326	8.1363	7.2181	3.5120	6.5734	8.5268	5.3343	3.2153	3.4206	3.4542	3.5260

Table C-6: (Continued).

	125P04865	125+04866	125P04866	125+04867	125P04867	125+04868	125P04868	125+04869	125P04869	125+04870	125P04870	125+04871	125P04871	125+04872	125P04872	
0.0001	0.2374	0.2334	0.2333	0.2393	0.1840	0.1788	0.2165	0.0814	0.2258	0.1902	0.2063	0.1865	0.2087	0.0434	0.2118	
0.05	0.8357	0.8333	0.8289	0.8342	0.8351	0.8322	0.8260	0.8342	0.8219	0.8217	0.8197	0.8349	0.8333	0.8398	0.8324	
0.1	0.8529	0.8477	0.8451	0.8528	0.8496	0.8485	0.8451	0.8487	0.8333	0.8341	0.8333	0.8469	0.8525	0.8542	0.8451	
0.15	0.8622	0.8596	0.8556	0.8622	0.8616	0.8621	0.8553	0.8594	0.8451	0.8449	0.8428	0.8572	0.8641	0.8619	0.8571	
0.2	0.8699	0.8696	0.8623	0.8707	0.8703	0.8702	0.8623	0.8693	0.8524	0.8529	0.8501	0.8668	0.8722	0.8699	0.8696	
0.25	0.8824	0.8772	0.8696	0.8799	0.8798	0.8818	0.8696	0.8780	0.8597	0.8609	0.8571	0.8722	0.8824	0.8775	0.8760	
0.3	0.8854	0.8824	0.8780	0.8828	0.8849	0.8851	0.8798	0.8835	0.8696	0.8696	0.8655	0.8815	0.8877	0.8831	0.8824	
0.35	0.8955	0.8878	0.8824	0.8905	0.8944	0.8929	0.8824	0.8905	0.8772	0.8754	0.8721	0.8838	0.8955	0.8911	0.8907	
0.4	0.8963	0.8955	0.8886	0.8955	0.8969	0.8966	0.8882	0.8959	0.8824	0.8824	0.8824	0.8923	0.9010	0.8955	0.8955	
0.45	0.9063	0.8987	0.8955	0.9017	0.9040	0.9049	0.8955	0.9023	0.8902	0.8879	0.8850	0.8955	0.9091	0.9014	0.9017	
0.5	0.9094	0.9091	0.9017	0.9091	0.9091	0.9091	0.8983	0.9088	0.8955	0.8953	0.8955	0.9007	0.9123	0.9075	0.9091	
0.55	0.9183	0.9091	0.9091	0.9123	0.9160	0.9147	0.9091	0.9121	0.9009	0.8991	0.8955	0.9085	0.9231	0.9107	0.9149	
0.6	0.9231	0.9182	0.9123	0.9231	0.9226	0.9228	0.9094	0.9191	0.9091	0.9084	0.9063	0.9096	0.9231	0.9166	0.9231	
0.65	0.9291	0.9231	0.9231	0.9231	0.9232	0.9232	0.9204	0.9231	0.9156	0.9132	0.9091	0.9177	0.9289	0.9226	0.9231	
0.7	0.9375	0.9288	0.9231	0.9318	0.9320	0.9314	0.9231	0.9256	0.9231	0.9227	0.9175	0.9231	0.9375	0.9233	0.9262	
0.75	0.9431	0.9375	0.9362	0.9375	0.9375	0.9375	0.9288	0.9334	0.9231	0.9231	0.9231	0.9273	0.9375	0.9296	0.9375	
0.8	0.9524	0.9411	0.9375	0.9465	0.9405	0.9433	0.9375	0.9375	0.9375	0.9278	0.9244	0.9371	0.9434	0.9366	0.9375	
0.85	0.9677	0.9524	0.9524	0.9526	0.9518	0.9524	0.9498	0.9422	0.9375	0.9374	0.9374	0.9385	0.9524	0.9375	0.9524	
0.9	0.9836	0.9709	0.9677	0.9739	0.9650	0.9677	0.9677	0.9587	0.9461	0.9501	0.9406	0.9524	0.9676	0.9485	0.9677	
0.95	1.0457	1.0346	1.0345	1.0345	1.0000	1.0064	1.0024	0.9938	0.9677	0.9705	0.9740	0.9679	1.0120	0.9677	1.0100	
0.9999	2.5518	6.0587	7.4703	5.2432	7.7472	5.9993	12.000	6.4402	1.4919	5.4207	1.5760	1.5426	2.0797	1.5734	1.9908	

Table C-7: Travel rate percentiles of incident observations during all temporal intervals.

	125+04836	125P04836	125+04837	125P04837	125+04838	125P04838	125+04961	125P04961	125+04962	125P04962	125+04963	125P04963	125+04964	125P04964	125+04965	125P04965	125+04966	125P04966
0.0001	0.0109	0.0069	0.0049	0.0034	0.0046	0.0202	0.0197	0.1603	0.1734	0.1742	0.1638	0.1694	0.0050	0.0126	0.0181	0.0295	0.0105	0.0313
0.05	0.8942	0.8971	2.3874	0.8841	0.8487	0.8574	0.8571	0.8476	0.8577	0.8499	0.8427	0.8451	0.8624	0.8659	0.9122	0.9038	0.9098	0.9231
0.1	0.9740	0.9231	3.5325	1.0452	0.8622	0.8851	0.8824	0.8646	0.8703	0.8688	0.8571	0.8596	0.8853	0.8918	0.9375	0.9231	0.9674	0.9231
0.15	1.0014	0.9244	4.0400	1.1979	0.8811	0.8961	0.8955	0.8743	0.8829	0.8774	0.8696	0.8696	0.8983	0.9085	0.9375	0.9231	1.2081	0.9231
0.2	1.0504	0.9325	4.8636	1.9020	0.8910	0.9096	0.9096	0.8829	0.8955	0.8855	0.8824	0.8823	0.9231	0.9488	0.9375	0.9231	1.8595	0.9231
0.25	1.3094	0.9375	5.5407	2.1161	0.9206	0.9231	0.9231	0.8927	0.9060	0.8955	0.8903	0.8903	0.9467	0.9938	0.9375	0.9256	2.2389	0.9423
0.3	1.6001	0.9383	5.7915	2.2693	0.9545	0.9231	0.9231	0.8968	0.9097	0.9041	0.9009	0.8982	0.9677	1.0967	0.9503	0.9376	2.6718	0.9661
0.35	1.9476	0.9458	6.0358	2.2928	1.0793	0.9231	0.9231	0.9066	0.9201	0.9092	0.9091	0.9091	0.9867	1.2697	1.1588	0.9828	3.0438	1.4589
0.4	2.2165	0.9499	6.2488	2.3882	1.1868	0.9231	0.9231	0.9116	0.9231	0.9206	0.9208	0.9175	1.1289	1.5909	1.7252	1.1572	3.5272	2.3750
0.45	2.4932	0.9524	6.5236	2.6784	1.9289	0.9231	0.9231	0.9226	0.9231	0.9231	0.9231	0.9231	1.2765	2.2292	1.9441	1.4982	3.8738	2.8045
0.5	2.7861	0.9614	6.9177	3.4681	2.0481	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	1.3346	2.7143	2.3491	1.9793	4.1355	3.2116
0.55	2.9336	0.9687	7.0554	5.5187	2.7621	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	2.3023	2.9428	2.6115	2.5756	4.6040	3.5810
0.6	3.1569	0.9802	7.2314	6.7482	3.1624	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	2.7325	3.5864	2.9264	3.0081	4.8101	3.9227
0.65	3.3291	0.9927	7.3945	7.0379	3.3026	0.9231	0.9231	0.9231	0.9243	0.9231	0.9231	0.9232	3.2257	4.3979	3.3158	3.4756	5.1532	4.3764
0.7	3.6152	1.0325	7.6124	7.7227	3.5686	0.9260	0.9231	0.9231	0.9342	0.9326	0.9354	0.9318	3.7755	5.1752	3.6960	3.7635	5.7357	5.0522
0.75	3.8155	1.2159	7.7148	7.9629	4.8140	0.9408	0.9346	0.9256	0.9375	0.9375	0.9404	0.9375	4.5008	5.6993	4.2769	4.7046	6.2549	5.7177
0.8	4.0853	3.5478	7.7516	8.2626	5.4977	0.9680	0.9375	0.9364	0.9440	0.9440	0.9524	0.9392	6.6834	6.3030	5.1589	5.4973	6.8837	6.3480
0.85	4.3570	4.5666	7.9248	8.5222	6.1035	1.0073	0.9542	0.9384	0.9524	0.9524	0.9677	0.9524	7.5594	7.0157	6.0628	6.6614	7.7267	7.4797
0.9	4.5996	7.0164	8.2397	8.9720	7.6008	1.2251	0.9840	0.9524	0.9647	0.9677	0.9709	0.9671	8.9552	7.7928	6.7775	8.4121	9.1092	8.5980
0.95	5.1045	7.6879	9.2573	9.8817	8.4711	2.7554	1.0381	0.9836	0.9891	0.9912	0.9987	0.9907	9.6935	8.9750	7.4313	9.6567	9.8254	10.157
0.9999	7.4552	9.8492	10.338	11.011	8.9638	7.3965	8.9147	10.859	2.8872	2.4919	1.4634	9.2189	11.488	10.803	8.4298	12.000	12.177	12.000

Table C-7: (Continued).

	125P04856	125+04857	125P04857	125+04858	125P04858	125+04859	125P04859	125+04860	125P04860	125+04861	125P04861	125+04862	125P04862	125+04863	125P04863	125+04864	125P04864	125+04865
0.0001	0.0000	0.0291	0.0297	0.0293	0.0267	0.0357	0.0200	0.0131	0.0191	0.0072	0.0077	0.1263	0.1394	0.2984	0.3025	0.3222	0.3213	0.1430
0.05	0.0000	0.9227	0.9231	0.9231	0.9181	0.9176	0.9413	0.9075	0.8859	0.8588	0.8661	0.8455	0.8580	0.8571	0.8595	0.8696	0.8571	0.8696
0.1	0.0000	0.9231	0.9231	0.9231	0.9231	0.9231	0.9766	0.9519	0.9231	0.8795	0.8822	0.8696	0.8803	0.8824	0.8831	0.8955	0.8824	0.8955
0.15	0.0000	0.9231	0.9231	0.9231	0.9231	0.9231	0.9931	1.0141	0.9417	0.8901	0.8881	0.8902	0.8955	0.8967	0.9040	0.9091	0.8994	0.9091
0.2	0.0000	0.9385	0.9375	0.9346	0.9400	0.9283	1.0069	1.0542	0.9840	0.9026	0.9049	0.9065	0.9119	0.9149	0.9181	0.9231	0.9140	0.9231
0.25	0.0000	0.9559	0.9797	0.9719	0.9677	0.9745	1.0204	1.0859	1.0273	0.9126	0.9184	0.9206	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.3	0.0000	1.0437	1.0345	1.0407	1.0125	1.0134	1.0346	1.1329	1.0913	0.9363	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.35	0.0000	1.4556	1.1290	1.0934	1.0788	1.0611	1.0529	1.1874	1.1584	0.9686	0.9262	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.4	0.0000	1.7697	1.2814	1.2001	1.1690	1.1882	1.0722	1.3273	1.3348	1.0158	0.9693	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.45	0.0000	2.0681	1.4378	1.3387	1.3160	1.3071	1.0943	1.5792	1.4918	1.1668	0.9991	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.5	0.0000	2.2270	1.5692	1.5394	1.4968	1.5193	1.1620	1.9187	1.7290	1.3423	1.0635	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.55	0.0000	2.4775	1.7345	1.6974	1.7456	1.6509	1.2918	2.0875	2.1250	1.5132	1.2677	0.9231	0.9231	0.9231	0.9233	0.9307	0.9259	0.9289
0.6	0.0000	2.6673	1.9176	1.9178	2.0153	1.8733	1.3829	2.2307	2.3922	1.7155	1.4165	0.9231	0.9231	0.9288	0.9300	0.9375	0.9375	0.9375
0.65	0.0000	2.9557	2.2354	2.2759	2.3307	2.0320	1.4637	2.3548	2.8313	1.9062	1.5978	0.9231	0.9231	0.9375	0.9375	0.9498	0.9404	0.9524
0.7	0.0000	3.4804	2.6729	2.5565	2.7194	2.3297	1.7213	2.6284	3.1092	2.3022	1.6829	0.9231	0.9349	0.9478	0.9492	0.9606	0.9524	0.9715
0.75	0.0000	4.0935	3.0024	3.1079	3.4842	2.7469	2.1442	2.9249	3.4007	2.6886	1.8747	0.9286	0.9499	0.9525	0.9578	0.9762	0.9677	0.9982
0.8	0.0000	4.7494	3.7358	3.7617	4.0878	3.2222	2.9330	3.3599	3.9261	3.1698	2.3858	0.9423	0.9594	0.9677	0.9788	1.0000	0.9836	1.0345
0.85	0.0000	5.5442	4.3175	4.4853	4.7740	3.7439	3.6657	3.6133	4.2961	3.5726	3.0787	0.9525	0.9786	0.9848	1.0123	1.0359	1.0148	1.0716
0.9	0.0000	6.4394	5.3968	5.2528	5.6101	4.5918	4.7489	4.4916	4.8333	4.0884	4.1552	0.9789	1.0111	1.0345	1.0951	1.1715	1.0586	1.1528
0.95	0.0000	7.9101	6.9952	6.9946	8.0646	6.2282	7.9100	5.6119	5.8731	5.1947	4.7408	1.0332	1.1269	1.9854	2.0402	1.9706	1.2517	1.3924
0.9999	0.0000	10.629	12.000	11.874	11.994	10.817	10.474	9.6360	10.740	9.1958	6.3703	6.6293	11.971	11.94	8.3914	11.793	12.000	8.7555

Table C-7: (Continued).

	125P04865	125+04866	125P04866	125+04867	125P04867	125+04868	125P04868	125+04869	125P04869	125+04870	125P04870	125+04871	125P04871	125+04872	125P04872	
0.0001	0.2008	0.1528	0.1535	0.1971	0.1266	0.0197	0.0187	0.0037	0.0184	0.0210	0.0206	0.0154	0.0196	0.0223	0.0157	
0.05	0.8622	0.8722	0.8696	0.8696	0.8701	0.8590	0.8333	0.8672	0.8333	0.8572	0.8444	0.8459	0.8573	0.8631	0.8571	
0.1	0.8824	0.8929	0.8824	0.8925	0.8905	0.8910	0.8707	0.8823	0.8571	0.8855	0.8798	0.8771	0.8708	0.8824	0.8819	
0.15	0.8987	0.9091	0.9003	0.9091	0.9030	0.9096	0.8882	0.9022	0.8824	0.8968	0.8879	0.8914	0.8932	0.8894	0.8995	
0.2	0.9146	0.9231	0.9120	0.9231	0.9169	0.9225	0.9065	0.9139	0.8955	0.9091	0.9091	0.9064	0.9079	0.8978	0.9091	
0.25	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9160	0.9194	0.9083	0.9194	0.9149	0.9095	0.9218	0.9057	0.9106	
0.3	0.9231	0.9231	0.9231	0.9231	0.9231	0.9237	0.9231	0.9231	0.9231	0.9231	0.9230	0.9212	0.9231	0.9125	0.9186	
0.35	0.9231	0.9231	0.9231	0.9231	0.9231	0.9315	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9259	0.9195	0.9231	
0.4	0.9231	0.9231	0.9231	0.9231	0.9231	0.9372	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9346	0.9231	0.9231	
0.45	0.9231	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9259	0.9231	0.9231	0.9231	0.9235	0.9375	0.9231	0.9231	
0.5	0.9231	0.9231	0.9231	0.9231	0.9233	0.9377	0.9231	0.9324	0.9231	0.9231	0.9231	0.9267	0.9375	0.9241	0.9231	
0.55	0.9231	0.9231	0.9231	0.9231	0.9294	0.9460	0.9231	0.9373	0.9231	0.9231	0.9231	0.9319	0.9375	0.9294	0.9231	
0.6	0.9288	0.9242	0.9232	0.9291	0.9375	0.9524	0.9231	0.9375	0.9231	0.9235	0.9231	0.9365	0.9466	0.9344	0.9282	
0.65	0.9375	0.9375	0.9375	0.9375	0.9413	0.9942	0.9346	0.9469	0.9259	0.9319	0.9259	0.9375	0.9524	0.9375	0.9375	
0.7	0.9524	0.9524	0.9500	0.9524	0.9521	1.1282	0.9453	0.9749	0.9317	0.9375	0.9348	0.9385	0.9573	0.9404	0.9375	
0.75	0.9677	0.9677	0.9677	0.9677	0.9603	1.3141	0.9677	1.0839	0.9375	0.9402	0.9413	0.9543	1.0003	0.9475	0.9677	
0.8	0.9903	0.9945	0.9903	0.9901	0.9773	1.5949	0.9844	1.5604	0.9375	0.9660	0.9689	0.9871	1.1179	0.9677	1.0714	
0.85	1.0239	1.0309	1.0169	1.0208	0.9998	1.7686	1.8502	2.1434	0.9552	1.2322	1.4139	1.3568	1.4246	2.3801	2.7803	
0.9	1.0714	1.1073	1.1494	1.1274	1.0632	2.9406	3.0463	2.6229	1.0664	2.8532	2.3637	2.3099	2.2512	6.4553	6.5966	
0.95	1.2060	1.6147	4.5360	2.4735	1.3442	4.7819	4.4668	3.3230	1.4329	4.7268	3.4816	3.6854	4.5116	8.6697	10.314	
0.9999	9.9313	10.771	12.000	6.7636	8.0911	6.7421	12.000	6.5701	3.3203	6.7605	6.7736	5.7593	8.2430	11.022	12.000	

Table C-8: Travel rate percentiles for weather observations during all temporal analysis periods.

	125+04836	125P04836	125+04837	125P04837	125+04838	125P04838	125+04961	125P04961	125+04962	125P04962	125+04963	125P04963	125+04964	125P04964	125+04965	125P04965	125+04966	125P04966
0.0001	0.4332	0.5869	0.4443	0.6504	0.4522	0.6443	0.8000	0.6614	0.6714	0.7182	0.8000	0.6855	0.8000	0.6733	0.5068	0.6714	0.0834	0.4939
0.05	0.8365	0.8497	0.8368	0.8346	0.8522	0.8588	0.8571	0.8469	0.8578	0.8525	0.8523	0.8553	0.8476	0.8480	0.8658	0.8604	0.8696	0.8825
0.1	0.8521	0.8705	0.8543	0.8523	0.8708	0.8824	0.8696	0.8665	0.8772	0.8696	0.8696	0.8704	0.8652	0.8678	0.8845	0.8824	0.8904	0.9057
0.15	0.8627	0.8848	0.8667	0.8654	0.8834	0.8956	0.8824	0.8774	0.8903	0.8824	0.8850	0.8833	0.8773	0.8824	0.8980	0.8957	0.9028	0.9204
0.2	0.8729	0.8980	0.8765	0.8761	0.8950	0.9091	0.8955	0.8876	0.8988	0.8955	0.8963	0.8955	0.8876	0.8930	0.9091	0.9074	0.9117	0.9231
0.25	0.8824	0.9091	0.8851	0.8851	0.9041	0.9201	0.9050	0.8961	0.9091	0.9036	0.9091	0.9089	0.8955	0.9011	0.9180	0.9152	0.9217	0.9231
0.3	0.8903	0.9189	0.8949	0.8955	0.9117	0.9231	0.9091	0.9086	0.9189	0.9099	0.9231	0.9173	0.9091	0.9092	0.9231	0.9231	0.9231	0.9231
0.35	0.8992	0.9231	0.9018	0.9055	0.9205	0.9231	0.9231	0.9145	0.9231	0.9230	0.9231	0.9231	0.9174	0.9209	0.9231	0.9231	0.9231	0.9231
0.4	0.9081	0.9231	0.9095	0.9122	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.45	0.9149	0.9231	0.9177	0.9222	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9281	0.9231	0.9231	0.9231
0.5	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9359	0.9231	0.9231	0.9258
0.55	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9375	0.9231	0.9264	0.9367
0.6	0.9231	0.9249	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9375	0.9287	0.9346	0.9375
0.65	0.9231	0.9349	0.9231	0.9231	0.9238	0.9261	0.9231	0.9231	0.9262	0.9231	0.9306	0.9232	0.9231	0.9232	0.9382	0.9372	0.9375	0.9438
0.7	0.9231	0.9379	0.9231	0.9231	0.9312	0.9375	0.9288	0.9231	0.9369	0.9335	0.9375	0.9341	0.9261	0.9317	0.9468	0.9392	0.9442	0.9524
0.75	0.9238	0.9494	0.9240	0.9287	0.9375	0.9431	0.9375	0.9291	0.9398	0.9375	0.9489	0.9375	0.9375	0.9375	0.9524	0.9518	0.9524	0.9640
0.8	0.9336	0.9551	0.9353	0.9375	0.9444	0.9524	0.9410	0.9375	0.9520	0.9523	0.9554	0.9469	0.9406	0.9466	0.9636	0.9564	0.9669	0.9813
0.85	0.9454	0.9680	0.9463	0.9524	0.9566	0.9638	0.9524	0.9503	0.9617	0.9614	0.9677	0.9524	0.9524	0.9611	0.9782	0.9730	0.9887	1.0131
0.9	0.9766	0.9984	0.9677	0.9805	0.9810	0.9827	0.9715	0.9676	0.9823	0.9831	0.9836	0.9677	0.9750	0.9834	1.0012	1.0026	1.0345	1.0831
0.95	1.1242	1.0745	1.0482	1.0672	1.0379	1.0271	1.0169	1.0087	1.0216	1.0285	1.0345	1.0033	1.0242	1.0390	1.0668	1.0792	1.2949	1.8704
0.9999	7.6327	8.4267	8.0036	8.4693	7.7770	3.7830	14.469	14.140	13.498	14.369	19.174	1.8700	10.030	9.6508	8.9264	13.275	11.329	13.446

Table C-8: (Continued).

	125P04856	125+04857	125P04857	125+04858	125P04858	125+04859	125P04859	125+04860	125P04860	125+04861	125P04861	125+04862	125P04862	125+04863	125P04863	125+04864	125P04864	125+04865
0.0001	0.8000	0.6745	0.8000	0.8000	0.6826	0.6827	0.6295	0.4870	0.6719	0.3176	0.6500	0.7124	0.8000	0.7308	0.6518	0.8000	0.8000	0.8000
0.05	0.8824	0.8771	0.8824	0.8764	0.8599	0.8575	0.8631	0.8567	0.8476	0.8456	0.8451	0.8451	0.8458	0.8475	0.8478	0.8571	0.8546	0.8476
0.1	0.9065	0.8960	0.9091	0.8955	0.8824	0.8786	0.8831	0.8713	0.8696	0.8616	0.8596	0.8622	0.8674	0.8696	0.8692	0.8763	0.8722	0.8696
0.15	0.9207	0.9103	0.9231	0.9091	0.8955	0.8929	0.8960	0.8837	0.8824	0.8720	0.8709	0.8750	0.8824	0.8824	0.8824	0.8901	0.8850	0.8824
0.2	0.9231	0.9231	0.9231	0.9231	0.9090	0.9045	0.9088	0.8948	0.8929	0.8821	0.8827	0.8851	0.8903	0.8955	0.8949	0.8986	0.8955	0.8938
0.25	0.9231	0.9231	0.9231	0.9231	0.9173	0.9131	0.9177	0.9030	0.9015	0.8890	0.8953	0.8955	0.8967	0.9091	0.9039	0.9091	0.9091	0.9017
0.3	0.9231	0.9231	0.9231	0.9231	0.9231	0.9230	0.9231	0.9100	0.9114	0.8964	0.9016	0.9065	0.9091	0.9174	0.9114	0.9231	0.9174	0.9091
0.35	0.9231	0.9231	0.9304	0.9231	0.9231	0.9231	0.9231	0.9193	0.9227	0.9045	0.9092	0.9142	0.9176	0.9231	0.9226	0.9231	0.9231	0.9210
0.4	0.9231	0.9231	0.9375	0.9330	0.9231	0.9231	0.9231	0.9231	0.9231	0.9096	0.9181	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.45	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9231	0.9231	0.9231	0.9162	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.5	0.9231	0.9237	0.9375	0.9375	0.9231	0.9231	0.9231	0.9231	0.9231	0.9222	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.55	0.9363	0.9348	0.9465	0.9375	0.9231	0.9231	0.9262	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231
0.6	0.9375	0.9377	0.9524	0.9465	0.9241	0.9231	0.9362	0.9231	0.9234	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9265	0.9231	0.9231
0.65	0.9434	0.9494	0.9586	0.9524	0.9372	0.9279	0.9392	0.9282	0.9344	0.9231	0.9231	0.9231	0.9231	0.9319	0.9269	0.9375	0.9333	0.9261
0.7	0.9524	0.9525	0.9677	0.9615	0.9375	0.9374	0.9503	0.9366	0.9385	0.9231	0.9231	0.9259	0.9295	0.9375	0.9371	0.9409	0.9375	0.9375
0.75	0.9646	0.9671	0.9815	0.9677	0.9499	0.9384	0.9565	0.9417	0.9520	0.9249	0.9292	0.9374	0.9375	0.9465	0.9404	0.9524	0.9467	0.9404
0.8	0.9836	0.9821	0.9970	0.9847	0.9589	0.9524	0.9677	0.9524	0.9597	0.9349	0.9375	0.9387	0.9452	0.9524	0.9521	0.9615	0.9524	0.9524
0.85	1.0137	1.0100	1.0208	1.0169	0.9834	0.9685	0.9868	0.9677	0.9746	0.9465	0.9502	0.9524	0.9524	0.9676	0.9641	0.9715	0.9677	0.9677
0.9	1.0884	1.0752	1.0909	1.0714	1.0338	1.0074	1.0220	0.9963	0.9997	0.9680	0.9674	0.9677	0.9677	0.9836	0.9825	1.0000	0.9945	0.9846
0.95	1.9636	1.8124	1.3887	1.2766	1.2515	1.1351	1.1225	1.0820	1.0714	1.0441	1.0169	1.0181	1.0184	1.0380	1.0428	1.0603	1.0526	1.0526
0.9999	14.459	13.497	25.655	18.336	13.534	12.087	16.363	6.8635	9.5716	3.8588	4.7271	4.7379	4.7632	4.7478	2.7851	2.3081	2.3882	2.2998

Table C-8: (Continued).

	125P04865	125+04866	125P04866	125+04867	125P04867	125+04868	125P04868	125+04869	125P04869	125+04870	125P04870	125+04871	125P04871	125+04872	125P04872	
0.0001	0.8000	0.8000	0.8000	0.8000	0.6407	0.6606	0.8000	0.3000	0.7717	0.6302	0.7308	0.6611	0.7379	0.1455	0.7373	
0.05	0.8451	0.8461	0.8432	0.8500	0.8497	0.8458	0.8434	0.8486	0.8333	0.8333	0.8333	0.8452	0.8476	0.8531	0.8451	
0.1	0.8683	0.8672	0.8596	0.8696	0.8700	0.8696	0.8597	0.8682	0.8548	0.8507	0.8499	0.8644	0.8696	0.8707	0.8692	
0.15	0.8824	0.8805	0.8722	0.8824	0.8829	0.8824	0.8746	0.8824	0.8696	0.8676	0.8646	0.8768	0.8824	0.8827	0.8824	
0.2	0.8910	0.8893	0.8824	0.8929	0.8955	0.8952	0.8824	0.8928	0.8824	0.8792	0.8755	0.8875	0.8955	0.8940	0.8939	
0.25	0.8983	0.8967	0.8950	0.9010	0.9063	0.9037	0.8955	0.9011	0.8919	0.8875	0.8850	0.8965	0.9052	0.9020	0.9038	
0.3	0.9091	0.9091	0.9018	0.9091	0.9144	0.9100	0.9046	0.9097	0.9009	0.8964	0.8955	0.9085	0.9123	0.9098	0.9120	
0.35	0.9176	0.9146	0.9091	0.9205	0.9228	0.9217	0.9119	0.9181	0.9091	0.9085	0.9063	0.9144	0.9231	0.9177	0.9231	
0.4	0.9231	0.9231	0.9195	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9167	0.9119	0.9228	0.9231	0.9231	0.9231	
0.45	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9230	0.9231	0.9231	0.9231	0.9231	
0.5	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.55	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.6	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	0.9231	
0.65	0.9239	0.9231	0.9231	0.9231	0.9242	0.9250	0.9231	0.9242	0.9231	0.9231	0.9231	0.9231	0.9245	0.9231	0.9231	
0.7	0.9375	0.9264	0.9236	0.9346	0.9347	0.9348	0.9231	0.9307	0.9231	0.9231	0.9231	0.9240	0.9349	0.9258	0.9317	
0.75	0.9406	0.9375	0.9375	0.9375	0.9375	0.9376	0.9320	0.9372	0.9289	0.9259	0.9257	0.9343	0.9375	0.9330	0.9375	
0.8	0.9524	0.9444	0.9442	0.9524	0.9477	0.9510	0.9375	0.9417	0.9375	0.9366	0.9374	0.9375	0.9437	0.9375	0.9465	
0.85	0.9677	0.9585	0.9588	0.9646	0.9551	0.9590	0.9524	0.9524	0.9464	0.9402	0.9410	0.9475	0.9524	0.9468	0.9588	
0.9	0.9836	0.9836	0.9836	0.9836	0.9760	0.9810	0.9707	0.9681	0.9588	0.9577	0.9631	0.9571	0.9677	0.9597	0.9836	
0.95	1.0526	1.0438	1.0489	1.0525	1.0308	1.0322	1.0171	1.0146	0.9999	0.9966	1.0000	0.9954	1.0087	0.9956	1.0494	
0.9999	3.8717	7.9612	5.0293	4.1493	2.9518	2.1540	1.8909	1.6956	7.5717	6.8058	7.3575	1.8398	1.7087	3.7915	6.1562	

Table C-9: Travel rate percentiles for combined weather and incident observations during all temporal intervals.

	125+04836	125P04836	125+04837	125P04837	125+04838	125P04838	125+04961	125P04961	125+04962	125P04962	125+04963	125P04963	125+04964	125P04964	125+04965	125P04965	125+04966	125P04966
0.0001		0.0035		0.0003			0.0004	0.0045	0.0033	0.0033	0.0041	0.0033		0.0020	0.0023	0.0036	0.0030	0.0030
0.05		0.9502		0.1600			0.2106	0.9231	0.9231	0.9231	0.9231	0.9208		1.0233	1.1457	0.9260	1.0161	1.5050
0.1		0.9546		0.3200			0.4212	0.9231	0.9231	0.9231	0.9231	0.9231		1.9190	2.1901	0.9372	1.0286	2.2366
0.15		0.9642		0.4800			0.6318	0.9231	0.9231	0.9231	0.9231	0.9231		2.2408	2.7788	0.9937	1.0865	2.7307
0.2		0.9756		0.6400			0.8424	0.9231	0.9231	0.9231	0.9231	0.9231		2.8687	3.3950	0.9999	1.1049	3.0055
0.25		0.9828		0.8000			1.0530	0.9231	0.9231	0.9231	0.9231	0.9231		4.0322	4.0592	1.0131	1.1176	3.0595
0.3		0.9846		0.9600			1.0600	0.9231	0.9231	0.9231	0.9231	0.9231		4.7912	4.4922	1.0876	1.1837	3.0835
0.35		0.9983		1.0688			1.0670	0.9231	0.9231	0.9231	0.9231	0.9231		5.2131	4.7325	1.2156	1.3980	3.2049
0.4		1.0043		1.0752			1.0740	0.9231	0.9231	0.9231	0.9231	0.9231		5.5627	5.1306	1.3753	2.7354	3.2931
0.45		1.0130		1.0816			1.0810	0.9231	0.9231	0.9231	0.9231	0.9231		5.8852	5.5880	1.7724	2.9960	3.3660
0.5		1.0175		1.0880			1.0879	0.9231	0.9231	0.9231	0.9231	0.9231		6.3026	5.7536	2.3638	3.2541	3.4690
0.55		1.0936		1.0944			1.1011	0.9231	0.9231	0.9231	0.9231	0.9231		6.7059	5.9170	2.5678	3.3839	3.5707
0.6		1.2391		1.1008			1.1143	0.9233	0.9231	0.9231	0.9231	0.9231		6.8722	6.3502	2.9069	3.6048	3.6223
0.65		1.3114		1.1073			1.1275	0.9463	0.9231	0.9231	0.9333	0.9231		7.0191	6.7170	3.1348	3.7283	3.6436
0.7		2.3077		1.1443			1.1407	0.9990	0.9231	0.9231	0.9836	0.9231		7.1144	6.9069	3.3125	3.9252	3.8912
0.75		2.6937		1.1965			1.1538	1.0000	0.9231	0.9231	0.9836	0.9231		7.4983	7.1787	3.8675	5.1788	4.2400
0.8		2.7810		1.2488			1.1538	3.1038	0.9231	0.9231	5.1730	0.9231		8.2287	7.5487	5.2099	6.0266	4.6321
0.85		3.2397		1.3011			1.1538	4.8158	0.9231	0.9267	8.1562	0.9231		9.2975	7.8515	6.7069	6.8396	5.0855
0.9		3.8168		1.3534			1.1538	8.3523	0.9231	0.9523	12.319	0.9231		10.559	8.1159	8.6824	7.6463	5.6657
0.95		4.3266		1.4057			1.1538	12.538	0.9233	0.9524	12.806	0.9231		10.855	8.8538	9.6269	9.2184	6.3279
0.9999		5.5599		1.4579			1.1538	13.652	0.9622	0.9715	14.996	0.9231		10.937	9.6951	11.075	10.103	6.6596

Table C-9: (Continued).

	125P04856	125+04857	125P04857	125+04858	125P04858	125+04859	125P04859	125+04860	125P04860	125+04861	125P04861	125+04862	125P04862	125+04863	125P04863	125+04864	125P04864	125+04865
0.0001		0.0037	0.0025	0.0017	0.0025	0.0022	0.0026	0.0027	0.0038	0.0026	0.0002	0.0053	0.0054	0.0076	0.0076	0.0052	0.0051	0.0031
0.05		1.6106	0.9855	0.8309	0.9375	1.0581	0.9848	0.8928	1.0030	0.9363	0.0923	0.8433	0.8451	0.8753	0.8787	0.8874	0.8887	0.8647
0.1		1.6592	1.0000	1.0130	0.9375	1.1314	1.0080	0.9062	1.1738	0.9596	0.1846	0.8621	0.8571	0.8888	0.8955	0.8953	0.9078	0.8696
0.15		1.7002	1.0000	1.0319	0.9375	1.1517	1.0395	0.9167	1.3779	1.0021	0.2769	0.8788	0.8687	0.8965	0.9067	0.9081	0.9231	0.8696
0.2		1.7970	1.0000	1.0391	0.9375	1.1537	1.0517	0.9218	1.4077	1.2718	0.3692	0.8824	0.8797	0.9047	0.9152	0.9231	0.9231	0.9014
0.25		1.9117	1.0000	1.0473	0.9487	1.1548	1.0576	0.9371	1.4138	1.4775	0.4615	0.8985	0.8825	0.9190	0.9231	0.9231	0.9231	0.9130
0.3		2.1133	1.0000	1.0535	0.9878	1.1620	1.0678	0.9537	1.4180	1.6876	0.5538	0.9030	0.8922	0.9231	0.9231	0.9231	0.9231	0.9231
0.35		2.1620	1.0000	1.0606	1.0732	1.2129	1.1267	0.9875	1.5006	1.7846	0.6462	0.9157	0.8955	0.9231	0.9231	0.9231	0.9231	0.9231
0.4		2.2819	1.0556	1.0695	1.0816	1.3187	1.1434	1.0194	1.5753	1.8800	0.7385	0.9230	0.9064	0.9231	0.9231	0.9231	0.9231	0.9231
0.45		2.3597	1.1202	1.0769	1.0942	1.4298	1.1671	1.1402	1.6594	1.9650	0.8308	0.9231	0.9094	0.9231	0.9231	0.9305	0.9260	0.9231
0.5		2.4792	1.1231	1.0853	1.1031	1.5143	1.1914	1.2427	1.8247	2.1362	0.9231	0.9231	0.9174	0.9231	0.9231	0.9375	0.9344	0.9231
0.55		2.5039	1.1375	1.0980	1.1110	1.5808	1.2156	1.4114	2.0167	2.3312	0.9231	0.9231	0.9231	0.9231	0.9231	0.9415	0.9405	0.9234
0.6		2.5185	1.1538	1.1178	1.1761	1.6786	1.3566	1.8932	2.1644	2.5572	0.9231	0.9231	0.9231	0.9231	0.9251	0.9524	0.9465	0.9277
0.65		2.5283	1.1561	1.1462	1.4711	1.7209	1.4216	1.9561	2.6502	2.9338	0.9231	0.9231	0.9231	0.9317	0.9314	0.9545	0.9524	0.9375
0.7		2.6573	1.2742	1.1733	1.7027	1.7994	1.6131	2.2052	3.3657	2.9844	0.9231	0.9231	0.9231	0.9383	0.9374	0.9677	0.9586	0.9375
0.75		2.7428	1.3917	1.2108	1.8950	1.9474	1.7000	2.6600	4.1697	3.0542	0.9231	0.9231	0.9231	0.9487	0.9379	0.9678	0.9669	0.9375
0.8		2.8582	1.5876	1.2420	2.1142	1.9953	1.9949	3.0139	5.2364	4.1368	0.9231	0.9231	0.9231	0.9553	0.9469	0.9839	0.9677	0.9385
0.85		2.9832	1.6790	1.2558	2.2587	2.1481	3.1109	3.0783	7.1700	4.3277	0.9231	0.9324	0.9231	0.9677	0.9746	1.0011	0.9677	0.9406
0.9		3.5575	1.7397	1.4147	2.5068	3.1646	3.4337	3.6901	8.1972	4.5267	0.9231	0.9523	0.9231	0.9939	1.2165	1.0304	0.9847	0.9524
0.95		4.9179	1.9600	1.8063	2.7317	5.7328	5.1325	6.4347	8.7875	4.6989	0.9231	0.9524	0.9386	1.1581	2.1313	1.5095	1.0124	0.9604
0.9999		5.4717	2.1328	1.9348	2.9431	7.1833	8.1493	10.061	11.431	4.8173	0.9231	1.0195	1.0204	8.5714	3.4035	3.9433	1.0713	0.9999

Table C-9: (Continued).

	125P04865	125+04866	125P04866	125+04867	125P04867	125+04868	125P04868	125+04869	125P04869	125+04870	125P04870	125+04871	125P04871	125+04872	125P04872	
0.0001	0.0031	0.0011	0.0011	0.0033	0.0022							0.0012				
0.05	0.8451	0.5471	0.5455	0.9231	0.9231							0.6094				
0.1	0.8690	0.9124	0.9102	0.9231	0.9231							0.9393				
0.15	0.8696	0.9141	0.9135	0.9231	0.9231							0.9433				
0.2	0.8795	0.9146	0.9180	0.9231	0.9231							1.0378				
0.25	0.9102	0.9146	0.9231	0.9231	0.9231							1.1016				
0.3	0.9231	0.9163	0.9231	0.9231	0.9231							1.1043				
0.35	0.9231	0.9186	0.9231	0.9231	0.9231							1.1946				
0.4	0.9231	0.9219	0.9231	0.9231	0.9251							1.2786				
0.45	0.9231	0.9231	0.9231	0.9231	0.9281							1.3126				
0.5	0.9231	0.9231	0.9231	0.9231	0.9368							1.3376				
0.55	0.9231	0.9231	0.9231	0.9254	0.9469							1.3598				
0.6	0.9231	0.9231	0.9231	0.9375	0.9692							1.3821				
0.65	0.9319	0.9231	0.9231	0.9406	0.9712							1.3917				
0.7	0.9382	0.9231	0.9231	0.9455	0.9920							1.3953				
0.75	0.9401	0.9231	0.9231	0.9524	0.9998							1.3958				
0.8	0.9500	0.9231	0.9231	0.9925	1.0216							1.4266				
0.85	0.9524	0.9231	0.9231	1.0542	1.0893							1.4786				
0.9	0.9677	0.9231	0.9231	1.1523	1.1588							1.5596				
0.95	0.9783	0.9231	0.9231	2.2253	1.2527							1.6063				
0.9999	0.9999	0.9231	0.9231	2.3033	1.2904							1.6236				

Appendix D: I-440 EB Additional Datasets

Table D-1: Travel rate percentiles for all observations over all temporal intervals.

	125-04984	125N04984	125-04983	125N04983	125-04982	125N04982	125-04981	125N04981	125-04980	125N04980	125-04979	125N04979	125-04978	125N04978	125-04991	125N04991	125-04990	125N04990
0.0001	0.8000	0.7571	0.7710	0.8000	0.8000	0.8108	0.8000	0.8000	0.8000	0.8000	0.7308	0.8000	0.7416	0.8000	0.8000	0.8000	0.5619	0.8000
0.05	0.8955	0.8990	0.9088	0.9039	0.9091	0.9177	0.9235	0.8982	0.8955	0.8902	0.8696	0.8676	0.8784	0.8824	0.8818	0.8824	0.8922	0.8824
0.1	0.9091	0.9231	0.9264	0.9231	0.9288	0.9375	0.9520	0.9231	0.9231	0.9112	0.8903	0.8824	0.8955	0.9059	0.9025	0.9070	0.9092	0.9010
0.15	0.9231	0.9375	0.9438	0.9350	0.9375	0.9524	0.9690	0.9410	0.9375	0.9261	0.8983	0.8955	0.9091	0.9231	0.9188	0.9231	0.9231	0.9148
0.2	0.9352	0.9404	0.9526	0.9375	0.9524	0.9617	0.9839	0.9534	0.9524	0.9375	0.9091	0.9091	0.9184	0.9375	0.9231	0.9375	0.9335	0.9231
0.25	0.9375	0.9524	0.9677	0.9524	0.9524	0.9677	1.0000	0.9677	0.9641	0.9524	0.9176	0.9155	0.9237	0.9467	0.9231	0.9443	0.9394	0.9353
0.3	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9344	0.9524	0.9231	0.9524	0.9496	0.9375
0.35	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9649	0.9231	0.9524	0.9524	0.9375
0.4	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9677	0.9310	0.9524	0.9524	0.9375
0.45	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9677	0.9375	0.9524	0.9524	0.9375
0.5	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9539	0.9231	0.9231	0.9375	0.9677	0.9436	0.9524	0.9524	0.9375
0.55	0.9464	0.9524	0.9677	0.9524	0.9677	0.9677	1.0015	0.9836	0.9836	0.9677	0.9231	0.9288	0.9375	0.9677	0.9524	0.9649	0.9524	0.9524
0.6	0.9524	0.9525	0.9832	0.9677	0.9677	0.9836	1.0169	0.9872	0.9875	0.9677	0.9289	0.9375	0.9375	0.9677	0.9613	0.9677	0.9561	0.9524
0.65	0.9620	0.9677	0.9836	0.9677	0.9836	0.9901	1.0190	1.0000	1.0000	0.9836	0.9375	0.9375	0.9447	0.9740	0.9677	0.9724	0.9656	0.9533
0.7	0.9677	0.9724	0.9996	0.9772	0.9836	1.0000	1.0345	1.0169	1.0169	0.9903	0.9388	0.9435	0.9524	0.9836	0.9809	0.9836	0.9677	0.9677
0.75	0.9836	0.9836	1.0007	0.9836	1.0000	1.0169	1.0380	1.0169	1.0311	1.0000	0.9523	0.9524	0.9537	0.9944	0.9836	0.9935	0.9779	0.9677
0.8	1.0000	1.0000	1.0169	1.0000	1.0125	1.0313	1.0526	1.0345	1.0493	1.0169	0.9525	0.9651	0.9668	1.0000	0.9982	1.0000	0.9836	0.9836
0.85	1.0169	1.0169	1.0333	1.0169	1.0309	1.0455	1.0714	1.0576	1.0714	1.0345	0.9677	0.9762	0.9759	1.0169	1.0113	1.0169	0.9976	0.9975
0.9	1.0526	1.0526	1.0526	1.0417	1.0526	1.0714	1.1028	1.0870	1.0957	1.0713	0.9868	1.0000	0.9947	1.0345	1.0345	1.0348	1.0146	1.0169
0.95	1.1534	1.1508	1.1403	1.1111	1.1238	1.1321	1.1605	1.1538	1.1765	1.1310	1.0352	1.0466	1.0345	1.0874	1.0909	1.0898	1.0513	1.0528
0.9999	14.640	12.964	11.809	12.371	10.793	12.782	10.834	8.9886	9.8361	9.0111	10.007	12.278	10.747	10.841	3.9758	5.6530	4.9427	4.7287

Table D-1: (Continued).

	125-04989	125N04989	125-04988	125N04988	125-04987	125N04987	125-04986	125N04986	125-04904	125N04904	125-04903	125N04903	125-04989	125N04989	
0.0001	0.7437	0.8000	0.7710	0.8000	0.8000	0.8000	0.7308	0.8000	0.8000	0.7308	0.7308	0.7308	0.7437	0.8000	
0.05	0.8824	0.8902	0.8955	0.8803	0.8772	0.8703	0.8704	0.8801	0.8798	0.8696	0.8748	0.8634	0.8824	0.8902	
0.1	0.9003	0.9119	0.9200	0.9009	0.8955	0.8930	0.8931	0.8983	0.8967	0.8892	0.8933	0.8807	0.9003	0.9119	
0.15	0.9140	0.9291	0.9372	0.9176	0.9123	0.9054	0.9064	0.9146	0.9114	0.9016	0.9055	0.8912	0.9140	0.9291	
0.2	0.9233	0.9380	0.9515	0.9266	0.9239	0.9132	0.9134	0.9251	0.9231	0.9117	0.9141	0.8978	0.9233	0.9380	
0.25	0.9347	0.9524	0.9594	0.9375	0.9375	0.9231	0.9231	0.9375	0.9346	0.9231	0.9231	0.9078	0.9347	0.9524	
0.3	0.9375	0.9625	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9092	0.9375	0.9625	
0.35	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9156	0.9375	0.9677	
0.4	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9229	0.9375	0.9677	
0.45	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9231	0.9375	0.9677	
0.5	0.9377	0.9677	0.9677	0.9437	0.9409	0.9231	0.9233	0.9375	0.9375	0.9231	0.9247	0.9231	0.9377	0.9677	
0.55	0.9469	0.9677	0.9677	0.9524	0.9524	0.9264	0.9350	0.9494	0.9375	0.9318	0.9345	0.9231	0.9469	0.9677	
0.6	0.9524	0.9677	0.9774	0.9524	0.9524	0.9375	0.9375	0.9524	0.9464	0.9375	0.9375	0.9231	0.9524	0.9677	
0.65	0.9524	0.9745	0.9836	0.9677	0.9651	0.9412	0.9384	0.9524	0.9524	0.9376	0.9392	0.9231	0.9524	0.9745	
0.7	0.9617	0.9836	0.9915	0.9677	0.9677	0.9524	0.9521	0.9677	0.9524	0.9499	0.9507	0.9241	0.9617	0.9836	
0.75	0.9677	1.0000	1.0000	0.9836	0.9836	0.9524	0.9542	0.9677	0.9649	0.9524	0.9547	0.9343	0.9677	1.0000	
0.8	0.9797	1.0010	1.0088	0.9911	0.9911	0.9677	0.9677	0.9836	0.9677	0.9676	0.9674	0.9375	0.9797	1.0010	
0.85	0.9894	1.0169	1.0197	1.0067	1.0000	0.9825	0.9789	0.9885	0.9836	0.9771	0.9767	0.9503	0.9894	1.0169	
0.9	1.0151	1.0418	1.0475	1.0265	1.0204	1.0000	0.9932	1.0096	0.9934	0.9930	0.9939	0.9603	1.0151	1.0418	
0.95	1.0512	1.0909	1.0909	1.0824	1.0591	1.0345	1.0244	1.0425	1.0267	1.0290	1.0318	0.9856	1.0512	1.0909	
0.9999	5.6849	7.3090	4.1168	3.7910	3.8780	3.7120	4.5702	3.9353	5.5042	6.9892	7.4021	8.7237	5.6849	7.3090	

Table D-2: Travel rate percentiles for unflagged observations during all temporal intervals.

	125-04984	125N04984	125-04983	125N04983	125-04982	125N04982	125-04981	125N04981	125-04980	125N04980	125-04979	125N04979	125-04978	125N04978	125-04991	125N04991	125-04990	125N04990
0.0001	0.8000	0.7571	0.7710	0.8000	0.8000	0.8108	0.8000	0.8000	0.8000	0.8000	0.7615	0.8000	0.7169	0.8000	0.8000	0.8000	0.5619	0.8000
0.05	0.8910	0.8955	0.9059	0.9017	0.9091	0.9174	0.9231	0.8955	0.8941	0.8857	0.8696	0.8672	0.8763	0.8824	0.8792	0.8824	0.8896	0.8824
0.1	0.9091	0.9208	0.9236	0.9202	0.9259	0.9375	0.9477	0.9231	0.9202	0.9091	0.8877	0.8824	0.8955	0.9027	0.8992	0.9039	0.9087	0.8993
0.15	0.9231	0.9333	0.9386	0.9317	0.9375	0.9483	0.9679	0.9375	0.9375	0.9231	0.8957	0.8955	0.9081	0.9207	0.9150	0.9231	0.9220	0.9123
0.2	0.9269	0.9375	0.9524	0.9375	0.9524	0.9554	0.9836	0.9524	0.9468	0.9375	0.9091	0.9051	0.9156	0.9349	0.9231	0.9346	0.9316	0.9231
0.25	0.9375	0.9523	0.9643	0.9524	0.9617	0.9677	0.9995	0.9677	0.9560	0.9524	0.9126	0.9120	0.9231	0.9435	0.9231	0.9406	0.9380	0.9337
0.3	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9306	0.9524	0.9231	0.9524	0.9469	0.9375
0.35	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9615	0.9231	0.9524	0.9524	0.9375
0.4	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9677	0.9265	0.9524	0.9524	0.9375
0.45	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9677	0.9375	0.9524	0.9524	0.9375
0.5	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9677	0.9445	0.9524	0.9524	0.9375
0.55	0.9497	0.9524	0.9679	0.9585	0.9677	0.9715	1.0047	0.9836	0.9772	0.9623	0.9231	0.9231	0.9375	0.9677	0.9524	0.9568	0.9524	0.9465
0.6	0.9524	0.9549	0.9833	0.9677	0.9693	0.9836	1.0169	0.9934	0.9908	0.9677	0.9289	0.9346	0.9375	0.9677	0.9633	0.9677	0.9564	0.9524
0.65	0.9646	0.9677	0.9836	0.9677	0.9836	0.9967	1.0204	1.0000	1.0000	0.9836	0.9375	0.9375	0.9440	0.9772	0.9688	0.9740	0.9655	0.9559
0.7	0.9677	0.9753	0.9995	0.9836	0.9852	1.0017	1.0345	1.0169	1.0169	0.9904	0.9380	0.9437	0.9524	0.9836	0.9816	0.9836	0.9677	0.9677
0.75	0.9836	0.9836	1.0007	0.9903	1.0000	1.0169	1.0389	1.0169	1.0345	1.0000	0.9521	0.9524	0.9532	0.9967	0.9836	0.9934	0.9778	0.9709
0.8	1.0000	1.0000	1.0169	1.0000	1.0169	1.0345	1.0526	1.0348	1.0526	1.0169	0.9525	0.9657	0.9662	1.0000	0.9990	1.0000	0.9836	0.9836
0.85	1.0169	1.0169	1.0330	1.0169	1.0345	1.0497	1.0714	1.0638	1.0714	1.0345	0.9677	0.9766	0.9737	1.0169	1.0113	1.0169	0.9973	1.0000
0.9	1.0526	1.0526	1.0526	1.0466	1.0527	1.0714	1.1036	1.0879	1.1003	1.0710	0.9840	0.9997	0.9928	1.0345	1.0345	1.0345	1.0132	1.0169
0.95	1.1538	1.1362	1.1321	1.1111	1.1268	1.1321	1.1585	1.1538	1.1765	1.1243	1.0288	1.0345	1.0284	1.0791	1.0836	1.0783	1.0445	1.0526
0.9999	15.418	13.636	13.759	12.564	11.765	13.221	10.585	9.8911	10.165	9.1390	10.049	13.152	10.787	10.466	4.0431	6.2518	4.9014	4.9803

Table D-2: (Continued).

	125-04989	125N04989	125-04988	125N04988	125-04987	125N04987	125-04986	125N04986	125-04904	125N04904	125-04903	125N04903	125-04989	125N04989	
0.0001	0.7437	0.8000	0.7710	0.8000	0.8000	0.8000	0.7460	0.8000	0.8000	0.7388	0.7389	0.7308	0.7437	0.8000	
0.05	0.8824	0.8876	0.8952	0.8792	0.8746	0.8696	0.8697	0.8776	0.8750	0.8696	0.8742	0.8646	0.8824	0.8876	
0.1	0.8983	0.9094	0.9175	0.8982	0.8955	0.8905	0.8908	0.8955	0.8955	0.8877	0.8930	0.8818	0.8983	0.9094	
0.15	0.9121	0.9265	0.9349	0.9132	0.9091	0.9023	0.9036	0.9103	0.9091	0.9009	0.9043	0.8925	0.9121	0.9265	
0.2	0.9231	0.9375	0.9485	0.9231	0.9231	0.9091	0.9098	0.9231	0.9208	0.9091	0.9120	0.8978	0.9231	0.9375	
0.25	0.9319	0.9524	0.9552	0.9375	0.9375	0.9231	0.9230	0.9365	0.9288	0.9204	0.9226	0.9068	0.9319	0.9524	
0.3	0.9375	0.9588	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9091	0.9375	0.9588	
0.35	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9133	0.9375	0.9677	
0.4	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9215	0.9375	0.9677	
0.45	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9231	0.9375	0.9677	
0.5	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9231	0.9375	0.9677	
0.55	0.9408	0.9677	0.9677	0.9524	0.9486	0.9264	0.9287	0.9390	0.9375	0.9265	0.9291	0.9231	0.9408	0.9677	
0.6	0.9520	0.9677	0.9793	0.9524	0.9524	0.9375	0.9375	0.9524	0.9375	0.9375	0.9375	0.9231	0.9520	0.9677	
0.65	0.9524	0.9783	0.9836	0.9677	0.9628	0.9406	0.9397	0.9524	0.9494	0.9382	0.9400	0.9231	0.9524	0.9783	
0.7	0.9629	0.9836	0.9938	0.9677	0.9677	0.9524	0.9522	0.9665	0.9524	0.9511	0.9510	0.9240	0.9629	0.9836	
0.75	0.9677	1.0000	1.0000	0.9836	0.9836	0.9524	0.9536	0.9677	0.9615	0.9524	0.9544	0.9338	0.9677	1.0000	
0.8	0.9791	1.0067	1.0126	0.9875	0.9875	0.9677	0.9677	0.9836	0.9677	0.9675	0.9670	0.9375	0.9791	1.0067	
0.85	0.9894	1.0169	1.0223	1.0000	1.0000	0.9804	0.9770	0.9868	0.9836	0.9757	0.9745	0.9488	0.9894	1.0169	
0.9	1.0136	1.0455	1.0491	1.0187	1.0169	0.9967	0.9915	1.0050	0.9896	0.9905	0.9914	0.9576	1.0136	1.0455	
0.95	1.0472	1.0909	1.0895	1.0714	1.0526	1.0255	1.0182	1.0356	1.0209	1.0235	1.0281	0.9836	1.0472	1.0909	
0.9999	5.8895	7.8010	4.0354	3.4513	3.7454	2.9061	4.2431	3.9840	5.7892	7.7939	7.6526	6.2991	5.8895	7.8010	

Table D-3: Travel rate percentiles for flagged observations during all temporal intervals.

	125-04984	125N04984	125-04983	125N04983	125-04982	125N04982	125-04981	125N04981	125-04980	125N04980	125-04979	125N04979	125-04978	125N04978	125-04991	125N04991	125-04990	125N04990
0.0001	0.8000	0.7469	0.6972	0.8108	0.8058	0.8063	0.7182	0.8000	0.8000	0.8000	0.6852	0.8000	0.5742	0.8000	0.8000	0.8000	0.4555	0.8000
0.05	0.8955	0.9144	0.9132	0.9091	0.9231	0.9289	0.9375	0.9091	0.9091	0.8958	0.8722	0.8746	0.8824	0.8890	0.8905	0.8919	0.8955	0.8854
0.1	0.9231	0.9375	0.9406	0.9317	0.9375	0.9524	0.9677	0.9375	0.9349	0.9231	0.8955	0.8955	0.9016	0.9119	0.9140	0.9151	0.9170	0.9091
0.15	0.9375	0.9523	0.9590	0.9404	0.9524	0.9677	0.9847	0.9592	0.9524	0.9375	0.9091	0.9091	0.9157	0.9317	0.9231	0.9336	0.9300	0.9231
0.2	0.9375	0.9524	0.9677	0.9524	0.9524	0.9677	1.0000	0.9792	0.9677	0.9524	0.9230	0.9218	0.9243	0.9435	0.9231	0.9437	0.9395	0.9375
0.25	0.9375	0.9524	0.9677	0.9524	0.9524	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9369	0.9524	0.9231	0.9524	0.9510	0.9375
0.3	0.9375	0.9524	0.9677	0.9524	0.9524	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9677	0.9267	0.9524	0.9524	0.9375
0.35	0.9375	0.9524	0.9677	0.9524	0.9646	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9677	0.9375	0.9524	0.9524	0.9375
0.4	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9836	0.9677	0.9231	0.9231	0.9375	0.9677	0.9375	0.9524	0.9524	0.9404
0.45	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9836	0.9677	0.9231	0.9375	0.9375	0.9677	0.9375	0.9677	0.9524	0.9524
0.5	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9836	0.9677	0.9231	0.9375	0.9375	0.9677	0.9416	0.9677	0.9524	0.9524
0.55	0.9375	0.9524	0.9678	0.9524	0.9677	0.9677	1.0043	0.9836	0.9836	0.9677	0.9233	0.9375	0.9375	0.9677	0.9524	0.9677	0.9534	0.9524
0.6	0.9524	0.9524	0.9834	0.9530	0.9677	0.9836	1.0169	0.9875	1.0000	0.9786	0.9374	0.9375	0.9390	0.9677	0.9569	0.9677	0.9622	0.9524
0.65	0.9524	0.9677	0.9836	0.9677	0.9809	0.9935	1.0283	1.0000	1.0113	0.9868	0.9375	0.9375	0.9516	0.9709	0.9677	0.9775	0.9677	0.9589
0.7	0.9677	0.9714	1.0000	0.9677	0.9836	1.0000	1.0345	1.0169	1.0169	1.0000	0.9519	0.9524	0.9524	0.9836	0.9772	0.9836	0.9747	0.9677
0.75	0.9836	0.9836	1.0031	0.9836	1.0000	1.0169	1.0514	1.0169	1.0345	1.0167	0.9524	0.9554	0.9614	0.9923	0.9836	0.9987	0.9836	0.9750
0.8	1.0000	1.0000	1.0169	1.0000	1.0078	1.0345	1.0613	1.0345	1.0526	1.0341	0.9642	0.9677	0.9677	1.0000	0.9947	1.0069	0.9924	0.9836
0.85	1.0169	1.0169	1.0331	1.0121	1.0316	1.0526	1.0827	1.0547	1.0714	1.0525	0.9768	0.9836	0.9832	1.0169	1.0083	1.0173	1.0030	1.0000
0.9	1.0345	1.0526	1.0526	1.0345	1.0526	1.0905	1.1111	1.0909	1.1111	1.0861	1.0000	1.0033	1.0000	1.0428	1.0345	1.0526	1.0253	1.0171
0.95	1.1201	1.1739	1.1538	1.0989	1.1236	1.1646	1.1956	1.1905	1.2000	1.1600	1.0714	1.0875	1.0616	1.1152	1.1088	1.1111	1.0818	1.0833
0.9999	5.8851	11.979	8.0186	3.9868	4.6165	5.5835	10.986	7.2631	9.4217	7.6040	9.5799	12.733	10.049	10.298	3.0858	4.1776	5.1345	2.5754

Table D-3: (Continued).

	125-04989	125N04989	125-04988	125N04988	125-04987	125N04987	125-04986	125N04986	125-04904	125N04904	125-04903	125N04903	125-04989	125N04989	
0.0001	0.6399	0.8000	0.6448	0.8000	0.8000	0.8000	0.6826	0.8000	0.8000	0.7329	0.6000	0.7060	0.6399	0.8000	
0.05	0.8851	0.9009	0.9025	0.8902	0.8876	0.8824	0.8824	0.8929	0.8955	0.8738	0.8775	0.8628	0.8851	0.9009	
0.1	0.9094	0.9244	0.9285	0.9132	0.9119	0.9065	0.9038	0.9125	0.9176	0.8955	0.8958	0.8820	0.9094	0.9244	
0.15	0.9232	0.9412	0.9500	0.9289	0.9318	0.9208	0.9174	0.9317	0.9328	0.9091	0.9099	0.8938	0.9232	0.9412	
0.2	0.9375	0.9524	0.9641	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9024	0.9375	0.9524	
0.25	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9092	0.9375	0.9677	
0.3	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9190	0.9375	0.9677	
0.35	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9231	0.9375	0.9677	
0.4	0.9408	0.9677	0.9677	0.9498	0.9524	0.9231	0.9319	0.9468	0.9375	0.9231	0.9248	0.9231	0.9408	0.9677	
0.45	0.9524	0.9677	0.9677	0.9524	0.9524	0.9231	0.9375	0.9524	0.9524	0.9346	0.9374	0.9231	0.9524	0.9677	
0.5	0.9524	0.9677	0.9677	0.9524	0.9524	0.9231	0.9375	0.9524	0.9524	0.9375	0.9375	0.9231	0.9524	0.9677	
0.55	0.9524	0.9677	0.9682	0.9524	0.9524	0.9375	0.9375	0.9524	0.9524	0.9375	0.9375	0.9231	0.9524	0.9677	
0.6	0.9524	0.9677	0.9828	0.9524	0.9588	0.9404	0.9375	0.9524	0.9524	0.9375	0.9375	0.9231	0.9524	0.9677	
0.65	0.9563	0.9807	0.9836	0.9677	0.9677	0.9524	0.9472	0.9646	0.9524	0.9424	0.9438	0.9231	0.9563	0.9807	
0.7	0.9677	0.9838	0.9986	0.9740	0.9836	0.9524	0.9524	0.9677	0.9677	0.9524	0.9524	0.9287	0.9677	0.9838	
0.75	0.9720	1.0000	1.0000	0.9836	0.9836	0.9677	0.9652	0.9808	0.9717	0.9623	0.9643	0.9375	0.9720	1.0000	
0.8	0.9836	1.0052	1.0165	1.0000	1.0000	0.9739	0.9689	0.9852	0.9836	0.9686	0.9695	0.9426	0.9836	1.0052	
0.85	0.9985	1.0169	1.0320	1.0169	1.0169	0.9836	0.9836	1.0000	0.9915	0.9836	0.9836	0.9524	0.9985	1.0169	
0.9	1.0193	1.0400	1.0525	1.0463	1.0417	1.0125	1.0000	1.0241	1.0169	1.0038	1.0040	0.9677	1.0193	1.0400	
0.95	1.0762	1.1111	1.1099	1.1111	1.0949	1.0601	1.0509	1.0715	1.0633	1.0630	1.0659	1.0119	1.0762	1.1111	
0.9999	6.7391	3.3871	3.6938	3.6221	3.6924	5.2388	6.5531	3.9337	6.6268	8.9216	5.9738	9.4710	6.7391	3.3871	

Table D-4: Travel rate percentiles for all observations during the AM peak period.

	125-04984	125N04984	125-04983	125N04983	125-04982	125N04982	125-04981	125N04981	125-04980	125N04980	125-04979	125N04979	125-04978	125N04978	125-04991	125N04991	125-04990	125N04990
0.0001	0.8000	0.7632	0.6942	0.8025	0.8049	0.8010	0.7034	0.8065	0.8000	0.8000	0.6910	0.8000	0.5742	0.8000	0.7531	0.8000	0.4809	0.8000
0.05	0.8824	0.8955	0.8987	0.8955	0.9027	0.9066	0.9096	0.8824	0.8774	0.8696	0.8523	0.8451	0.8577	0.8571	0.8571	0.8607	0.8714	0.8579
0.1	0.9009	0.9231	0.9231	0.9146	0.9231	0.9261	0.9375	0.9075	0.8955	0.8934	0.8696	0.8630	0.8726	0.8772	0.8753	0.8824	0.8875	0.8787
0.15	0.9202	0.9375	0.9375	0.9264	0.9375	0.9430	0.9527	0.9231	0.9103	0.9065	0.8802	0.8772	0.8831	0.8913	0.8898	0.8955	0.8983	0.8905
0.2	0.9308	0.9523	0.9522	0.9375	0.9465	0.9524	0.9678	0.9375	0.9231	0.9151	0.8881	0.8851	0.8930	0.9036	0.9010	0.9070	0.9084	0.8989
0.25	0.9375	0.9530	0.9647	0.9486	0.9524	0.9677	0.9826	0.9497	0.9375	0.9231	0.8956	0.8955	0.8982	0.9123	0.9105	0.9151	0.9157	0.9091
0.3	0.9497	0.9677	0.9681	0.9524	0.9615	0.9677	0.9929	0.9588	0.9496	0.9349	0.9036	0.9017	0.9060	0.9231	0.9192	0.9231	0.9229	0.9153
0.35	0.9524	0.9682	0.9811	0.9585	0.9677	0.9772	1.0000	0.9690	0.9597	0.9404	0.9091	0.9091	0.9104	0.9317	0.9270	0.9328	0.9286	0.9231
0.4	0.9677	0.9834	0.9864	0.9677	0.9743	0.9836	1.0075	0.9836	0.9677	0.9501	0.9126	0.9146	0.9163	0.9375	0.9348	0.9382	0.9351	0.9289
0.45	0.9688	0.9902	0.9996	0.9740	0.9836	0.9947	1.0169	0.9847	0.9836	0.9559	0.9203	0.9228	0.9220	0.9464	0.9412	0.9468	0.9394	0.9375
0.5	0.9836	1.0015	1.0034	0.9836	0.9911	1.0017	1.0276	1.0000	0.9838	0.9663	0.9231	0.9245	0.9253	0.9524	0.9487	0.9524	0.9456	0.9404
0.55	1.0000	1.0169	1.0169	0.9934	1.0000	1.0169	1.0355	1.0070	1.0000	0.9677	0.9265	0.9325	0.9316	0.9586	0.9549	0.9615	0.9514	0.9475
0.6	1.0169	1.0345	1.0315	1.0000	1.0128	1.0239	1.0502	1.0169	1.0103	0.9772	0.9345	0.9375	0.9369	0.9677	0.9625	0.9677	0.9542	0.9524
0.65	1.0345	1.0541	1.0476	1.0169	1.0204	1.0345	1.0590	1.0309	1.0223	0.9836	0.9375	0.9437	0.9392	0.9709	0.9686	0.9742	0.9605	0.9585
0.7	1.0714	1.0845	1.0704	1.0345	1.0345	1.0526	1.0725	1.0384	1.0357	0.9967	0.9437	0.9524	0.9462	0.9810	0.9773	0.9836	0.9672	0.9677
0.75	1.1111	1.1321	1.1100	1.0563	1.0526	1.0683	1.0916	1.0526	1.0526	1.0053	0.9522	0.9585	0.9522	0.9872	0.9855	0.9922	0.9732	0.9715
0.8	1.2000	1.2204	1.1755	1.0909	1.0830	1.0908	1.1111	1.0714	1.0714	1.0170	0.9584	0.9677	0.9580	1.0000	0.9967	1.0000	0.9817	0.9836
0.85	1.3333	1.3619	1.2742	1.1374	1.1174	1.1235	1.1389	1.0931	1.0953	1.0345	0.9677	0.9804	0.9670	1.0101	1.0106	1.0151	0.9916	0.9934
0.9	1.6667	1.6666	1.4668	1.2245	1.1811	1.1751	1.1804	1.1321	1.1374	1.0596	0.9826	0.9975	0.9784	1.0249	1.0324	1.0344	1.0041	1.0099
0.95	2.3432	2.1534	1.7984	1.3953	1.3161	1.3079	1.2761	1.2191	1.2245	1.1105	1.0085	1.0297	1.0006	1.0567	1.0738	1.0718	1.0305	1.0417
0.9999	11.121	7.3565		9.2226	8.3982	7.1242	5.1788	3.8723	2.7273	2.0445	3.5943	7.6676	8.7388	7.1649	3.2539	8.1220	7.3639	3.6695

Table D-4: (Continued).

	125-04989	125N04989	125-04988	125N04988	125-04987	125N04987	125-04986	125N04986	125-04904	125N04904	125-04903	125N04903	125-04989	125N04989	
0.0001	0.6347	0.8000	0.6446	0.8000	0.8000	0.8000	0.7060	0.8000	0.8000	0.7338	0.6276	0.6768	0.6347	0.8000	
0.05	0.8672	0.8704	0.8804	0.8696	0.8696	0.8671	0.8696	0.8752	0.8746	0.8571	0.8584	0.8476	0.8672	0.8704	
0.1	0.8824	0.8906	0.8966	0.8833	0.8853	0.8824	0.8826	0.8929	0.8903	0.8696	0.8705	0.8592	0.8824	0.8906	
0.15	0.8944	0.9036	0.9095	0.8955	0.8986	0.8914	0.8955	0.9012	0.8996	0.8824	0.8788	0.8678	0.8944	0.9036	
0.2	0.9018	0.9123	0.9211	0.9091	0.9091	0.8958	0.9010	0.9091	0.9091	0.8880	0.8846	0.8723	0.9018	0.9123	
0.25	0.9092	0.9231	0.9294	0.9146	0.9202	0.9044	0.9091	0.9183	0.9146	0.8955	0.8911	0.8778	0.9092	0.9231	
0.3	0.9155	0.9317	0.9375	0.9231	0.9239	0.9091	0.9146	0.9231	0.9231	0.8995	0.8959	0.8824	0.9155	0.9317	
0.35	0.9230	0.9375	0.9457	0.9289	0.9347	0.9148	0.9206	0.9299	0.9259	0.9065	0.9008	0.8859	0.9230	0.9375	
0.4	0.9268	0.9465	0.9524	0.9375	0.9375	0.9231	0.9231	0.9375	0.9318	0.9092	0.9061	0.8906	0.9268	0.9465	
0.45	0.9345	0.9524	0.9583	0.9416	0.9465	0.9231	0.9287	0.9375	0.9375	0.9150	0.9097	0.8953	0.9345	0.9524	
0.5	0.9378	0.9586	0.9671	0.9512	0.9524	0.9265	0.9348	0.9464	0.9375	0.9208	0.9145	0.8981	0.9378	0.9586	
0.55	0.9436	0.9677	0.9689	0.9537	0.9565	0.9349	0.9375	0.9524	0.9434	0.9234	0.9199	0.9028	0.9436	0.9677	
0.6	0.9503	0.9679	0.9770	0.9637	0.9677	0.9375	0.9404	0.9524	0.9494	0.9293	0.9236	0.9077	0.9503	0.9679	
0.65	0.9524	0.9804	0.9836	0.9677	0.9682	0.9435	0.9471	0.9585	0.9524	0.9374	0.9292	0.9099	0.9524	0.9804	
0.7	0.9586	0.9836	0.9904	0.9774	0.9804	0.9524	0.9524	0.9656	0.9554	0.9401	0.9355	0.9154	0.9586	0.9836	
0.75	0.9673	0.9944	0.9999	0.9836	0.9836	0.9557	0.9576	0.9677	0.9615	0.9470	0.9392	0.9216	0.9673	0.9944	
0.8	0.9731	1.0003	1.0087	0.9972	0.9967	0.9677	0.9670	0.9804	0.9677	0.9525	0.9478	0.9253	0.9731	1.0003	
0.85	0.9836	1.0169	1.0210	1.0067	1.0040	0.9743	0.9714	0.9868	0.9740	0.9637	0.9562	0.9339	0.9836	1.0169	
0.9	0.9997	1.0363	1.0399	1.0286	1.0221	0.9852	0.9836	1.0000	0.9836	0.9751	0.9677	0.9421	0.9997	1.0363	
0.95	1.0312	1.0846	1.0768	1.0714	1.0539	1.0151	1.0095	1.0344	1.0063	0.9991	0.9882	0.9608	1.0312	1.0846	
0.9999	4.5764	2.5509	1.9947	1.9769	2.1890	2.0496	5.2933	1.8672	1.8809	1.2915	1.2742	8.6535	4.5764	2.5509	

Table D-5: Travel rate percentiles for unflagged observations during the AM peak period.

	125-04984	125N04984	125-04983	125N04983	125-04982	125N04982	125-04981	125N04981	125-04980	125N04980	125-04979	125N04979	125-04978	125N04978	125-04991	125N04991	125-04990	125N04990
0.0001	0.8000	0.7499	0.6995	0.8000	0.8000	0.8000	0.6959	0.8000	0.8000	0.8000	0.6826	0.8000	0.5743	0.8000	0.7669	0.8000	0.5164	0.8000
0.05	0.8824	0.8982	0.8985	0.8930	0.9009	0.9045	0.9092	0.8824	0.8748	0.8721	0.8548	0.8476	0.8591	0.8571	0.8578	0.8672	0.8744	0.8666
0.1	0.8983	0.9231	0.9234	0.9123	0.9231	0.9259	0.9375	0.9091	0.8964	0.8955	0.8696	0.8696	0.8764	0.8824	0.8814	0.8857	0.8930	0.8824
0.15	0.9209	0.9375	0.9382	0.9264	0.9375	0.9437	0.9532	0.9253	0.9165	0.9091	0.8824	0.8824	0.8875	0.8955	0.8955	0.9010	0.9037	0.8955
0.2	0.9318	0.9523	0.9529	0.9375	0.9434	0.9524	0.9681	0.9390	0.9289	0.9231	0.8954	0.8903	0.8963	0.9091	0.9091	0.9120	0.9133	0.9069
0.25	0.9375	0.9524	0.9677	0.9467	0.9524	0.9677	0.9836	0.9524	0.9416	0.9310	0.9005	0.8967	0.9055	0.9210	0.9190	0.9231	0.9227	0.9146
0.3	0.9378	0.9524	0.9677	0.9524	0.9524	0.9677	0.9955	0.9677	0.9557	0.9375	0.9090	0.9079	0.9108	0.9297	0.9273	0.9346	0.9293	0.9231
0.35	0.9524	0.9524	0.9681	0.9524	0.9612	0.9677	1.0000	0.9810	0.9677	0.9494	0.9124	0.9123	0.9178	0.9375	0.9360	0.9378	0.9368	0.9297
0.4	0.9524	0.9648	0.9829	0.9524	0.9677	0.9677	1.0000	0.9836	0.9836	0.9554	0.9209	0.9231	0.9231	0.9468	0.9405	0.9491	0.9422	0.9375
0.45	0.9677	0.9677	0.9837	0.9615	0.9677	0.9809	1.0066	0.9836	0.9836	0.9677	0.9231	0.9251	0.9287	0.9524	0.9491	0.9554	0.9497	0.9406
0.5	0.9677	0.9804	0.9979	0.9677	0.9768	0.9836	1.0169	0.9836	0.9944	0.9677	0.9287	0.9347	0.9359	0.9615	0.9524	0.9653	0.9524	0.9497
0.55	0.9836	0.9838	1.0000	0.9688	0.9836	0.9934	1.0199	1.0000	1.0067	0.9743	0.9357	0.9375	0.9375	0.9677	0.9606	0.9677	0.9575	0.9524
0.6	0.9836	1.0000	1.0166	0.9836	0.9903	1.0000	1.0343	1.0000	1.0169	0.9836	0.9375	0.9413	0.9427	0.9677	0.9677	0.9750	0.9650	0.9524
0.65	1.0000	1.0165	1.0300	0.9934	1.0000	1.0135	1.0386	1.0101	1.0345	0.9911	0.9433	0.9524	0.9505	0.9709	0.9708	0.9836	0.9677	0.9594
0.7	1.0169	1.0345	1.0380	1.0037	1.0169	1.0208	1.0526	1.0169	1.0394	1.0000	0.9521	0.9524	0.9524	0.9836	0.9804	0.9903	0.9687	0.9677
0.75	1.0514	1.0633	1.0526	1.0211	1.0313	1.0345	1.0599	1.0345	1.0552	1.0032	0.9524	0.9585	0.9585	0.9836	0.9836	1.0000	0.9763	0.9677
0.8	1.0909	1.1083	1.0908	1.0526	1.0495	1.0526	1.0797	1.0526	1.0801	1.0169	0.9527	0.9677	0.9676	0.9935	0.9965	1.0135	0.9836	0.9791
0.85	1.2000	1.2112	1.1729	1.0909	1.0793	1.0789	1.1079	1.0714	1.1044	1.0331	0.9652	0.9836	0.9677	1.0033	1.0088	1.0170	0.9900	0.9843
0.9	1.4634	1.4225	1.3242	1.1572	1.1321	1.1277	1.1417	1.1111	1.1321	1.0520	0.9771	0.9849	0.9833	1.0176	1.0315	1.0391	1.0024	1.0003
0.95	2.0363	1.9602	1.6501	1.3161	1.2500	1.2245	1.2218	1.1865	1.2000	1.1026	0.9997	1.0169	1.0000	1.0526	1.0604	1.0639	1.0239	1.0345
0.9999	10.510	7.2603	7.1223	8.5896	7.9534	7.0506	3.6573	3.8485	2.5957	2.0376	3.3795	7.2986	8.6909	6.9696	3.2358	8.0871	7.2772	3.6524

Table D-5: (Continued).

	125-04989	125N04989	125-04988	125N04988	125-04987	125N04987	125-04986	125N04986	125-04904	125N04904	125-04903	125N04903	125-04989	125N04989	
0.0001	0.6933	0.8000	0.6928	0.8000	0.8000	0.8000	0.7117	0.8000	0.8000	0.7368	0.6414	0.6820	0.6933	0.8000	
0.05	0.8696	0.8750	0.8824	0.8721	0.8696	0.8696	0.8697	0.8813	0.8798	0.8582	0.8616	0.8502	0.8696	0.8750	
0.1	0.8849	0.8955	0.9010	0.8902	0.8922	0.8824	0.8878	0.8955	0.8955	0.8748	0.8745	0.8627	0.8849	0.8955	
0.15	0.8965	0.9091	0.9146	0.9012	0.9063	0.8955	0.8957	0.9091	0.9067	0.8853	0.8831	0.8701	0.8965	0.9091	
0.2	0.9085	0.9202	0.9238	0.9103	0.9148	0.9015	0.9074	0.9151	0.9146	0.8955	0.8913	0.8774	0.9085	0.9202	
0.25	0.9146	0.9271	0.9354	0.9231	0.9231	0.9091	0.9103	0.9231	0.9231	0.9010	0.8970	0.8825	0.9146	0.9271	
0.3	0.9230	0.9375	0.9434	0.9288	0.9349	0.9148	0.9203	0.9317	0.9288	0.9091	0.9036	0.8878	0.9230	0.9375	
0.35	0.9271	0.9465	0.9524	0.9375	0.9375	0.9231	0.9231	0.9375	0.9357	0.9146	0.9091	0.8936	0.9271	0.9465	
0.4	0.9355	0.9524	0.9593	0.9441	0.9494	0.9231	0.9289	0.9404	0.9375	0.9205	0.9145	0.8970	0.9355	0.9524	
0.45	0.9379	0.9617	0.9677	0.9524	0.9524	0.9317	0.9373	0.9495	0.9406	0.9231	0.9212	0.9028	0.9379	0.9617	
0.5	0.9455	0.9677	0.9682	0.9585	0.9585	0.9375	0.9375	0.9524	0.9473	0.9289	0.9244	0.9087	0.9455	0.9677	
0.55	0.9520	0.9677	0.9769	0.9677	0.9677	0.9375	0.9409	0.9527	0.9524	0.9374	0.9313	0.9104	0.9520	0.9677	
0.6	0.9524	0.9740	0.9836	0.9743	0.9677	0.9473	0.9499	0.9628	0.9524	0.9375	0.9375	0.9170	0.9524	0.9740	
0.65	0.9524	0.9836	0.9836	0.9836	0.9804	0.9524	0.9524	0.9677	0.9560	0.9404	0.9381	0.9228	0.9524	0.9836	
0.7	0.9586	0.9836	0.9930	0.9875	0.9836	0.9534	0.9560	0.9677	0.9646	0.9493	0.9462	0.9231	0.9586	0.9836	
0.75	0.9674	0.9973	1.0000	1.0000	0.9904	0.9677	0.9673	0.9677	0.9677	0.9524	0.9524	0.9263	0.9674	0.9973	
0.8	0.9680	1.0002	1.0062	1.0101	1.0000	0.9687	0.9677	0.9804	0.9709	0.9559	0.9589	0.9347	0.9680	1.0002	
0.85	0.9813	1.0169	1.0174	1.0208	1.0142	0.9836	0.9831	0.9836	0.9836	0.9677	0.9677	0.9379	0.9813	1.0169	
0.9	0.9931	1.0341	1.0345	1.0526	1.0242	1.0000	0.9836	1.0000	0.9836	0.9831	0.9748	0.9519	0.9931	1.0341	
0.95	1.0180	1.0714	1.0714	1.0909	1.0526	1.0239	1.0030	1.0253	1.0000	1.0091	1.0004	0.9667	1.0180	1.0714	
0.9999	2.8997	2.4096	1.9706	1.9216	2.1609	2.0521	4.9024	1.8750	2.3997	4.7004	5.1107	8.5634	2.8997	2.4096	

Table D-6: Travel rate percentiles for flagged observations during the AM peak period.

	125-04984	125N04984	125-04983	125N04983	125-04982	125N04982	125-04981	125N04981	125-04980	125N04980	125-04979	125N04979	125-04978	125N04978	125-04991	125N04991	125-04990	125N04990
0.0001	0.2319	0.2181	0.2008	0.2349	0.2641	0.2935	0.2856	0.2886	0.3585	0.2946	0.2078	0.2275	0.1633	0.2274	0.2266	0.2287	0.1343	0.2275
0.05	0.8851	0.8982	0.8985	0.8955	0.9091	0.9231	0.9234	0.8955	0.8955	0.8824	0.8571	0.8571	0.8672	0.8647	0.8660	0.8696	0.8744	0.8646
0.1	0.8955	0.9289	0.9287	0.9172	0.9231	0.9464	0.9554	0.9204	0.9176	0.9072	0.8777	0.8773	0.8830	0.8864	0.8874	0.8906	0.8947	0.8824
0.15	0.9231	0.9419	0.9519	0.9311	0.9375	0.9524	0.9704	0.9375	0.9375	0.9192	0.8954	0.8878	0.8955	0.9014	0.9044	0.9091	0.9091	0.9008
0.2	0.9288	0.9524	0.9629	0.9375	0.9464	0.9674	0.9836	0.9524	0.9524	0.9328	0.8986	0.8955	0.9054	0.9127	0.9168	0.9231	0.9206	0.9119
0.25	0.9375	0.9524	0.9677	0.9440	0.9524	0.9677	0.9993	0.9677	0.9554	0.9375	0.9091	0.9069	0.9119	0.9231	0.9238	0.9318	0.9286	0.9231
0.3	0.9375	0.9524	0.9692	0.9524	0.9581	0.9677	1.0000	0.9836	0.9677	0.9524	0.9203	0.9120	0.9224	0.9375	0.9364	0.9375	0.9375	0.9231
0.35	0.9524	0.9524	0.9836	0.9524	0.9677	0.9677	1.0016	0.9836	0.9814	0.9533	0.9231	0.9231	0.9258	0.9384	0.9381	0.9432	0.9432	0.9352
0.4	0.9524	0.9524	0.9836	0.9524	0.9677	0.9741	1.0169	0.9836	0.9836	0.9677	0.9316	0.9289	0.9357	0.9524	0.9481	0.9524	0.9524	0.9375
0.45	0.9560	0.9619	0.9964	0.9524	0.9677	0.9836	1.0172	0.9836	0.9967	0.9677	0.9375	0.9375	0.9375	0.9524	0.9524	0.9525	0.9524	0.9464
0.5	0.9677	0.9677	1.0000	0.9604	0.9715	0.9934	1.0341	0.9948	1.0040	0.9782	0.9375	0.9375	0.9420	0.9524	0.9524	0.9677	0.9577	0.9524
0.55	0.9836	0.9811	1.0006	0.9677	0.9836	1.0018	1.0345	1.0037	1.0169	0.9836	0.9437	0.9375	0.9516	0.9646	0.9614	0.9677	0.9664	0.9524
0.6	0.9846	0.9934	1.0169	0.9677	0.9901	1.0169	1.0459	1.0169	1.0256	0.9998	0.9524	0.9375	0.9524	0.9677	0.9677	0.9788	0.9677	0.9630
0.65	1.0054	1.0000	1.0169	0.9717	1.0000	1.0306	1.0526	1.0169	1.0345	1.0000	0.9524	0.9524	0.9524	0.9677	0.9731	0.9836	0.9677	0.9677
0.7	1.0169	1.0162	1.0176	0.9836	1.0169	1.0495	1.0691	1.0345	1.0490	1.0005	0.9524	0.9524	0.9539	0.9807	0.9836	0.9836	0.9770	0.9677
0.75	1.0345	1.0338	1.0345	1.0011	1.0345	1.0680	1.0904	1.0486	1.0637	1.0169	0.9583	0.9668	0.9662	0.9836	0.9836	1.0000	0.9836	0.9696
0.8	1.0526	1.0707	1.0545	1.0239	1.0526	1.0908	1.1101	1.0682	1.0775	1.0238	0.9677	0.9714	0.9702	1.0000	1.0000	1.0127	0.9858	0.9836
0.85	1.0909	1.1530	1.1151	1.0651	1.0791	1.1196	1.1332	1.0909	1.1035	1.0388	0.9834	0.9836	0.9836	1.0169	1.0169	1.0239	1.0000	0.9901
0.9	1.2245	1.3228	1.2051	1.1261	1.1346	1.1730	1.1773	1.1321	1.1457	1.0710	1.0088	1.0104	0.9999	1.0345	1.0368	1.0526	1.0204	1.0169
0.95	1.7251	1.7437	1.6457	1.2547	1.2503	1.3047	1.2680	1.2254	1.2348	1.1320	1.0740	1.0909	1.0600	1.1311	1.1269	1.1152	1.0847	1.0768
0.9999	6.0738	6.2322	8.4060	2.7465	4.1341	2.7896	2.7052	2.3895	2.7759	5.0000	2.0606	2.1827	4.3414	2.1008	2.0090	4.4607	5.1695	1.9999

Table D-6: (Continued).

	125-04989	125N04989	125-04988	125N04988	125-04987	125N04987	125-04986	125N04986	125-04904	125N04904	125-04903	125N04903	125-04989	125N04989	
0.0001	0.1767	0.2278	0.1823	0.2254	0.2245	0.2244	0.1981	0.2244	0.2275	0.2088	0.1761	0.1984	0.1767	0.2278	
0.05	0.8681	0.8835	0.8879	0.8824	0.8824	0.8799	0.8738	0.8878	0.8955	0.8621	0.8638	0.8552	0.8681	0.8835	
0.1	0.8885	0.9091	0.9156	0.9063	0.9091	0.8955	0.8956	0.9063	0.9091	0.8774	0.8785	0.8688	0.8885	0.9091	
0.15	0.9016	0.9231	0.9374	0.9225	0.9231	0.9091	0.9091	0.9208	0.9202	0.8873	0.8877	0.8748	0.9016	0.9231	
0.2	0.9131	0.9375	0.9467	0.9232	0.9320	0.9177	0.9124	0.9291	0.9264	0.8955	0.8958	0.8824	0.9131	0.9375	
0.25	0.9233	0.9473	0.9531	0.9375	0.9387	0.9231	0.9231	0.9375	0.9375	0.9059	0.9035	0.8854	0.9233	0.9473	
0.3	0.9347	0.9524	0.9675	0.9434	0.9524	0.9267	0.9238	0.9436	0.9375	0.9119	0.9096	0.8929	0.9347	0.9524	
0.35	0.9375	0.9524	0.9702	0.9524	0.9524	0.9375	0.9370	0.9524	0.9375	0.9230	0.9171	0.8955	0.9375	0.9524	
0.4	0.9442	0.9677	0.9833	0.9524	0.9588	0.9375	0.9375	0.9524	0.9375	0.9231	0.9231	0.9012	0.9442	0.9677	
0.45	0.9524	0.9677	0.9836	0.9560	0.9677	0.9375	0.9375	0.9524	0.9465	0.9231	0.9232	0.9082	0.9524	0.9677	
0.5	0.9524	0.9742	0.9836	0.9677	0.9677	0.9467	0.9376	0.9589	0.9524	0.9240	0.9309	0.9091	0.9524	0.9742	
0.55	0.9575	0.9836	0.9951	0.9677	0.9772	0.9524	0.9442	0.9677	0.9524	0.9349	0.9375	0.9101	0.9575	0.9836	
0.6	0.9675	0.9836	1.0000	0.9804	0.9836	0.9524	0.9524	0.9677	0.9585	0.9375	0.9375	0.9176	0.9675	0.9836	
0.65	0.9677	0.9938	1.0000	0.9836	0.9836	0.9524	0.9525	0.9677	0.9677	0.9404	0.9382	0.9231	0.9677	0.9938	
0.7	0.9710	1.0000	1.0000	1.0000	0.9967	0.9677	0.9652	0.9824	0.9677	0.9503	0.9480	0.9232	0.9710	1.0000	
0.75	0.9836	1.0000	1.0141	1.0169	1.0000	0.9677	0.9717	0.9857	0.9836	0.9524	0.9524	0.9320	0.9836	1.0000	
0.8	0.9870	1.0169	1.0169	1.0169	1.0169	0.9836	0.9836	1.0000	0.9836	0.9621	0.9627	0.9375	0.9870	1.0169	
0.85	1.0142	1.0316	1.0345	1.0345	1.0345	1.0000	0.9905	1.0179	0.9877	0.9677	0.9712	0.9480	1.0142	1.0316	
0.9	1.0345	1.0540	1.0714	1.0714	1.0526	1.0206	1.0138	1.0350	1.0162	0.9836	0.9837	0.9596	1.0345	1.0540	
0.95	1.0844	1.1712	1.1529	1.1754	1.1186	1.0714	1.0698	1.1299	1.0803	1.0349	1.0376	1.0056	1.0844	1.1712	
0.9999	3.3802	3.2192	2.1331	3.4448	2.2882	3.7278	2.2164	2.5989	2.0000	2.9143	2.5231	1.8862	3.3802	3.2192	

Table D-7: Travel rate percentiles for incident observations during all temporal analysis.

	125-04984	125N04984	125-04983	125N04983	125-04982	125N04982	125-04981	125N04981	125-04980	125N04980	125-04979	125N04979	125-04978	125N04978	125-04991	125N04991	125-04990	125N04990
0.0001	0.2518	0.0217	0.1073	0.0805	0.0522	0.0386	0.0419	0.0083	0.0172	0.0134	0.0093	0.0105	0.0177	0.0291	0.0440	0.0812	0.2084	0.3761
0.05	1.2227	1.2482	1.5467	1.0160	0.9677	0.9677	0.9644	0.9836	1.1111	0.9865	0.9389	0.9585	0.9387	1.8519	1.5419	1.6227	0.9984	1.8155
0.1	1.3084	1.3973	1.6977	1.5122	1.2290	0.9836	1.0000	1.3610	1.6103	1.0570	1.0346	0.9826	0.9519	1.8750	1.6903	2.1799	1.8583	2.0000
0.15	1.4148	1.6401	1.7737	1.5658	1.5968	1.0000	1.0169	1.4025	1.7536	1.0959	1.0903	1.0342	0.9642	1.9685	1.9673	2.2628	2.0030	2.2002
0.2	1.5275	1.7597	1.8015	1.6292	1.6611	1.0682	1.0345	1.4237	1.8191	1.3301	1.1835	1.1169	0.9832	2.0690	2.0298	2.3686	2.1609	2.3992
0.25	1.6478	1.7934	1.8399	1.6889	1.6907	1.4251	1.0526	1.4573	1.9355	1.4430	1.3188	1.4667	1.0315	2.1643	2.1246	2.4762	2.2800	2.5849
0.3	1.7704	1.8419	1.8586	1.7143	1.7235	1.4967	1.0714	1.5006	1.9874	1.5855	1.6410	1.6658	1.4733	2.3106	2.2074	2.5896	2.4369	2.7419
0.35	1.8182	1.8872	1.8782	1.7432	1.7647	1.5983	1.1321	1.5413	2.0000	1.6460	1.9679	1.7349	1.9189	2.4914	2.2967	2.6985	2.5738	2.8991
0.4	1.8932	1.9511	1.9037	1.7788	1.7977	1.7404	1.6246	1.6156	2.0690	1.8109	2.0485	1.8579	1.9821	2.7238	2.3969	2.8490	2.7193	3.0184
0.45	1.9628	1.9919	1.9427	1.8182	1.8441	1.8764	1.7171	1.6763	2.1052	1.9238	2.2314	2.1274	2.0819	2.9785	2.5017	2.9913	2.8477	3.1578
0.5	2.0478	2.0500	1.9969	1.8518	1.8925	1.9197	1.7807	1.7609	2.1722	1.9720	2.3415	2.2339	2.3086	3.3387	2.5968	3.1489	2.9966	3.2987
0.55	2.1229	2.1237	2.0321	1.8758	1.9787	1.9876	1.8389	1.8750	2.2278	2.0560	2.4624	2.4901	2.5538	3.6816	2.7592	3.3352	3.1471	3.4350
0.6	2.2222	2.2026	2.0872	1.9355	2.0718	2.0596	1.9097	1.9355	2.5456	2.4547	2.6360	2.8905	2.9635	3.9699	2.8806	3.5106	3.2833	3.5836
0.65	2.3493	2.2837	2.1415	1.9902	2.2140	2.1569	2.0060	1.9884	2.8641	2.9126	2.7273	3.0000	3.1585	4.3031	3.1418	3.7226	3.4497	3.7377
0.7	2.4886	2.3779	2.2099	2.0875	2.3648	2.3655	2.2527	2.0870	3.4114	3.2277	2.8527	3.3652	3.5335	4.7239	3.3577	3.9260	3.6108	3.8975
0.75	2.6327	2.4892	2.3336	2.1968	2.4735	2.5677	2.6881	2.2367	4.1355	3.7315	3.4052	4.3155	4.0231	5.3624	3.6308	4.2112	3.7959	4.1236
0.8	2.8140	2.5974	2.4502	2.3824	2.6818	2.9184	3.1506	2.4254	4.6653	4.3574	3.6036	4.8573	4.7950	6.3072	4.1751	4.5841	4.0394	4.3155
0.85	3.0748	2.7867	2.6153	2.7261	3.1333	3.9007	3.9586	2.8876	5.1990	4.8051	3.8686	5.5941	5.8315	7.5000	4.7218	5.0231	4.3787	4.6044
0.9	3.4286	3.1033	2.8571	3.2928	3.8632	4.7743	4.7793	3.7734	6.6038	5.9729	4.8866	6.1582	7.5153	8.2586	5.8584	6.1111	4.7878	4.9956
0.95	4.1886	3.7827	3.7849	4.1879	5.7349	5.8949	6.9064	5.9009	8.5761	9.1143	5.3956	7.5852	8.5366	9.4958	6.9285	7.9975	6.1246	5.7552
0.9999	13.386	14.097	10.075	12.355	12.000	12.000	12.823	10.598	12.000	11.892	8.3250	11.991	11.322	11.876	10.185	12.313	11.962	12.263

Table D-7: (Continued).

	125-04989	125N04989	125-04988	125N04988	125-04987	125N04987	125-04986	125N04986	125-04904	125N04904	125-04903	125N04903	125-04989	125N04989	
0.0001	0.3940	0.1369	0.0285	0.0482	0.0436	0.0256	0.0089	0.0122	0.0186	0.0091	0.0695	0.0359	0.3940	0.1369	
0.05	2.1373	1.7414	1.0500	1.1987	1.2000	1.2053	1.0150	1.2151	0.9524	1.0050	1.7337	0.8307	2.1373	1.7414	
0.1	2.3211	2.8160	1.3527	1.2093	1.2173	1.2361	1.2185	1.2235	1.2810	1.7438	1.9800	0.9231	2.3211	2.8160	
0.15	2.5042	2.8542	1.4455	1.2333	1.2302	1.3030	1.2334	1.2335	1.3705	1.8967	2.1942	0.9375	2.5042	2.8542	
0.2	2.6604	2.8915	1.5789	1.2474	1.2502	1.3972	1.2457	1.2500	1.5385	2.0758	2.4546	1.0810	2.6604	2.8915	
0.25	2.7921	2.9401	1.8066	1.2640	1.2791	1.5629	1.2505	1.2796	1.7236	2.3594	2.5186	1.0933	2.7921	2.9401	
0.3	2.9312	2.9883	3.3925	1.2770	1.3144	1.6667	1.3021	1.3158	1.9017	2.5000	2.6183	1.1307	2.9312	2.9883	
0.35	3.0577	3.0254	3.5361	1.3036	1.3953	1.8950	1.3296	1.3604	2.1157	2.6765	2.7072	1.1995	3.0577	3.0254	
0.4	3.1926	3.0788	3.7175	1.3333	1.4898	2.9823	1.4021	1.4093	2.8947	2.7849	2.8574	1.3514	3.1926	3.0788	
0.45	3.3216	3.1392	3.8894	1.3844	1.6618	3.1435	1.4320	1.6541	2.9626	2.9460	2.9608	1.5936	3.3216	3.1392	
0.5	3.4705	3.2163	4.0950	1.4219	2.1568	3.3212	1.9648	2.6952	3.0821	3.0146	3.0000	1.8377	3.4705	3.2163	
0.55	3.6059	3.2851	4.4333	1.6146	3.4172	3.5011	3.8557	3.5056	3.2731	3.1476	3.1240	1.9370	3.6059	3.2851	
0.6	3.7565	3.3793	4.6522	1.9977	3.6062	3.7390	4.0331	3.8493	3.4443	3.2720	3.3024	2.0528	3.7565	3.3793	
0.65	3.9051	3.4831	4.9932	3.1970	3.8642	3.9932	4.2340	4.0508	3.6440	3.4424	3.4549	2.1331	3.9051	3.4831	
0.7	4.0882	3.6150	5.3162	3.5054	4.2190	4.3057	4.4973	4.3507	3.9439	3.6607	3.6301	2.2592	4.0882	3.6150	
0.75	4.3534	3.7686	5.6294	3.8685	4.5478	4.5765	4.7749	4.6359	4.2181	3.8191	3.8433	2.5172	4.3534	3.7686	
0.8	4.6230	4.0157	6.1924	4.6086	5.0690	5.2878	5.0763	4.9779	4.6852	4.0835	4.1748	2.8482	4.6230	4.0157	
0.85	4.9697	4.4132	6.8838	5.3477	5.6637	6.0480	5.4575	5.1393	5.7600	4.5673	4.5410	3.2687	4.9697	4.4132	
0.9	5.4314	5.1037	7.8354	6.2404	6.4064	7.4489	5.7495	5.4385	6.6377	5.2778	4.9358	3.9421	5.4314	5.1037	
0.95	6.8075	6.1275	8.9319	7.5676	7.4932	9.6747	6.7088	6.0255	7.7569	6.1733	6.0804	5.3338	6.8075	6.1275	
0.9999	12.629	10.965	12.000	11.455	12.000	12.000	11.968	8.6289	9.9999	9.5953	9.9773	12.000	12.629	10.965	

Table D-8: Travel rate percentiles for weather observations during all temporal intervals.

	125-04984	125N04984	125-04983	125N04983	125-04982	125N04982	125-04981	125N04981	125-04980	125N04980	125-04979	125N04979	125-04978	125N04978	125-04991	125N04991	125-04990	125N04990
0.0001	0.8000	0.1294	0.6981	0.8108	0.8058	0.8059	0.7182	0.2853	0.8000	0.8000	0.6851	0.8000	0.5742	0.8000	0.8000	0.8000	0.4579	0.8000
0.05	0.9063	0.9204	0.9196	0.9091	0.9231	0.9288	0.9375	0.9091	0.9091	0.8955	0.8722	0.8746	0.8824	0.8903	0.8917	0.8955	0.8983	0.8955
0.1	0.9244	0.9375	0.9465	0.9357	0.9375	0.9524	0.9677	0.9375	0.9375	0.9231	0.8955	0.8955	0.9018	0.9123	0.9156	0.9204	0.9231	0.9231
0.15	0.9375	0.9524	0.9672	0.9464	0.9524	0.9677	0.9852	0.9622	0.9524	0.9375	0.9091	0.9091	0.9159	0.9325	0.9231	0.9375	0.9375	0.9375
0.2	0.9375	0.9524	0.9677	0.9524	0.9524	0.9677	1.0000	0.9836	0.9677	0.9524	0.9230	0.9231	0.9245	0.9449	0.9231	0.9524	0.9500	0.9375
0.25	0.9375	0.9524	0.9677	0.9524	0.9524	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9371	0.9524	0.9231	0.9524	0.9524	0.9375
0.3	0.9375	0.9524	0.9677	0.9524	0.9524	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9677	0.9298	0.9524	0.9524	0.9406
0.35	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9677	0.9524	0.9231	0.9231	0.9375	0.9677	0.9375	0.9524	0.9524	0.9524
0.4	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9836	0.9640	0.9231	0.9231	0.9375	0.9677	0.9375	0.9615	0.9524	0.9524
0.45	0.9375	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9836	0.9677	0.9231	0.9375	0.9375	0.9677	0.9375	0.9677	0.9524	0.9524
0.5	0.9524	0.9524	0.9677	0.9524	0.9677	0.9677	1.0000	0.9836	0.9836	0.9677	0.9231	0.9375	0.9375	0.9677	0.9459	0.9677	0.9564	0.9660
0.55	0.9559	0.9554	0.9805	0.9524	0.9677	0.9677	1.0000	0.9836	0.9836	0.9677	0.9233	0.9375	0.9375	0.9677	0.9524	0.9677	0.9677	0.9687
0.6	0.9677	0.9677	0.9836	0.9677	0.9677	0.9836	1.0169	0.9836	0.9872	0.9677	0.9373	0.9375	0.9394	0.9677	0.9626	0.9745	0.9737	0.9836
0.65	0.9836	0.9835	0.9998	0.9677	0.9836	0.9836	1.0177	1.0000	1.0000	0.9836	0.9375	0.9375	0.9519	0.9750	0.9695	0.9836	0.9836	1.0012
0.7	1.0095	0.9997	1.0025	0.9836	0.9844	1.0000	1.0345	1.0169	1.0169	0.9999	0.9518	0.9524	0.9524	0.9836	0.9836	0.9987	0.9976	1.0633
0.75	1.0429	1.0139	1.0169	0.9973	1.0000	1.0169	1.0415	1.0169	1.0239	1.0042	0.9524	0.9555	0.9632	0.9983	0.9864	1.0087	1.0169	1.7759
0.8	1.1765	1.0508	1.0345	1.0121	1.0169	1.0208	1.0526	1.0345	1.0384	1.0211	0.9641	0.9677	0.9677	1.0043	1.0000	1.0239	1.0665	2.5008
0.85	1.5506	1.1674	1.0629	1.0345	1.0345	1.0384	1.0714	1.0601	1.0714	1.0418	0.9764	0.9836	0.9836	1.0236	1.0201	1.0544	1.8182	3.0722
0.9	1.9911	1.7731	1.2316	1.1210	1.0714	1.0826	1.1111	1.1110	1.1035	1.0718	1.0000	1.0067	1.0018	1.0565	1.0714	1.1935	2.7017	3.6228
0.95	2.5829	2.2131	1.9113	1.7143	1.3864	1.2244	1.2454	1.2766	1.2245	1.1538	1.0714	1.0909	1.0741	1.2245	1.3501	2.6905	3.6012	4.3549
0.9999	10.484	7.9423	8.9174	9.6028	12.000	11.973	9.1975	10.049	12.000	11.658	9.5889	8.0393	10.480	11.556	9.4033	12.047	11.830	11.646

Table D-8: (Continued).

	125-04989	125N04989	125-04988	125N04988	125-04987	125N04987	125-04986	125N04986	125-04904	125N04904	125-04903	125N04903	125-04989	125N04989	
0.0001	0.6730	0.8000	0.6448	0.8000	0.8000	0.8000	0.6826	0.8000	0.8000	0.7331	0.6000	0.6714	0.6730	0.8000	
0.05	0.8955	0.9068	0.9048	0.8929	0.8924	0.8850	0.8826	0.8955	0.8955	0.8746	0.8788	0.8628	0.8955	0.9068	
0.1	0.9229	0.9327	0.9321	0.9179	0.9177	0.9091	0.9091	0.9174	0.9183	0.8955	0.8968	0.8824	0.9229	0.9327	
0.15	0.9375	0.9505	0.9523	0.9341	0.9375	0.9231	0.9230	0.9375	0.9347	0.9091	0.9117	0.8952	0.9375	0.9505	
0.2	0.9375	0.9617	0.9666	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9039	0.9375	0.9617	
0.25	0.9375	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9096	0.9375	0.9677	
0.3	0.9402	0.9677	0.9677	0.9375	0.9375	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9211	0.9402	0.9677	
0.35	0.9524	0.9677	0.9677	0.9375	0.9404	0.9231	0.9231	0.9375	0.9375	0.9231	0.9231	0.9231	0.9524	0.9677	
0.4	0.9524	0.9677	0.9677	0.9524	0.9524	0.9231	0.9368	0.9524	0.9375	0.9231	0.9287	0.9231	0.9524	0.9677	
0.45	0.9524	0.9677	0.9677	0.9524	0.9524	0.9231	0.9375	0.9524	0.9524	0.9374	0.9375	0.9231	0.9524	0.9677	
0.5	0.9598	0.9677	0.9677	0.9524	0.9524	0.9271	0.9375	0.9524	0.9524	0.9375	0.9375	0.9231	0.9598	0.9677	
0.55	0.9677	0.9677	0.9688	0.9524	0.9524	0.9375	0.9375	0.9524	0.9524	0.9375	0.9375	0.9231	0.9677	0.9677	
0.6	0.9836	0.9836	0.9836	0.9617	0.9677	0.9467	0.9376	0.9524	0.9524	0.9375	0.9386	0.9231	0.9836	0.9836	
0.65	1.0000	0.9934	0.9841	0.9677	0.9724	0.9524	0.9498	0.9677	0.9559	0.9465	0.9511	0.9241	1.0000	0.9934	
0.7	1.0414	1.0000	1.0000	0.9836	0.9836	0.9585	0.9525	0.9677	0.9677	0.9524	0.9572	0.9349	1.0414	1.0000	
0.75	1.6667	1.0169	1.0000	1.0000	1.0000	0.9677	0.9675	0.9836	0.9775	0.9677	0.9677	0.9376	1.6667	1.0169	
0.8	2.6502	1.0345	1.0169	1.0169	1.0103	0.9836	0.9741	0.9934	0.9836	0.9771	0.9827	0.9515	2.6502	1.0345	
0.85	3.1895	1.0909	1.0345	1.0345	1.0345	0.9982	0.9836	1.0114	1.0000	0.9871	0.9984	0.9647	3.1895	1.0909	
0.9	3.7512	1.7556	1.0677	1.0909	1.0714	1.0241	1.0083	1.0345	1.0185	1.0174	1.0399	0.9935	3.7512	1.7556	
0.95	4.6098	3.2239	1.1765	1.2729	1.2532	1.1321	1.0714	1.1250	1.1070	1.1523	1.3953	1.1246	4.6098	3.2239	
0.9999	12.000	10.559	12.000	10.691	11.982	11.969	11.498	7.8124	9.8375	9.1026	9.1011	11.793	12.000	10.559	

Table D-9: Travel rate percentiles for combined weather and incident observations during all temporal intervals.

	125-04984	125N04984	125-04983	125N04983	125-04982	125N04982	125-04981	125N04981	125-04980	125N04980	125-04979	125N04979	125-04978	125N04978	125-04991	125N04991	125-04990	125N04990
0.0001	0.2555	0.0203	0.1475	0.1174	0.0491	0.0347	0.0425	0.0074	0.0185	0.0091	0.0071	0.0130	0.0126	0.0468	0.0673	0.1000	0.3348	0.3692
0.05	1.2232	1.2818	1.6384	1.5139	1.5926	1.4806	1.6615	1.3643	1.6295	0.9524	1.0229	1.6667	1.9189	1.8750	1.5949	2.1767	1.9037	1.8325
0.1	1.3081	1.4728	1.7647	1.5706	1.6454	1.5673	1.7188	1.4026	1.7628	0.9524	1.0603	1.7242	1.9942	1.8886	1.8686	2.2509	2.0499	2.0078
0.15	1.4143	1.7285	1.7881	1.6295	1.6825	1.6505	1.7731	1.4221	1.8780	0.9836	1.0910	1.7799	2.0534	2.0033	2.0186	2.3531	2.1841	2.2147
0.2	1.5251	1.7684	1.8155	1.6878	1.7158	1.7422	1.7880	1.4551	1.9355	1.2985	1.1104	1.9276	2.1502	2.0842	2.0868	2.4545	2.3013	2.4133
0.25	1.6471	1.8076	1.8462	1.7126	1.7545	1.8466	1.8233	1.4804	1.9867	1.5262	1.1258	2.1548	2.4171	2.2070	2.1643	2.5585	2.4472	2.5928
0.3	1.7702	1.8523	1.8667	1.7346	1.7718	1.9101	1.8666	1.5188	2.0000	1.5855	1.4020	2.2388	2.5498	2.3272	2.2682	2.6719	2.5738	2.7467
0.35	1.8182	1.8976	1.8839	1.7647	1.8023	1.9291	1.9023	1.5705	2.0436	1.6402	1.8554	2.4671	2.7256	2.5144	2.3452	2.7955	2.7125	2.9049
0.4	1.8908	1.9541	1.9113	1.8023	1.8541	2.0000	1.9355	1.6360	2.0855	1.7005	2.0370	2.5145	3.0467	2.7307	2.4345	2.9443	2.8245	3.0269
0.45	1.9618	1.9962	1.9469	1.8309	1.8923	2.0497	1.9999	1.6883	2.1301	1.8503	2.2274	2.9707	3.1662	2.9939	2.5374	3.0817	2.9547	3.1677
0.5	2.0449	2.0522	1.9971	1.8657	1.9711	2.1083	2.1142	1.8419	2.1826	1.9238	2.2908	3.0000	3.3669	3.3471	2.6694	3.2478	3.1018	3.3066
0.55	2.1202	2.1229	2.0288	1.9072	2.0367	2.1860	2.2724	1.8937	2.2898	1.9275	2.3595	3.2354	3.7956	3.6823	2.7947	3.4124	3.2340	3.4400
0.6	2.2222	2.1981	2.0815	1.9507	2.1354	2.3554	2.5546	1.9355	2.5666	2.0071	2.4470	3.7468	4.2125	4.0045	2.9776	3.5806	3.3772	3.5872
0.65	2.3461	2.2733	2.1341	2.0127	2.2735	2.5201	2.8569	1.9920	2.9707	2.0402	2.5421	4.5842	4.7470	4.3232	3.1842	3.7971	3.5220	3.7409
0.7	2.4804	2.3643	2.1856	2.1023	2.3922	2.6936	3.0700	2.0855	3.4212	2.4828	2.7271	5.1330	5.3520	4.7445	3.3885	4.0281	3.6895	3.9044
0.75	2.6246	2.4616	2.3016	2.2222	2.5086	2.9714	3.5084	2.1971	3.9793	2.6404	2.7638	5.6091	5.8643	5.3826	3.7460	4.2927	3.8591	4.1256
0.8	2.8077	2.5669	2.4116	2.4315	2.7496	3.9931	4.0780	2.3672	4.6010	3.2736	2.8638	6.1008	7.1990	6.5307	4.2586	4.6589	4.1380	4.3181
0.85	3.0659	2.7116	2.5805	2.7279	3.2670	4.5419	4.7025	2.8635	5.0602	4.5423	3.5489	6.6278	7.8295	7.6015	4.8710	5.0718	4.4342	4.6069
0.9	3.4228	2.9828	2.7721	3.3377	4.1970	5.2827	6.0711	3.7388	5.8159	5.9340	3.8193	9.0221	8.5761	8.3487	5.9244	6.3247	4.8716	4.9998
0.95	4.1895	3.5301	3.5966	4.2429	6.3432	7.0397	7.5890	6.1596	7.4609	10.968	5.1905	11.269	9.6871	9.7444	6.9684	8.0982	6.3045	5.7610
0.9999	13.387	10.379	10.086	12.372	12.000	12.000	9.5456	10.600	12.000	11.892	6.9953	12.367	11.322	11.876	10.187	12.314	11.964	12.263

Table D-9: (Continued).

	125-04989	125N04989	125-04988	125N04988	125-04987	125N04987	125-04986	125N04986	125-04904	125N04904	125-04903	125N04903	125-04989	125N04989	
0.0001	0.5580	0.1937	0.0377	0.0526	0.0548	0.0331	0.0082	0.0121	0.0238	0.0085	0.0695	0.0339	0.5580	0.1937	
0.05	2.1435	1.9979	1.4394	1.1986	1.2091	1.2354	1.2284	1.2152	1.2919	1.7985	1.7337	0.7626	2.1435	1.9979	
0.1	2.3297	2.8177	1.5085	1.2091	1.2245	1.2767	1.2403	1.2236	1.3806	1.9285	1.9800	0.9231	2.3297	2.8177	
0.15	2.5136	2.8571	1.6346	1.2329	1.2500	1.3596	1.2466	1.2394	1.5610	2.1943	2.1942	1.0777	2.5136	2.8571	
0.2	2.6655	2.8965	1.8121	1.2471	1.2641	1.5085	1.2545	1.2500	1.7236	2.3675	2.4546	1.0904	2.6655	2.8965	
0.25	2.8022	2.9422	3.3990	1.2608	1.3022	1.6194	1.3042	1.2840	1.9017	2.5000	2.5186	1.1241	2.8022	2.9422	
0.3	2.9394	2.9942	3.5372	1.2766	1.3819	1.8124	1.3352	1.3247	2.0956	2.6696	2.6183	1.1706	2.9394	2.9942	
0.35	3.0619	3.0267	3.7114	1.3020	1.4554	2.1156	1.4060	1.3622	2.5073	2.7641	2.7072	1.2806	3.0619	3.0267	
0.4	3.1962	3.0812	3.8802	1.3297	1.5856	3.0485	1.4286	1.4271	2.9568	2.9315	2.8574	1.4982	3.1962	3.0812	
0.45	3.3280	3.1418	4.0636	1.3662	1.7497	3.1975	1.8825	1.7339	3.0288	3.0009	2.9608	1.7908	3.3280	3.1418	
0.5	3.4769	3.2192	4.3664	1.4099	3.3142	3.3739	3.5834	3.3157	3.1964	3.0981	3.0000	1.9079	3.4769	3.2192	
0.55	3.6123	3.2881	4.5791	1.5510	3.4858	3.5710	4.0042	3.5553	3.3495	3.1939	3.1240	1.9893	3.6123	3.2881	
0.6	3.7586	3.3817	4.8479	1.9832	3.6494	3.8106	4.1578	3.8580	3.5694	3.3353	3.3024	2.1062	3.7586	3.3817	
0.65	3.9081	3.4865	5.1469	3.2009	3.9250	4.0843	4.3250	4.0750	3.7754	3.5438	3.4549	2.1796	3.9081	3.4865	
0.7	4.0884	3.6181	5.4819	3.5072	4.3172	4.3800	4.6422	4.4061	4.1161	3.7031	3.6301	2.3007	4.0884	3.6181	
0.75	4.3511	3.7713	5.7983	3.8852	4.5943	4.7278	4.8215	4.6560	4.4891	3.9605	3.8433	2.5965	4.3511	3.7713	
0.8	4.6230	4.0183	6.4092	4.6214	5.2038	5.4430	5.1985	4.9912	4.8812	4.2510	4.1748	2.9348	4.6230	4.0183	
0.85	4.9682	4.4236	7.0316	5.3523	5.7195	6.1794	5.5068	5.1543	5.8473	4.6897	4.5410	3.3602	4.9682	4.4236	
0.9	5.4289	5.1063	7.9483	6.2425	6.5021	7.5086	6.0737	5.4413	6.7469	5.3334	4.9358	4.0360	5.4289	5.1063	
0.95	6.8037	6.1379	9.0036	7.5697	7.5411	9.8068	7.1729	6.0257	7.8822	6.2652	6.0804	5.4330	6.8037	6.1379	
0.9999	12.629	10.965	12.000	11.455	12.000	12.000	11.968	8.6291	9.9999	9.5974	9.9773	12.000	12.629	10.965	

Appendix E: 1-440 WB Additional Datasets

Table E-1: Travel rate percentiles for all observations during all temporal intervals.

	125P04903	125+04904	125P04904	125+04986	125P04986	125+04987	125P04987	125+04988	125P04988	125+04989	125P04989	125+04990	125P04990	125+04991	125P04991	125+04978	125P04978	125+04979
0.0001	0.7308	0.5385	0.7308	1.0000	0.7308	0.7308	0.8000	0.8000	0.8000	0.7852	0.8000	0.7710	0.8000	0.5385	0.7571	0.8000	0.8000	0.5619
0.05	0.8654	0.8696	0.8696	1.0000	0.8721	0.8767	0.8824	0.8933	0.9091	0.9142	0.8955	0.9083	0.8955	0.8770	0.8827	0.8696	0.8799	0.8978
0.1	0.8824	0.8838	0.8852	1.0000	0.8955	0.8955	0.8982	0.9142	0.9320	0.9383	0.9148	0.9272	0.9131	0.8953	0.9077	0.8929	0.9009	0.9198
0.15	0.8943	0.8955	0.8983	1.0000	0.9065	0.9091	0.9119	0.9284	0.9489	0.9546	0.9259	0.9434	0.9307	0.9075	0.9231	0.9078	0.9152	0.9348
0.2	0.9012	0.9032	0.9091	1.0000	0.9126	0.9173	0.9231	0.9375	0.9524	0.9679	0.9375	0.9529	0.9415	0.9142	0.9342	0.9187	0.9276	0.9439
0.25	0.9091	0.9091	0.9176	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9814	0.9375	0.9659	0.9524	0.9231	0.9407	0.9245	0.9375	0.9524
0.3	0.9131	0.9157	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9615	0.9231	0.9524	0.9375	0.9375	0.9524
0.35	0.9226	0.9230	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.4	0.9231	0.9231	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.45	0.9231	0.9231	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.5	0.9231	0.9231	0.9231	1.0000	0.9231	0.9235	0.9375	0.9524	0.9653	0.9836	0.9524	0.9685	0.9677	0.9247	0.9524	0.9375	0.9437	0.9529
0.55	0.9231	0.9231	0.9231	1.0000	0.9233	0.9348	0.9375	0.9646	0.9677	0.9917	0.9524	0.9799	0.9677	0.9342	0.9524	0.9375	0.9524	0.9624
0.6	0.9231	0.9231	0.9289	1.0000	0.9360	0.9375	0.9375	0.9677	0.9836	1.0000	0.9617	0.9836	0.9677	0.9375	0.9568	0.9524	0.9533	0.9677
0.65	0.9235	0.9250	0.9375	1.0000	0.9375	0.9377	0.9524	0.9677	0.9868	1.0025	0.9677	0.9836	0.9766	0.9382	0.9677	0.9524	0.9677	0.9678
0.7	0.9319	0.9333	0.9406	1.0000	0.9444	0.9497	0.9524	0.9836	1.0000	1.0163	0.9774	0.9944	0.9836	0.9480	0.9713	0.9677	0.9677	0.9793
0.75	0.9375	0.9375	0.9523	1.0000	0.9524	0.9524	0.9608	0.9868	1.0077	1.0173	0.9836	1.0000	0.9967	0.9524	0.9836	0.9715	0.9836	0.9847
0.8	0.9437	0.9446	0.9556	1.0000	0.9614	0.9671	0.9677	1.0000	1.0169	1.0342	1.0000	1.0096	1.0033	0.9613	0.9903	0.9836	0.9967	1.0000
0.85	0.9524	0.9524	0.9677	1.0000	0.9711	0.9754	0.9836	1.0169	1.0417	1.0511	1.0142	1.0216	1.0169	0.9723	1.0031	1.0000	1.0139	1.0150
0.9	0.9677	0.9673	0.9836	1.0000	0.9894	0.9985	1.0081	1.0345	1.0714	1.0774	1.0345	1.0432	1.0345	0.9917	1.0306	1.0241	1.0345	1.0408
0.95	1.0010	0.9972	1.0168	1.0000	1.0250	1.0341	1.0526	1.0935	1.1544	1.1558	1.0860	1.0843	1.0728	1.0310	1.0909	1.0893	1.0909	1.1676
0.9999	6.3745	4.6043	3.3333	1.0000	9.2021	9.4684	15.265	19.642	11.334	10.082	14.725	12.412	10.422	10.749	15.768	20.000	15.301	10.194

Table E-1: (Continued).

	125P04979	125+04980	125P04980	125+04981	125P04981	125+04982	125P04982	125+04983	125P04983	125+04984	125P04984	125+04985	
0.0001	0.8000	0.8000	0.8000	0.8000	0.8000	0.7852	0.8000	0.8000	0.8000	0.7710	0.8000	0.8000	
0.05	0.8955	0.8962	0.9119	0.9198	0.9186	0.9232	0.9231	0.9123	0.9091	0.8985	0.8958	0.8903	
0.1	0.9174	0.9231	0.9419	0.9489	0.9416	0.9524	0.9524	0.9375	0.9289	0.9231	0.9231	0.9091	
0.15	0.9346	0.9385	0.9645	0.9677	0.9677	0.9611	0.9677	0.9605	0.9375	0.9375	0.9375	0.9231	
0.2	0.9456	0.9524	0.9771	0.9836	0.9836	0.9721	0.9836	0.9782	0.9524	0.9524	0.9524	0.9375	
0.25	0.9524	0.9677	0.9885	1.0007	1.0000	0.9836	0.9982	0.9883	0.9524	0.9629	0.9524	0.9495	
0.3	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9625	0.9524	
0.35	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9677	0.9524	
0.4	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9677	0.9524	
0.45	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9677	0.9524	
0.5	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.55	0.9677	0.9810	1.0000	1.0187	1.0169	0.9844	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.6	0.9677	0.9836	1.0168	1.0345	1.0204	1.0000	1.0000	1.0000	0.9804	0.9737	0.9677	0.9676	
0.65	0.9740	0.9885	1.0243	1.0444	1.0345	1.0033	1.0169	1.0169	0.9836	0.9836	0.9836	0.9677	
0.7	0.9836	1.0000	1.0346	1.0526	1.0526	1.0169	1.0180	1.0325	0.9944	0.9940	0.9836	0.9836	
0.75	1.0000	1.0169	1.0526	1.0714	1.0714	1.0276	1.0345	1.0526	1.0000	1.0000	0.9868	0.9934	
0.8	1.0121	1.0345	1.0713	1.0909	1.0909	1.0345	1.0490	1.0644	1.0169	1.0169	1.0000	1.0000	
0.85	1.0345	1.0526	1.0992	1.1194	1.1115	1.0575	1.0714	1.0840	1.0345	1.0276	1.0169	1.0190	
0.9	1.0714	1.0909	1.1538	1.1538	1.1765	1.0909	1.1111	1.1209	1.0526	1.0451	1.0345	1.0526	
0.95	1.2544	1.3043	1.3333	1.3043	1.3219	1.2148	1.2020	1.1983	1.1111	1.0921	1.0909	1.0995	
0.9999	13.657	14.073	11.529	8.5860	8.6562	5.3345	4.8376	5.3028	6.6363	5.8553	6.1160	9.7589	

Table E-2: Travel rate percentiles for unflagged observations during all temporal intervals.

	125P04903	125+04904	125P04904	125+04986	125P04986	125+04987	125P04987	125+04988	125P04988	125+04989	125P04989	125+04990	125P04990	125+04991	125P04991	125+04978	125P04978	125+04979
0.0001	0.7444	0.5385	0.7550	1.0000	0.7729	0.7734	0.8000	0.8000	0.8000	0.7926	0.8000	0.7828	0.8000	0.5532	0.7639	0.8000	0.8000	0.5619
0.05	0.8644	0.8694	0.8696	1.0000	0.8696	0.8745	0.8812	0.8903	0.9091	0.9125	0.8955	0.9062	0.8934	0.8742	0.8824	0.8696	0.8772	0.8957
0.1	0.8818	0.8830	0.8853	1.0000	0.8930	0.8955	0.8955	0.9091	0.9291	0.9375	0.9124	0.9255	0.9096	0.8924	0.9038	0.8878	0.8967	0.9164
0.15	0.8926	0.8943	0.8982	1.0000	0.9044	0.9069	0.9091	0.9231	0.9464	0.9531	0.9231	0.9405	0.9264	0.9040	0.9207	0.9037	0.9119	0.9315
0.2	0.8986	0.9007	0.9091	1.0000	0.9101	0.9146	0.9231	0.9375	0.9524	0.9677	0.9375	0.9524	0.9375	0.9110	0.9290	0.9131	0.9231	0.9406
0.25	0.9088	0.9091	0.9171	1.0000	0.9230	0.9231	0.9231	0.9476	0.9524	0.9774	0.9375	0.9621	0.9524	0.9215	0.9377	0.9231	0.9375	0.9521
0.3	0.9100	0.9129	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9580	0.9231	0.9503	0.9357	0.9375	0.9524
0.35	0.9202	0.9215	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.4	0.9231	0.9231	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.45	0.9231	0.9231	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9539	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.5	0.9231	0.9231	0.9231	1.0000	0.9231	0.9231	0.9291	0.9524	0.9677	0.9836	0.9437	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.55	0.9231	0.9231	0.9232	1.0000	0.9236	0.9274	0.9375	0.9538	0.9712	0.9849	0.9524	0.9716	0.9677	0.9266	0.9524	0.9375	0.9524	0.9560
0.6	0.9231	0.9231	0.9315	1.0000	0.9373	0.9375	0.9384	0.9677	0.9836	0.9970	0.9623	0.9830	0.9677	0.9360	0.9559	0.9434	0.9554	0.9663
0.65	0.9232	0.9250	0.9375	1.0000	0.9375	0.9376	0.9524	0.9677	0.9906	1.0021	0.9677	0.9836	0.9743	0.9375	0.9677	0.9524	0.9677	0.9679
0.7	0.9310	0.9331	0.9420	1.0000	0.9442	0.9493	0.9524	0.9836	1.0000	1.0162	0.9772	0.9929	0.9836	0.9467	0.9704	0.9677	0.9677	0.9793
0.75	0.9375	0.9375	0.9524	1.0000	0.9524	0.9524	0.9605	0.9841	1.0135	1.0169	0.9836	1.0000	0.9935	0.9524	0.9835	0.9712	0.9836	0.9846
0.8	0.9436	0.9440	0.9561	1.0000	0.9611	0.9665	0.9677	1.0000	1.0188	1.0332	1.0000	1.0056	1.0000	0.9578	0.9870	0.9836	0.9949	0.9997
0.85	0.9524	0.9524	0.9677	1.0000	0.9709	0.9737	0.9836	1.0169	1.0420	1.0483	1.0101	1.0169	1.0169	0.9682	1.0000	1.0000	1.0103	1.0140
0.9	0.9677	0.9669	0.9836	1.0000	0.9873	0.9935	1.0044	1.0345	1.0714	1.0714	1.0309	1.0346	1.0345	0.9845	1.0208	1.0173	1.0318	1.0371
0.95	1.0058	0.9947	1.0154	1.0000	1.0171	1.0287	1.0477	1.0877	1.1408	1.1365	1.0714	1.0711	1.0684	1.0169	1.0718	1.0714	1.0757	1.1439
0.9999	6.6627	5.6991	3.4720	1.0000	9.5604	10.592	15.798	20.835	11.569	10.845	14.713	13.764	9.9587	11.788	10.869	15.885	12.727	8.8298

Table E-2: (Continued).

	125P04979	125+04980	125P04980	125+04981	125P04981	125+04982	125P04982	125+04983	125P04983	125+04984	125P04984	125+04985	
0.0001	0.8000	0.8000	0.8000	0.8000	0.8000	0.7852	0.8047	0.8000	0.8000	0.7710	0.8000	0.8000	
0.05	0.8955	0.8955	0.9091	0.9148	0.9146	0.9231	0.9231	0.9091	0.9091	0.8965	0.8955	0.8876	
0.1	0.9146	0.9231	0.9375	0.9421	0.9375	0.9495	0.9524	0.9375	0.9231	0.9231	0.9231	0.9036	
0.15	0.9308	0.9375	0.9567	0.9667	0.9616	0.9572	0.9677	0.9534	0.9375	0.9375	0.9346	0.9231	
0.2	0.9406	0.9524	0.9682	0.9836	0.9836	0.9689	0.9836	0.9712	0.9524	0.9517	0.9465	0.9375	
0.25	0.9524	0.9677	0.9837	1.0000	1.0000	0.9836	0.9935	0.9836	0.9524	0.9564	0.9524	0.9412	
0.3	0.9524	0.9677	1.0000	1.0169	1.0142	0.9836	1.0000	1.0000	0.9524	0.9677	0.9677	0.9524	
0.35	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9677	0.9524	
0.4	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9677	0.9524	
0.45	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9677	0.9524	
0.5	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9559	0.9677	0.9677	0.9524	
0.55	0.9615	0.9712	1.0002	1.0169	1.0169	0.9858	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.6	0.9677	0.9836	1.0169	1.0313	1.0239	1.0000	1.0069	1.0000	0.9825	0.9742	0.9681	0.9676	
0.65	0.9762	0.9934	1.0274	1.0455	1.0345	1.0074	1.0169	1.0169	0.9836	0.9836	0.9836	0.9677	
0.7	0.9836	1.0000	1.0349	1.0526	1.0526	1.0169	1.0249	1.0345	0.9970	0.9942	0.9836	0.9836	
0.75	1.0000	1.0169	1.0526	1.0714	1.0714	1.0331	1.0345	1.0526	1.0000	1.0000	0.9901	0.9958	
0.8	1.0137	1.0345	1.0713	1.0909	1.0909	1.0361	1.0526	1.0714	1.0169	1.0169	1.0000	1.0025	
0.85	1.0345	1.0526	1.1039	1.1291	1.1321	1.0670	1.0715	1.0909	1.0345	1.0288	1.0169	1.0265	
0.9	1.0714	1.0909	1.1538	1.1538	1.1765	1.0981	1.1196	1.1278	1.0526	1.0495	1.0358	1.0526	
0.95	1.2452	1.3100	1.3452	1.3471	1.3636	1.2270	1.2234	1.2000	1.1134	1.0955	1.0909	1.1111	
0.9999	14.426	14.096	11.726	9.4782	10.072	6.0868	5.1350	6.0720	8.2434	7.0161	7.0637	13.950	

Table E-3: Travel rate percentiles for flagged observations during all temporal intervals.

	125P04903	125+04904	125P04904	125+04986	125P04986	125+04987	125P04987	125+04988	125P04988	125+04989	125P04989	125+04990	125P04990	125+04991	125P04991	125+04978	125P04978	125+04979
0.0001	0.6627	0.4857	0.6714	0.5914	0.7182	0.6734	0.3825	0.8108	0.8208	0.7517	0.8000	0.7358	0.8000	0.4995	0.6989	0.8000	0.8000	0.4773
0.05	0.8704	0.8757	0.8771	1.0000	0.8824	0.8882	0.8955	0.9091	0.9217	0.9236	0.9091	0.9115	0.9070	0.8842	0.8938	0.8824	0.8903	0.9065
0.1	0.8898	0.8954	0.8959	1.0000	0.9091	0.9091	0.9202	0.9375	0.9435	0.9524	0.9244	0.9375	0.9239	0.9043	0.9177	0.9063	0.9094	0.9266
0.15	0.9008	0.9074	0.9097	1.0000	0.9230	0.9231	0.9231	0.9524	0.9524	0.9683	0.9375	0.9524	0.9435	0.9162	0.9318	0.9231	0.9295	0.9423
0.2	0.9091	0.9129	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9658	0.9524	0.9231	0.9440	0.9320	0.9375	0.9524
0.25	0.9162	0.9231	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.3	0.9231	0.9231	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.35	0.9231	0.9231	0.9231	1.0000	0.9231	0.9232	0.9346	0.9524	0.9524	0.9836	0.9497	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.4	0.9231	0.9231	0.9231	1.0000	0.9231	0.9350	0.9375	0.9677	0.9524	0.9863	0.9524	0.9729	0.9677	0.9330	0.9524	0.9375	0.9524	0.9544
0.45	0.9231	0.9231	0.9231	1.0000	0.9231	0.9375	0.9375	0.9677	0.9524	1.0000	0.9524	0.9836	0.9677	0.9375	0.9524	0.9524	0.9524	0.9668
0.5	0.9231	0.9231	0.9231	1.0000	0.9231	0.9375	0.9375	0.9677	0.9524	1.0000	0.9524	0.9836	0.9677	0.9375	0.9524	0.9524	0.9524	0.9677
0.55	0.9231	0.9231	0.9260	1.0000	0.9292	0.9375	0.9375	0.9677	0.9677	1.0000	0.9585	0.9836	0.9677	0.9375	0.9524	0.9524	0.9524	0.9677
0.6	0.9264	0.9260	0.9375	1.0000	0.9375	0.9375	0.9498	0.9677	0.9728	1.0000	0.9677	0.9836	0.9693	0.9391	0.9623	0.9524	0.9524	0.9677
0.65	0.9359	0.9354	0.9407	1.0000	0.9434	0.9475	0.9524	0.9836	0.9836	1.0105	0.9772	0.9932	0.9836	0.9498	0.9677	0.9559	0.9677	0.9688
0.7	0.9375	0.9375	0.9524	1.0000	0.9524	0.9524	0.9615	0.9875	1.0000	1.0169	0.9836	1.0000	0.9911	0.9536	0.9808	0.9677	0.9715	0.9821
0.75	0.9446	0.9472	0.9589	1.0000	0.9584	0.9641	0.9677	1.0000	1.0000	1.0297	1.0000	1.0103	1.0000	0.9663	0.9839	0.9804	0.9836	0.9895
0.8	0.9524	0.9524	0.9677	1.0000	0.9677	0.9686	0.9836	1.0144	1.0169	1.0439	1.0077	1.0203	1.0169	0.9754	1.0000	0.9852	1.0000	1.0009
0.85	0.9623	0.9648	0.9836	1.0000	0.9834	0.9836	1.0000	1.0279	1.0345	1.0583	1.0248	1.0345	1.0345	0.9906	1.0169	1.0008	1.0169	1.0179
0.9	0.9790	0.9827	1.0000	1.0000	0.9998	1.0006	1.0169	1.0526	1.0713	1.0924	1.0526	1.0603	1.0603	1.0169	1.0526	1.0345	1.0526	1.0517
0.95	1.0158	1.0246	1.0526	1.0000	1.0487	1.0702	1.0887	1.1321	1.1916	1.2059	1.1276	1.1187	1.1321	1.1107	1.2004	1.1539	1.1538	1.2255
0.9999	4.3027	2.3311	7.9646	1.0000	9.4509	5.6874	10.812	7.1507	10.918	9.9329	14.419	8.6046	10.829	9.5489	16.916	21.105	17.198	11.344

Table E-3: (Continued).

	125P04979	125+04980	125P04980	125+04981	125P04981	125+04982	125P04982	125+04983	125P04983	125+04984	125P04984	125+04985	
0.0001	0.8000	0.8000	0.7648	0.8000	0.8010	0.7154	0.8108	0.8012	0.8092	0.6755	0.8000	0.8000	
0.05	0.9027	0.9091	0.9231	0.9231	0.9237	0.9265	0.9375	0.9231	0.9174	0.9073	0.9091	0.8955	
0.1	0.9231	0.9320	0.9524	0.9661	0.9527	0.9524	0.9677	0.9524	0.9375	0.9324	0.9307	0.9204	
0.15	0.9410	0.9524	0.9744	0.9836	0.9836	0.9677	0.9836	0.9715	0.9524	0.9500	0.9524	0.9375	
0.2	0.9524	0.9677	0.9903	1.0017	1.0000	0.9836	0.9959	0.9935	0.9524	0.9654	0.9524	0.9524	
0.25	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9524	0.9524	
0.3	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9524	0.9524	
0.35	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9564	0.9677	0.9524	0.9524	
0.4	0.9533	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.45	0.9677	0.9836	1.0000	1.0345	1.0169	0.9836	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.5	0.9677	0.9836	1.0000	1.0345	1.0169	0.9836	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.55	0.9677	0.9836	1.0000	1.0345	1.0169	0.9836	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.6	0.9677	0.9836	1.0169	1.0345	1.0169	0.9933	1.0000	1.0000	0.9774	0.9747	0.9677	0.9677	
0.65	0.9709	0.9836	1.0312	1.0391	1.0345	1.0000	1.0070	1.0169	0.9836	0.9836	0.9740	0.9677	
0.7	0.9836	1.0000	1.0415	1.0559	1.0442	1.0101	1.0169	1.0240	0.9960	0.9999	0.9836	0.9836	
0.75	0.9972	1.0135	1.0547	1.0714	1.0566	1.0169	1.0345	1.0345	1.0000	1.0003	0.9904	0.9982	
0.8	1.0125	1.0309	1.0816	1.0923	1.0788	1.0345	1.0345	1.0526	1.0169	1.0169	1.0000	1.0001	
0.85	1.0345	1.0446	1.1132	1.1111	1.0989	1.0496	1.0528	1.0714	1.0345	1.0338	1.0169	1.0169	
0.9	1.0714	1.0793	1.1750	1.1538	1.1364	1.0764	1.0963	1.1161	1.0566	1.0519	1.0345	1.0444	
0.95	1.2692	1.2466	1.3940	1.2766	1.2500	1.1921	1.2000	1.2226	1.1321	1.1055	1.0909	1.0877	
0.9999	12.059	12.233	11.478	10.740	10.503	5.6556	6.6807	3.5057	2.8571	2.8571	6.1595	6.6124	

Table E-4: Travel rate percentiles for all observations during the AM peak period.

	125P04903	125+04904	125P04904	125+04986	125P04986	125+04987	125P04987	125+04988	125P04988	125+04989	125P04989	125+04990	125P04990	125+04991	125P04991	125+04978	125P04978	125+04979
0.0001	0.6881	0.4981	0.6835	0.6384	0.7099	0.6897	0.4167	0.8000	0.8000	0.7809	0.8000	0.7118	0.8000	0.5084	0.6891	0.8000	0.8000	0.4989
0.05	0.8649	0.8678	0.8596	1.0000	0.8658	0.8697	0.8697	0.8884	0.9018	0.9116	0.8955	0.9039	0.8906	0.8716	0.8730	0.8646	0.8696	0.8884
0.1	0.8784	0.8804	0.8747	1.0000	0.8824	0.8828	0.8851	0.9091	0.9233	0.9361	0.9120	0.9211	0.9091	0.8858	0.8905	0.8824	0.8876	0.9075
0.15	0.8880	0.8874	0.8828	1.0000	0.8930	0.8933	0.8955	0.9231	0.9382	0.9513	0.9231	0.9326	0.9231	0.8955	0.9013	0.8955	0.8983	0.9208
0.2	0.8957	0.8940	0.8929	1.0000	0.9009	0.8992	0.9065	0.9375	0.9524	0.9633	0.9320	0.9408	0.9318	0.9029	0.9106	0.9027	0.9091	0.9303
0.25	0.9012	0.8981	0.8966	1.0000	0.9090	0.9069	0.9123	0.9465	0.9592	0.9723	0.9375	0.9508	0.9388	0.9091	0.9204	0.9099	0.9177	0.9387
0.3	0.9077	0.9033	0.9037	1.0000	0.9121	0.9118	0.9207	0.9554	0.9677	0.9830	0.9464	0.9562	0.9494	0.9144	0.9264	0.9207	0.9244	0.9469
0.35	0.9100	0.9083	0.9091	1.0000	0.9184	0.9179	0.9265	0.9665	0.9782	0.9908	0.9524	0.9644	0.9554	0.9206	0.9352	0.9272	0.9347	0.9536
0.4	0.9153	0.9111	0.9120	1.0000	0.9231	0.9232	0.9352	0.9712	0.9844	1.0000	0.9586	0.9689	0.9618	0.9247	0.9409	0.9375	0.9406	0.9608
0.45	0.9206	0.9157	0.9177	1.0000	0.9265	0.9289	0.9404	0.9836	0.9957	1.0085	0.9677	0.9764	0.9677	0.9306	0.9502	0.9437	0.9495	0.9675
0.5	0.9231	0.9203	0.9230	1.0000	0.9345	0.9366	0.9494	0.9901	1.0033	1.0177	0.9712	0.9832	0.9745	0.9364	0.9557	0.9524	0.9554	0.9734
0.55	0.9258	0.9232	0.9261	1.0000	0.9377	0.9407	0.9554	1.0000	1.0137	1.0289	0.9804	0.9881	0.9836	0.9403	0.9650	0.9617	0.9658	0.9815
0.6	0.9314	0.9273	0.9320	1.0000	0.9449	0.9494	0.9646	1.0113	1.0221	1.0387	0.9843	0.9968	0.9901	0.9467	0.9711	0.9709	0.9737	0.9880
0.65	0.9367	0.9321	0.9375	1.0000	0.9523	0.9547	0.9718	1.0241	1.0345	1.0526	0.9967	1.0026	1.0000	0.9524	0.9822	0.9836	0.9836	0.9981
0.7	0.9383	0.9368	0.9433	1.0000	0.9588	0.9653	0.9836	1.0417	1.0526	1.0705	1.0033	1.0120	1.0069	0.9596	0.9907	0.9967	0.9934	1.0096
0.75	0.9454	0.9416	0.9504	1.0000	0.9678	0.9766	1.0000	1.0676	1.0755	1.0948	1.0169	1.0205	1.0169	0.9677	1.0034	1.0101	1.0069	1.0262
0.8	0.9522	0.9490	0.9560	1.0000	0.9834	0.9913	1.0211	1.1111	1.1202	1.1312	1.0345	1.0338	1.0309	0.9794	1.0212	1.0313	1.0267	1.0526
0.85	0.9598	0.9555	0.9674	1.0000	1.0027	1.0190	1.0807	1.2170	1.2088	1.1905	1.0526	1.0499	1.0490	0.9952	1.0533	1.0676	1.0528	1.1080
0.9	0.9705	0.9667	0.9825	1.0000	1.0501	1.0928	1.3349	1.6267	1.3934	1.3170	1.0909	1.0755	1.0793	1.0242	1.1441	1.1625	1.1327	1.2608
0.95	0.9959	0.9889	1.0072	1.0000	1.2844	1.4427	2.0861	2.3085	1.7456	1.6127	1.1957	1.1861	1.2060	1.1393	1.5414	1.6304	1.4890	1.5591
0.9999	1.7140	2.8760	8.1879	1.0000	10.828	11.001	16.025	22.031	13.324	13.873	15.227	14.712	11.793	10.946	16.901	20.000	13.768	10.247

Table E-4: (Continued).

	125P04979	125+04980	125P04980	125+04981	125P04981	125+04982	125P04982	125+04983	125P04983	125+04984	125P04984	125+04985	
0.0001	0.8000	0.8000	0.7641	0.8000	0.8000	0.7118	0.8000	0.8000	0.8000	0.6910	0.8000	0.8000	
0.05	0.8892	0.8955	0.9012	0.9036	0.9036	0.9069	0.9017	0.8905	0.8893	0.8821	0.8696	0.8696	
0.1	0.9091	0.9148	0.9262	0.9238	0.9231	0.9242	0.9231	0.9092	0.9091	0.8985	0.8955	0.8942	
0.15	0.9231	0.9285	0.9444	0.9453	0.9375	0.9385	0.9378	0.9308	0.9231	0.9118	0.9091	0.9068	
0.2	0.9317	0.9379	0.9586	0.9604	0.9524	0.9524	0.9524	0.9469	0.9350	0.9233	0.9183	0.9146	
0.25	0.9385	0.9524	0.9709	0.9740	0.9646	0.9601	0.9646	0.9592	0.9410	0.9347	0.9259	0.9231	
0.3	0.9497	0.9591	0.9836	0.9848	0.9740	0.9677	0.9709	0.9688	0.9524	0.9394	0.9375	0.9328	
0.35	0.9537	0.9677	0.9934	1.0000	0.9836	0.9743	0.9824	0.9836	0.9586	0.9501	0.9435	0.9375	
0.4	0.9628	0.9772	1.0001	1.0103	0.9939	0.9832	0.9872	0.9944	0.9677	0.9535	0.9524	0.9482	
0.45	0.9677	0.9836	1.0108	1.0169	1.0008	0.9838	0.9978	1.0000	0.9677	0.9642	0.9524	0.9524	
0.5	0.9772	0.9926	1.0172	1.0318	1.0159	0.9903	1.0000	1.0106	0.9742	0.9677	0.9586	0.9585	
0.55	0.9836	1.0000	1.0310	1.0345	1.0169	0.9992	1.0065	1.0169	0.9836	0.9717	0.9677	0.9677	
0.6	0.9934	1.0113	1.0365	1.0458	1.0325	1.0003	1.0169	1.0313	0.9836	0.9815	0.9687	0.9684	
0.65	1.0035	1.0238	1.0515	1.0563	1.0377	1.0096	1.0169	1.0384	0.9910	0.9836	0.9810	0.9807	
0.7	1.0169	1.0351	1.0575	1.0714	1.0526	1.0167	1.0277	1.0526	1.0000	0.9897	0.9836	0.9836	
0.75	1.0345	1.0567	1.0714	1.0797	1.0586	1.0201	1.0345	1.0601	1.0002	0.9995	0.9967	0.9935	
0.8	1.0676	1.0874	1.0907	1.0913	1.0714	1.0330	1.0417	1.0714	1.0142	1.0002	1.0000	1.0000	
0.85	1.1138	1.1321	1.1128	1.1111	1.0909	1.0413	1.0526	1.0909	1.0208	1.0156	1.0142	1.0091	
0.9	1.2116	1.2179	1.1551	1.1337	1.1157	1.0542	1.0714	1.1111	1.0345	1.0269	1.0333	1.0229	
0.95	1.4658	1.4615	1.2381	1.1853	1.1647	1.0891	1.1107	1.1538	1.0601	1.0526	1.0637	1.0576	
0.9999	11.706	11.358	5.8342	4.1746	4.2782	2.0885	1.9882	1.8267	2.1600	1.5977	2.1952	13.989	

Table E-5: Travel rate percentiles for unflagged observations during the AM peak period.

	125P04903	125+04904	125P04904	125+04986	125P04986	125+04987	125P04987	125+04988	125P04988	125+04989	125P04989	125+04990	125P04990	125+04991	125P04991	125+04978	125P04978	125+04979
0.0001	0.1091	0.0633	0.0895	0.0833	0.0948	0.0873	0.1068	0.1080	0.1079	0.1203	0.1320	0.1208	0.1378	0.0878	0.1234	0.1202	0.1186	0.0703
0.05	0.8579	0.8648	0.8572	1.0000	0.8696	0.8635	0.8807	0.9027	0.9063	0.9091	0.8942	0.8955	0.8879	0.8737	0.8833	0.8696	0.8782	0.8991
0.1	0.8769	0.8803	0.8824	1.0000	0.8876	0.8888	0.8955	0.9231	0.9290	0.9406	0.9120	0.9214	0.9091	0.8928	0.9057	0.8929	0.8955	0.9231
0.15	0.8883	0.8914	0.8931	1.0000	0.9069	0.9091	0.9096	0.9375	0.9471	0.9576	0.9232	0.9354	0.9231	0.9046	0.9204	0.9010	0.9175	0.9390
0.2	0.8955	0.8980	0.8998	1.0000	0.9202	0.9204	0.9231	0.9464	0.9524	0.9685	0.9375	0.9505	0.9375	0.9094	0.9327	0.9093	0.9290	0.9518
0.25	0.9039	0.9069	0.9091	1.0000	0.9231	0.9231	0.9239	0.9524	0.9677	0.9798	0.9434	0.9613	0.9524	0.9169	0.9441	0.9231	0.9419	0.9569
0.3	0.9091	0.9114	0.9183	1.0000	0.9238	0.9262	0.9351	0.9585	0.9677	0.9840	0.9524	0.9682	0.9574	0.9231	0.9524	0.9289	0.9524	0.9667
0.35	0.9125	0.9179	0.9231	1.0000	0.9350	0.9371	0.9375	0.9677	0.9802	0.9906	0.9561	0.9786	0.9677	0.9284	0.9608	0.9375	0.9649	0.9677
0.4	0.9211	0.9226	0.9235	1.0000	0.9375	0.9375	0.9434	0.9677	0.9836	0.9999	0.9658	0.9836	0.9686	0.9370	0.9677	0.9494	0.9677	0.9748
0.45	0.9231	0.9231	0.9346	1.0000	0.9376	0.9386	0.9524	0.9754	0.9924	1.0028	0.9677	0.9838	0.9808	0.9415	0.9701	0.9524	0.9775	0.9836
0.5	0.9286	0.9250	0.9375	1.0000	0.9438	0.9494	0.9524	0.9836	1.0000	1.0136	0.9740	0.9934	0.9836	0.9511	0.9830	0.9601	0.9852	0.9886
0.55	0.9368	0.9317	0.9398	1.0000	0.9522	0.9524	0.9524	0.9836	1.0000	1.0169	0.9836	1.0000	0.9872	0.9526	0.9849	0.9677	1.0000	0.9998
0.6	0.9375	0.9372	0.9471	1.0000	0.9524	0.9524	0.9586	0.9959	1.0101	1.0207	0.9899	1.0011	1.0000	0.9622	1.0000	0.9836	1.0017	1.0106
0.65	0.9437	0.9385	0.9524	1.0000	0.9571	0.9587	0.9677	1.0000	1.0169	1.0345	1.0000	1.0126	1.0070	0.9687	1.0163	0.9852	1.0169	1.0275
0.7	0.9523	0.9475	0.9620	1.0000	0.9674	0.9676	0.9709	1.0001	1.0210	1.0453	1.0084	1.0215	1.0169	0.9812	1.0305	1.0000	1.0345	1.0491
0.75	0.9647	0.9525	0.9711	1.0000	0.9677	0.9711	0.9836	1.0169	1.0345	1.0531	1.0225	1.0345	1.0299	0.9963	1.0614	1.0170	1.0526	1.0766
0.8	0.9805	0.9641	0.9836	1.0000	0.9780	0.9832	0.9980	1.0244	1.0526	1.0725	1.0381	1.0526	1.0526	1.0240	1.1171	1.0526	1.0909	1.1584
0.85	1.0000	0.9836	1.0004	1.0000	0.9915	0.9997	1.0123	1.0348	1.0796	1.0936	1.0714	1.0866	1.0714	1.0756	1.2431	1.1305	1.1607	1.3322
0.9	1.0346	1.0087	1.0329	1.0000	1.0166	1.0329	1.0474	1.0714	1.1273	1.1440	1.1134	1.1398	1.1321	1.1882	1.6824	1.3390	1.4371	2.0261
0.95	1.1389	1.0733	1.1467	1.0000	1.0709	1.0750	1.1111	1.1321	1.2431	1.2910	1.3963	1.4922	1.4636	1.7567	3.8951	2.2486	3.8297	4.1550
0.9999	6.3426	2.2899	3.1029	1.0000	2.1421	2.3030	2.3072	2.3077	13.922	10.396	15.255	9.9375	9.3387	10.522	15.831	25.689	21.158	9.8363

Table E-5: (Continued).

	125P04979	125+04980	125P04980	125+04981	125P04981	125+04982	125P04982	125+04983	125P04983	125+04984	125P04984	125+04985	
0.0001	0.1235	0.1214	0.1325	0.1290	0.1276	0.1125	0.1316	0.1539	0.1449	0.1177	0.1473	0.1484	
0.05	0.8987	0.9016	0.9231	0.9426	0.9375	0.9375	0.9431	0.9375	0.9231	0.9091	0.9038	0.8955	
0.1	0.9231	0.9318	0.9585	0.9695	0.9677	0.9681	0.9677	0.9677	0.9375	0.9375	0.9231	0.9036	
0.15	0.9375	0.9524	0.9811	1.0000	0.9957	0.9836	0.9846	0.9837	0.9524	0.9524	0.9404	0.9231	
0.2	0.9524	0.9677	1.0000	1.0169	1.0000	0.9891	1.0000	1.0000	0.9677	0.9608	0.9524	0.9375	
0.25	0.9677	0.9744	1.0168	1.0345	1.0169	1.0000	1.0169	1.0142	0.9742	0.9703	0.9646	0.9437	
0.3	0.9677	0.9836	1.0237	1.0385	1.0345	1.0078	1.0169	1.0242	0.9836	0.9836	0.9677	0.9524	
0.35	0.9836	0.9836	1.0345	1.0526	1.0345	1.0169	1.0345	1.0345	0.9894	0.9934	0.9709	0.9677	
0.4	0.9872	1.0000	1.0526	1.0714	1.0526	1.0307	1.0421	1.0486	1.0000	1.0000	0.9836	0.9677	
0.45	1.0000	1.0067	1.0688	1.0909	1.0714	1.0345	1.0526	1.0526	1.0169	1.0103	0.9840	0.9778	
0.5	1.0000	1.0169	1.0881	1.0994	1.0909	1.0523	1.0714	1.0714	1.0279	1.0169	1.0000	0.9836	
0.55	1.0211	1.0345	1.1111	1.1126	1.1103	1.0714	1.0910	1.0909	1.0385	1.0272	1.0101	0.9945	
0.6	1.0492	1.0444	1.1404	1.1321	1.1321	1.0955	1.1193	1.1111	1.0526	1.0345	1.0179	1.0000	
0.65	1.0714	1.0714	1.2000	1.1538	1.1653	1.1334	1.1528	1.1354	1.0714	1.0423	1.0345	1.0135	
0.7	1.0909	1.0909	1.2714	1.2000	1.1846	1.1742	1.1790	1.1680	1.0909	1.0635	1.0429	1.0169	
0.75	1.1710	1.1538	1.3447	1.2766	1.2723	1.2230	1.2242	1.2000	1.1167	1.0788	1.0571	1.0311	
0.8	1.2829	1.2731	1.5385	1.4164	1.3636	1.3072	1.2848	1.2450	1.1510	1.1063	1.0714	1.0464	
0.85	1.7441	1.6537	1.9084	1.6667	1.5789	1.4444	1.4584	1.2941	1.1797	1.1321	1.0923	1.0687	
0.9	2.9784	2.8081	2.5350	2.1429	1.9290	1.6468	1.6426	1.3953	1.2500	1.1704	1.1488	1.1070	
0.95	4.8803	4.0071	3.5377	2.8571	2.6907	2.1812	2.1380	1.6667	1.4600	1.2976	1.2630	1.2299	
0.9999	12.000	11.988	11.652	11.778	10.662	6.0110	7.2197	3.6179	3.0704	3.0356	7.4404	7.8720	

Table E-6: Travel rate percentiles for flagged observations during the AM peak hour.

	125P04903	125+04904	125P04904	125+04986	125P04986	125+04987	125P04987	125+04988	125P04988	125+04989	125P04989	125+04990	125P04990	125+04991	125P04991	125+04978	125P04978	125+04979
0.0001	0.4565	0.1411	0.1954	0.1300	0.2071	0.1994	0.0841	0.2274	0.2313	0.2371	0.3056	0.2942	0.2777	0.2062	0.2104	0.2314	0.2282	0.1476
0.05	0.8696	0.8696	0.8697	1.0000	0.8774	0.8824	0.8824	0.8955	0.9091	0.9091	0.8955	0.9087	0.8955	0.8744	0.8769	0.8670	0.8702	0.8929
0.1	0.8825	0.8829	0.8824	1.0000	0.8955	0.8958	0.9009	0.9198	0.9231	0.9371	0.9183	0.9238	0.9091	0.8930	0.8955	0.8831	0.8930	0.9091
0.15	0.8930	0.8944	0.8955	1.0000	0.9064	0.9091	0.9125	0.9338	0.9375	0.9524	0.9317	0.9385	0.9231	0.9024	0.9089	0.8955	0.9036	0.9181
0.2	0.8986	0.9007	0.9064	1.0000	0.9147	0.9118	0.9231	0.9376	0.9524	0.9671	0.9375	0.9520	0.9375	0.9108	0.9215	0.9091	0.9091	0.9306
0.25	0.9066	0.9084	0.9117	1.0000	0.9231	0.9229	0.9231	0.9524	0.9524	0.9747	0.9424	0.9542	0.9472	0.9199	0.9234	0.9231	0.9231	0.9375
0.3	0.9091	0.9091	0.9202	1.0000	0.9231	0.9233	0.9375	0.9594	0.9677	0.9836	0.9524	0.9642	0.9524	0.9231	0.9362	0.9231	0.9317	0.9470
0.35	0.9145	0.9125	0.9231	1.0000	0.9245	0.9323	0.9375	0.9677	0.9677	0.9869	0.9524	0.9681	0.9524	0.9293	0.9380	0.9352	0.9375	0.9524
0.4	0.9203	0.9199	0.9257	1.0000	0.9348	0.9375	0.9375	0.9677	0.9740	0.9999	0.9615	0.9772	0.9615	0.9365	0.9494	0.9406	0.9483	0.9534
0.45	0.9231	0.9231	0.9348	1.0000	0.9375	0.9377	0.9435	0.9682	0.9836	1.0000	0.9677	0.9836	0.9677	0.9375	0.9524	0.9524	0.9524	0.9620
0.5	0.9248	0.9267	0.9375	1.0000	0.9377	0.9462	0.9524	0.9809	0.9844	1.0096	0.9740	0.9836	0.9677	0.9383	0.9583	0.9524	0.9524	0.9677
0.55	0.9305	0.9341	0.9394	1.0000	0.9464	0.9524	0.9539	0.9836	1.0000	1.0169	0.9836	0.9926	0.9772	0.9450	0.9676	0.9615	0.9552	0.9677
0.6	0.9367	0.9375	0.9495	1.0000	0.9524	0.9559	0.9677	0.9937	1.0000	1.0174	0.9901	1.0000	0.9836	0.9520	0.9677	0.9677	0.9677	0.9728
0.65	0.9375	0.9379	0.9524	1.0000	0.9525	0.9675	0.9741	1.0000	1.0139	1.0325	1.0000	1.0008	0.9912	0.9570	0.9726	0.9677	0.9677	0.9829
0.7	0.9427	0.9449	0.9586	1.0000	0.9616	0.9728	0.9836	1.0145	1.0242	1.0471	1.0101	1.0130	1.0017	0.9669	0.9836	0.9785	0.9709	0.9879
0.75	0.9496	0.9514	0.9677	1.0000	0.9679	0.9837	1.0000	1.0322	1.0471	1.0611	1.0239	1.0214	1.0169	0.9734	0.9963	0.9836	0.9836	1.0000
0.8	0.9532	0.9567	0.9762	1.0000	0.9834	1.0000	1.0169	1.0526	1.0698	1.0909	1.0377	1.0350	1.0338	0.9855	1.0078	1.0000	1.0010	1.0169
0.85	0.9647	0.9677	0.9903	1.0000	1.0000	1.0166	1.0402	1.0919	1.1173	1.1418	1.0603	1.0532	1.0526	1.0048	1.0339	1.0269	1.0309	1.0502
0.9	0.9766	0.9898	1.0169	1.0000	1.0411	1.0910	1.1118	1.2447	1.2710	1.2575	1.1029	1.0900	1.0910	1.0442	1.0909	1.0793	1.0770	1.1321
0.95	1.0075	1.0508	1.1245	1.0000	1.4061	1.4089	1.5890	1.7585	1.5881	1.5632	1.2094	1.1864	1.3451	1.2203	1.4668	1.4687	1.3722	1.5147
0.9999	2.1816	2.1979	9.0058	1.0000	9.8580	6.2717	11.721	7.1279	5.5211	5.9265	7.9579	7.4681	13.037	3.4890	6.0346	5.7876	6.0943	9.4362

Table E-6: (Continued).

	125P04979	125+04980	125P04980	125+04981	125P04981	125+04982	125P04982	125+04983	125P04983	125+04984	125P04984	125+04985	
0.0001	0.2307	0.2301	0.2724	0.2283	0.2276	0.2152	0.2332	0.2276	0.2307	0.2043	0.2275	0.2275	
0.05	0.8861	0.8854	0.9010	0.9091	0.9091	0.9125	0.9147	0.9091	0.8824	0.8955	0.8955	0.8824	
0.1	0.9091	0.9091	0.9375	0.9419	0.9375	0.9408	0.9404	0.9289	0.9224	0.9229	0.9174	0.9012	
0.15	0.9231	0.9231	0.9554	0.9527	0.9524	0.9524	0.9586	0.9375	0.9375	0.9342	0.9294	0.9208	
0.2	0.9346	0.9345	0.9678	0.9677	0.9677	0.9538	0.9677	0.9524	0.9381	0.9375	0.9457	0.9347	
0.25	0.9404	0.9473	0.9836	0.9836	0.9715	0.9677	0.9699	0.9677	0.9524	0.9522	0.9524	0.9455	
0.3	0.9524	0.9524	0.9837	0.9836	0.9836	0.9686	0.9836	0.9824	0.9554	0.9615	0.9557	0.9524	
0.35	0.9524	0.9646	0.9998	1.0000	0.9973	0.9830	0.9836	0.9934	0.9677	0.9677	0.9677	0.9586	
0.4	0.9528	0.9677	1.0000	1.0037	1.0120	0.9836	0.9903	1.0000	0.9677	0.9677	0.9677	0.9677	
0.45	0.9653	0.9677	1.0069	1.0169	1.0169	0.9836	1.0000	1.0000	0.9709	0.9796	0.9677	0.9677	
0.5	0.9677	0.9836	1.0169	1.0345	1.0169	0.9895	1.0000	1.0067	0.9836	0.9836	0.9742	0.9677	
0.55	0.9677	0.9836	1.0284	1.0345	1.0345	1.0000	1.0000	1.0169	0.9836	0.9853	0.9836	0.9772	
0.6	0.9807	0.9836	1.0359	1.0526	1.0345	1.0000	1.0000	1.0169	0.9935	0.9999	0.9836	0.9836	
0.65	0.9836	1.0000	1.0525	1.0526	1.0345	1.0000	1.0169	1.0169	1.0000	1.0000	0.9874	0.9872	
0.7	0.9949	1.0000	1.0600	1.0714	1.0526	1.0138	1.0169	1.0345	1.0000	1.0000	1.0000	1.0000	
0.75	1.0070	1.0204	1.0714	1.0732	1.0526	1.0169	1.0239	1.0418	1.0169	1.0166	1.0000	1.0000	
0.8	1.0275	1.0345	1.0911	1.0909	1.0714	1.0226	1.0345	1.0526	1.0345	1.0169	1.0103	1.0169	
0.85	1.0562	1.0714	1.1285	1.1034	1.0909	1.0345	1.0345	1.0714	1.0345	1.0171	1.0169	1.0345	
0.9	1.1321	1.1321	1.1785	1.1111	1.0953	1.0517	1.0526	1.1111	1.0421	1.0345	1.0345	1.0526	
0.95	1.4295	1.4222	1.3010	1.1538	1.1317	1.0899	1.0910	1.1321	1.0707	1.0612	1.0697	1.0714	
0.9999	6.6921	4.2165	5.1213	2.0463	2.0465	1.9906	2.0003	2.1044	1.9926	1.9760	2.4245	4.5101	

Table E-7: Travel rate percentiles for all incident observations during all temporal intervals.

	125P04903	125+04904	125P04904	125+04986	125P04986	125+04987	125P04987	125+04988	125P04988	125+04989	125P04989	125+04990	125P04990	125+04991	125P04991	125+04978	125P04978	125+04979
0.0001		0.0095	0.0172	0.0098	0.0117	0.0080	0.0005	0.0068	0.0009	0.0470	0.0548	0.0574	0.0726	0.0401	0.0583			0.0084
0.05		0.8951	0.8840	1.0000	0.8622	0.9377	0.2366	0.9198	0.4286	0.9212	0.9067	0.9112	0.8982	0.8899	0.9070			0.9805
0.1		0.9030	0.8969	1.0000	0.8793	0.9516	0.4732	0.9278	0.8571	0.9439	0.9252	0.9300	0.9198	0.9125	0.9237			1.0085
0.15		0.9122	0.9144	1.0000	0.8921	0.9595	0.7098	0.9377	0.9668	0.9611	0.9375	0.9432	0.9318	0.9231	0.9381			1.1508
0.2		0.9161	0.9227	1.0000	0.9113	0.9719	0.9464	0.9465	0.9854	0.9732	0.9375	0.9565	0.9466	0.9231	0.9504			1.3174
0.25		0.9231	0.9231	1.0000	0.9230	0.9975	0.9472	0.9497	0.9973	0.9836	0.9375	0.9670	0.9559	0.9231	0.9524			1.3704
0.3		0.9250	0.9240	1.0000	0.9258	1.0172	0.9480	0.9524	1.0036	0.9836	0.9375	0.9677	0.9677	0.9233	0.9524			1.5152
0.35		0.9317	0.9318	1.0000	0.9375	1.0671	0.9488	0.9554	1.0136	0.9836	0.9516	0.9677	0.9677	0.9371	0.9524			1.6176
0.4		0.9376	0.9375	1.0000	0.9375	1.1166	0.9497	0.9571	1.0306	0.9836	0.9554	0.9677	0.9677	0.9436	0.9561			1.6603
0.45		0.9451	0.9436	1.0000	0.9375	1.1860	0.9503	0.9684	1.0457	0.9836	0.9677	0.9706	0.9710	0.9519	0.9677			1.8729
0.5		0.9530	0.9519	1.0000	0.9443	1.2399	0.9510	0.9774	1.0458	0.9912	0.9774	0.9821	0.9836	0.9528	0.9742			1.9816
0.55		0.9575	0.9526	1.0000	0.9640	1.2709	0.9517	0.9836	1.0458	1.0000	0.9836	0.9887	0.9874	0.9645	0.9836			2.1974
0.6		0.9602	0.9642	1.0000	0.9791	1.3204	0.9524	0.9851	1.2759	1.0138	0.9916	0.9974	1.0000	0.9699	0.9909			2.5678
0.65		0.9676	0.9750	1.0000	1.0262	1.3801	0.9524	0.9971	1.5348	1.0169	1.0000	1.0005	1.0124	0.9830	1.0000			3.0629
0.7		0.9758	0.9951	1.0000	1.2990	1.5073	0.9524	1.0000	3.0490	1.0314	1.0040	1.0134	1.0204	0.9961	1.0165			3.2971
0.75		0.9897	1.0229	1.0000	1.4099	1.6643	0.9524	1.0054	5.1910	1.0392	1.0169	1.0237	1.0417	1.0144	1.0327			3.9806
0.8		0.9993	1.0683	1.0000	1.7156	1.9578	0.9524	1.0093	7.2021	1.0531	1.0345	1.0345	1.0658	1.0453	1.0678			4.3307
0.85		1.0333	1.1696	1.0000	1.9431	2.7540	2.5559	1.0150	9.0496	1.0714	1.0496	1.0515	1.1032	1.1200	1.1308			5.6375
0.9		1.2094	1.7789	1.0000	2.2095	3.5190	4.1594	1.0290	10.538	1.1043	1.0745	1.0791	1.5417	1.4724	1.5568			6.1582
0.95		1.3453	3.7311	1.0000	2.9636	4.6069	5.7629	1.1409	10.771	1.1786	1.1321	1.1844	3.2559	2.2878	3.1474			8.2569
0.9999		2.2071	9.2180	1.0000	7.1666	5.7039	7.3632	8.5795	11.004	6.8858	7.2645	8.6551	13.802	6.5295	10.574			9.4588

Table E-7: (Continued).

	125P04979	125+04980	125P04980	125+04981	125P04981	125+04982	125P04982	125+04983	125P04983	125+04984	125P04984	125+04985	
0.0001	0.0070	0.0015	0.0155	0.0099	0.0093	0.0200	0.0136	0.0095	0.0094	0.0086	0.0073	0.0017	
0.05	0.9836	0.7627	1.0079	1.0225	1.0279	0.9562	1.0151	0.9834	0.9534	0.9329	0.9234	0.8571	
0.1	1.0133	1.0204	1.0676	1.0963	1.3497	0.9679	1.0529	1.0407	0.9833	0.9424	0.9378	1.0181	
0.15	1.0475	1.0348	1.2716	1.3999	1.6765	0.9836	1.0719	1.0607	1.0205	0.9679	0.9457	1.0345	
0.2	1.0638	1.0674	1.4453	1.8182	1.8191	0.9836	1.1336	1.0901	1.0345	0.9842	0.9570	1.0366	
0.25	1.0999	2.3728	1.6085	2.3641	1.9464	0.9839	1.1538	1.1066	1.0518	1.0000	0.9677	1.0453	
0.3	1.1226	2.8334	1.7692	2.5000	2.4182	0.9985	1.2145	1.1710	1.0612	1.0092	0.9679	1.0527	
0.35	1.2269	2.8655	1.9976	2.6432	2.6010	1.0000	1.4396	1.1944	1.0910	1.0403	0.9836	1.1237	
0.4	1.3043	2.8856	2.1720	2.9703	3.0000	1.0165	1.6808	1.2150	1.1225	1.0548	1.0098	1.3241	
0.45	1.4802	2.9311	2.3329	3.2000	3.2719	1.0280	1.8149	1.2996	1.1534	1.0636	1.0217	1.4663	
0.5	1.6086	3.2003	2.5732	3.4622	3.5381	1.0569	2.1760	1.4323	1.1715	1.0877	1.0331	1.4925	
0.55	1.7312	3.5242	3.0390	3.7975	3.7433	1.0714	2.3809	1.5227	1.2406	1.1098	1.0345	1.4945	
0.6	1.9715	3.7335	3.3411	4.0956	4.0346	1.1563	2.5700	1.6958	1.2788	1.1132	1.0526	1.5266	
0.65	2.5842	3.7929	3.8158	4.2918	4.1446	1.3253	2.7999	1.7390	1.3333	1.1346	1.0601	1.5879	
0.7	2.9142	3.8530	4.3833	4.9940	4.3479	1.5314	2.9310	1.8197	1.3591	1.1484	1.0711	1.6139	
0.75	3.0269	3.9214	4.9399	5.2534	4.6088	1.8225	3.0787	1.9452	1.3849	1.1622	1.0909	1.6188	
0.8	4.0000	4.0056	5.4707	5.8798	4.9978	2.1620	3.3129	2.0970	1.4286	1.1831	1.1036	1.6434	
0.85	4.3652	4.0303	5.9455	6.0000	5.6909	2.7389	3.4654	2.1548	1.4475	1.2035	1.1780	1.7389	
0.9	5.2364	4.0829	7.5502	6.8858	6.4655	3.4327	3.9900	2.2632	1.5590	1.2369	1.2245	1.8878	
0.95	5.6415	4.2536	9.1571	8.1947	8.2574	4.0149	4.4054	2.4336	1.6735	1.2868	1.2711	1.9336	
0.9999	6.5487	4.6317	11.524	11.921	10.674	5.3401	7.2922	2.7887	1.8263	1.5109	7.4972	2.2686	

Table E-8: Travel rate percentiles for all weather incident observations during all temporal intervals.

	125P04903	125+04904	125P04904	125+04986	125P04986	125+04987	125P04987	125+04988	125P04988	125+04989	125P04989	125+04990	125P04990	125+04991	125P04991	125+04978	125P04978	125+04979
0.0001	0.6534	0.4857	0.6714	0.5717	0.7182	0.6732	0.3782	0.8108	0.8208	0.7495	0.8000	0.7335	0.8000	0.4978	0.6974	0.8000	0.8000	0.4766
0.05	0.8713	0.8758	0.8772	1.0000	0.8824	0.8879	0.8955	0.9091	0.9221	0.9235	0.9091	0.9102	0.9072	0.8834	0.8929	0.8824	0.8903	0.9065
0.1	0.8955	0.8954	0.8960	1.0000	0.9091	0.9091	0.9204	0.9375	0.9435	0.9524	0.9231	0.9375	0.9252	0.9034	0.9175	0.9063	0.9098	0.9265
0.15	0.9091	0.9077	0.9098	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9684	0.9375	0.9524	0.9438	0.9153	0.9311	0.9231	0.9298	0.9421
0.2	0.9164	0.9133	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9665	0.9524	0.9231	0.9436	0.9325	0.9375	0.9524
0.25	0.9231	0.9231	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.3	0.9231	0.9231	0.9231	1.0000	0.9231	0.9231	0.9231	0.9524	0.9524	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.35	0.9231	0.9231	0.9231	1.0000	0.9231	0.9231	0.9346	0.9524	0.9524	0.9836	0.9409	0.9677	0.9677	0.9231	0.9524	0.9375	0.9375	0.9524
0.4	0.9231	0.9231	0.9231	1.0000	0.9231	0.9346	0.9375	0.9677	0.9524	0.9867	0.9524	0.9704	0.9677	0.9296	0.9524	0.9375	0.9524	0.9537
0.45	0.9231	0.9231	0.9231	1.0000	0.9231	0.9375	0.9375	0.9677	0.9524	1.0000	0.9524	0.9835	0.9677	0.9375	0.9524	0.9524	0.9524	0.9665
0.5	0.9231	0.9231	0.9231	1.0000	0.9231	0.9375	0.9375	0.9677	0.9524	1.0000	0.9524	0.9836	0.9677	0.9375	0.9524	0.9524	0.9524	0.9677
0.55	0.9231	0.9231	0.9240	1.0000	0.9288	0.9375	0.9375	0.9677	0.9677	1.0000	0.9524	0.9836	0.9677	0.9375	0.9524	0.9524	0.9524	0.9677
0.6	0.9233	0.9257	0.9375	1.0000	0.9375	0.9375	0.9498	0.9677	0.9715	1.0000	0.9615	0.9836	0.9677	0.9375	0.9583	0.9524	0.9524	0.9677
0.65	0.9319	0.9348	0.9402	1.0000	0.9420	0.9465	0.9524	0.9836	0.9836	1.0083	0.9677	0.9849	0.9775	0.9418	0.9677	0.9557	0.9677	0.9682
0.7	0.9375	0.9375	0.9523	1.0000	0.9524	0.9524	0.9615	0.9872	1.0000	1.0169	0.9804	0.9996	0.9836	0.9524	0.9757	0.9677	0.9715	0.9803
0.75	0.9403	0.9466	0.9574	1.0000	0.9560	0.9616	0.9677	1.0000	1.0000	1.0265	0.9843	1.0029	1.0000	0.9582	0.9836	0.9804	0.9836	0.9874
0.8	0.9523	0.9524	0.9677	1.0000	0.9677	0.9679	0.9836	1.0142	1.0169	1.0400	1.0000	1.0169	1.0121	0.9677	0.9996	0.9842	1.0000	1.0000
0.85	0.9596	0.9646	0.9836	1.0000	0.9831	0.9836	1.0000	1.0276	1.0345	1.0539	1.0169	1.0345	1.0276	0.9836	1.0165	1.0000	1.0169	1.0169
0.9	0.9811	0.9819	1.0000	1.0000	0.9991	1.0000	1.0169	1.0526	1.0708	1.0909	1.0384	1.0526	1.0526	1.0036	1.0417	1.0345	1.0526	1.0448
0.95	1.0209	1.0226	1.0485	1.0000	1.0355	1.0526	1.0871	1.1321	1.1779	1.2050	1.1111	1.1111	1.1071	1.0714	1.1497	1.1534	1.1538	1.1653
0.9999	2.9147	2.3316	3.3333	1.0000	8.8528	5.3498	10.822	6.9363	10.207	9.9456	14.527	8.1917	8.1837	9.7266	16.948	21.119	17.215	9.8283

Table E-8: (Continued).

	125P04979	125+04980	125P04980	125+04981	125P04981	125+04982	125P04982	125+04983	125P04983	125+04984	125P04984	125+04985	
0.0001	0.8000	0.8000	0.7639	0.8000	0.8009	0.7141	0.8108	0.8009	0.8091	0.6730	0.8000	0.8000	
0.05	0.9038	0.9091	0.9204	0.9231	0.9239	0.9264	0.9375	0.9231	0.9156	0.9063	0.9091	0.8955	
0.1	0.9231	0.9334	0.9524	0.9660	0.9525	0.9524	0.9677	0.9524	0.9375	0.9318	0.9292	0.9202	
0.15	0.9419	0.9524	0.9720	0.9836	0.9836	0.9677	0.9836	0.9677	0.9524	0.9496	0.9524	0.9375	
0.2	0.9524	0.9677	0.9869	1.0012	1.0000	0.9836	0.9944	0.9901	0.9524	0.9646	0.9524	0.9524	
0.25	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9524	0.9524	
0.3	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9524	0.9524	
0.35	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9524	0.9677	0.9524	0.9524	
0.4	0.9524	0.9677	1.0000	1.0169	1.0169	0.9836	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.45	0.9677	0.9836	1.0000	1.0345	1.0169	0.9836	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.5	0.9677	0.9836	1.0000	1.0345	1.0169	0.9836	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.55	0.9677	0.9836	1.0000	1.0345	1.0169	0.9836	1.0000	1.0000	0.9677	0.9677	0.9677	0.9524	
0.6	0.9677	0.9836	1.0007	1.0345	1.0169	0.9876	1.0000	1.0000	0.9689	0.9687	0.9677	0.9677	
0.65	0.9677	0.9836	1.0169	1.0345	1.0345	1.0000	1.0012	1.0169	0.9836	0.9836	0.9677	0.9677	
0.7	0.9836	1.0000	1.0345	1.0526	1.0357	1.0047	1.0169	1.0169	0.9868	0.9967	0.9836	0.9836	
0.75	0.9937	1.0116	1.0499	1.0714	1.0526	1.0169	1.0252	1.0345	1.0000	1.0000	0.9836	0.9934	
0.8	1.0077	1.0299	1.0653	1.0909	1.0714	1.0337	1.0345	1.0499	1.0142	1.0168	1.0000	1.0000	
0.85	1.0335	1.0421	1.0909	1.1111	1.0909	1.0385	1.0526	1.0631	1.0345	1.0214	1.0169	1.0169	
0.9	1.0603	1.0753	1.1367	1.1442	1.1321	1.0714	1.0883	1.0909	1.0526	1.0360	1.0345	1.0417	
0.95	1.2110	1.2245	1.2972	1.2308	1.2000	1.1534	1.1654	1.1538	1.0909	1.0898	1.0714	1.0815	
0.9999	12.061	12.236	11.328	6.8313	7.2906	5.6165	5.5089	3.5089	2.8571	2.8348	3.1573	6.6208	

Table E-9: Travel rate distribution for combined incident and weather incidents during all temporal intervals.

	125P04903	125+04904	125P04904	125+04986	125P04986	125+04987	125P04987	125+04988	125P04988	125+04989	125P04989	125+04990	125P04990	125+04991	125P04991	125+04978	125P04978	125+04979
0.0001		0.0005	0.0013	0.0005	0.0012	0.0004		0.0010	0.0009	0.0052	0.0072	0.0056	0.0190	0.0068	0.0092			0.0034
0.05		0.2615	0.6404	0.2500	0.5928	0.1962		0.5124	0.4509	0.9265	0.9091	0.9091	0.8950	0.8853	0.9061			0.9538
0.1		0.5230	1.2808	0.5000	1.0378	0.3924		1.0249	0.9018	0.9535	0.9146	0.9108	0.9093	0.9091	0.9481			0.9673
0.15		0.7844	1.9213	0.7500	1.1874	0.5887		1.5373	1.1745	0.9618	0.9231	0.9186	0.9258	0.9130	0.9524			0.9789
0.2		1.0459	2.5617	1.0000	1.2604	0.7849		2.0497	1.2691	0.9764	0.9285	0.9246	0.9409	0.9222	0.9524			0.9890
0.25		1.0531	2.7618	1.0000	1.2950	0.9811		2.3489	1.3636	0.9836	0.9375	0.9524	0.9524	0.9231	0.9524			0.9967
0.3		1.0602	2.9619	1.0000	1.3891	1.1773		2.6481	1.6588	0.9836	0.9375	0.9613	0.9662	0.9231	0.9524			1.0218
0.35		1.0674	3.1620	1.0000	1.4546	1.3219		2.9473	1.9541	0.9836	0.9375	0.9677	0.9677	0.9231	0.9524			1.0981
0.4		1.0746	3.3621	1.0000	1.4630	1.3630		3.2466	2.1948	0.9836	0.9375	0.9677	0.9677	0.9320	0.9563			1.2461
0.45		1.1250	3.3994	1.0000	1.6033	1.4041		3.2682	2.3810	0.9836	0.9524	0.9677	0.9677	0.9419	0.9699			1.8300
0.5		1.1753	3.4368	1.0000	1.8098	1.4453		3.2899	2.5673	0.9836	0.9588	0.9677	0.9677	0.9532	0.9797			2.3879
0.55		1.2257	3.4742	1.0000	1.9367	1.4864		3.3116	2.5709	0.9836	0.9677	0.9680	0.9677	0.9673	1.0078			2.9868
0.6		1.2761	3.5115	1.0000	2.0260	1.5275		3.3333	2.5745	0.9836	0.9872	0.9834	0.9677	0.9786	1.0222			3.3587
0.65		1.2891	3.6508	1.0000	2.0399	1.5687		3.4932	2.5951	0.9888	1.0000	0.9836	0.9740	1.0091	1.0346			5.8079
0.7		1.3021	3.7900	1.0000	2.1204	1.5973		3.6531	2.6329	1.0156	1.0101	0.9983	0.9892	1.0169	1.1321			6.3538
0.75		1.3150	3.9293	1.0000	2.2344	1.6195		3.8130	2.6707	1.0169	1.0169	1.0247	1.0151	1.0345	1.3170			6.8642
0.8		1.3280	4.0685	1.0000	3.0909	1.6418		3.9728	2.7466	1.0247	1.0274	1.0345	1.0169	2.9640	2.1918			7.1488
0.85		1.3346	4.2959	1.0000	4.3166	1.6641		4.3908	2.8224	1.0436	1.0345	1.0559	1.0345	3.5583	4.3315			7.3935
0.9		1.3412	4.5232	1.0000	6.2803	1.6864		4.8088	3.4701	1.0942	1.0453	1.0840	1.0526	4.6266	6.9110			8.0346
0.95		1.3478	4.7505	1.0000	8.1549	1.7087		5.2268	4.6895	1.6542	1.0961	1.2770	1.1277	6.6173	11.142			8.8601
0.9999		1.3544	4.9774	1.0000	9.9812	1.7310		5.6439	5.9064	2.0733	1.4246	2.7482	6.1882	8.2626	16.059			11.596

Table E-9: (Continued).

	125P04979	125+04980	125P04980	125+04981	125P04981	125+04982	125P04982	125+04983	125P04983	125+04984	125P04984	125+04985	
0.0001	0.0030	0.0022	0.0023	0.0016	0.0019	0.0018	0.0018	0.0011	0.0011			0.0001	
0.05	0.9091	0.8955	0.9091	0.8194	0.9375	0.8883	0.8778	0.5357	0.5282			0.0577	
0.1	0.9591	0.9255	0.9463	1.1990	1.8750	1.7767	0.9799	1.0714	1.0563			0.1154	
0.15	0.9810	0.9647	0.9839	1.2480	1.8750	1.7974	1.0086	1.1740	1.1282			0.1731	
0.2	1.0143	0.9988	0.9883	1.2918	1.8750	1.8182	1.0225	1.2766	1.2000			0.2308	
0.25	1.0226	1.0165	1.0206	1.3043	1.8750	1.8182	1.0257	1.2766	1.2000			0.2885	
0.3	1.0501	1.0302	1.0520	1.3964	1.8750	1.8182	1.0303	1.2766	1.2000			0.3462	
0.35	1.1195	1.0388	1.0730	1.7187	1.8750	1.8182	1.0349	1.2766	1.2000			0.4038	
0.4	1.2138	1.0909	1.0782	1.7647	1.8750	1.8182	1.0638	1.2766	1.2000			0.4615	
0.45	1.5333	1.1036	1.1283	1.7647	1.8750	1.8341	1.1786	1.2766	1.2000			0.5192	
0.5	1.6141	1.1618	1.1803	1.7647	1.8750	1.8500	1.2000	1.2766	1.2000			0.5769	
0.55	1.6929	1.7070	1.5720	1.7647	1.8750	2.0770	1.4618	1.2766	1.2000			0.6346	
0.6	1.8239	3.0000	1.9115	1.7647	1.8750	2.3039	1.4982	1.2766	1.2000			0.6923	
0.65	1.9103	3.0000	2.0240	1.7647	1.8750	2.3070	1.5000	1.6060	1.3924			0.7500	
0.7	2.0548	3.0000	2.1342	1.7647	1.8750	2.3101	1.5000	1.9355	1.5848			0.8077	
0.75	2.5453	3.0000	2.1429	1.7647	1.8750	2.6011	1.5259	2.0174	1.6495			0.8654	
0.8	3.4035	3.0000	2.9059	1.7647	1.8750	2.8921	1.7745	2.0994	1.7143			0.9231	
0.85	3.8249	3.0000	3.0000	1.7647	1.8750	2.9508	2.4495	2.7164	1.7143			0.9808	
0.9	4.1528	3.0196	3.0587	1.7647	1.8750	3.0095	3.2682	3.3333	1.7143			1.0385	
0.95	5.9867	3.4792	3.2600	1.7647	1.8750	3.0301	3.3770	3.3333	1.7143			1.0962	
0.9999	7.7178	3.6292	3.3333	1.7647	1.8750	3.0506	3.5291	3.3333	1.7143			1.1537	

Appendix F: Route Travel Rate Data

Table F-1: Route 1 Westbound (I-540 and US 1/Capital Blvd. to I-40 and Davis Dr. RTP) key percentiles

	All Intervals	Unflagged	Flagged	AM Peak	PM Peak	Weekend
0.0001	0.0000	0.0000	0.8520	0.8470	0.8425	0.8446
0.05	0.9179	0.9154	0.9276	0.9080	0.9122	0.9270
0.1	0.9310	0.9299	0.9370	0.9197	0.9231	0.9375
0.15	0.9370	0.9359	0.9421	0.9265	0.9293	0.9423
0.2	0.9408	0.9400	0.9470	0.9308	0.9338	0.9463
0.25	0.9441	0.9431	0.9508	0.9346	0.9371	0.9494
0.3	0.9476	0.9459	0.9552	0.9376	0.9399	0.9532
0.35	0.9508	0.9489	0.9595	0.9407	0.9425	0.9573
0.4	0.9547	0.9523	0.9624	0.9438	0.9454	0.9604
0.45	0.9585	0.9561	0.9625	0.9475	0.9485	0.9623
0.5	0.9620	0.9597	0.9625	0.9515	0.9511	0.9625
0.55	0.9625	0.9625	0.9625	0.9561	0.9544	0.9625
0.6	0.9625	0.9625	0.9628	0.9611	0.9579	0.9625
0.65	0.9625	0.9625	0.9655	0.9667	0.9618	0.9629
0.7	0.9630	0.9626	0.9712	0.9760	0.9656	0.9648
0.75	0.9668	0.9656	0.9858	0.9890	0.9706	0.9675
0.8	0.9749	0.9722	1.0006	1.0041	0.9801	0.9724
0.85	0.9900	0.9864	1.0148	1.0275	0.9920	0.9887
0.9	1.0045	0.9994	1.0453	1.0842	1.0035	1.0004
0.95	1.0244	1.0170	1.2477	1.2832	1.0178	1.0152
0.9999	4.1514	2.0237	5.0264	5.0511	2.9947	1.7252

Table F-2: Route 1 Eastbound (I-40 and Davis Dr. to I-540 and US 1) key percentiles

	All Intervals	Unflagged	Flagged	AM Peak	PM Peak	Weekend
0.0001	0.8935	0.9051	0.7933	0.0000	0.7918	0.8213
0.05	0.9985	0.9987	1.0014	0.9880	0.9917	0.9988
0.1	1.0098	1.0097	1.0136	0.9985	1.0036	1.0098
0.15	1.0168	1.0166	1.0227	1.0083	1.0113	1.0189
0.2	1.0219	1.0215	1.0336	1.0127	1.0160	1.0268
0.25	1.0271	1.0262	1.0437	1.0159	1.0201	1.0373
0.3	1.0359	1.0335	1.0499	1.0184	1.0240	1.0444
0.35	1.0429	1.0409	1.0558	1.0209	1.0293	1.0494
0.4	1.0475	1.0455	1.0610	1.0235	1.0371	1.0538
0.45	1.0514	1.0493	1.0644	1.0264	1.0434	1.0578
0.5	1.0554	1.0528	1.0665	1.0312	1.0482	1.0614
0.55	1.0591	1.0565	1.0692	1.0394	1.0530	1.0639
0.6	1.0627	1.0600	1.0732	1.0441	1.0581	1.0658
0.65	1.0656	1.0631	1.0794	1.0473	1.0640	1.0677
0.7	1.0682	1.0658	1.0798	1.0503	1.0715	1.0704
0.75	1.0723	1.0687	1.0837	1.0533	1.0847	1.0755
0.8	1.0793	1.0734	1.0993	1.0566	1.1154	1.0794
0.85	1.0795	1.0794	1.2410	1.0605	1.2786	1.0798
0.9	1.0838	1.0797	1.3903	1.0657	1.3920	1.0809
0.95	1.1118	1.0857	1.6509	1.0776	1.6397	1.0858
0.9999	3.7414	1.5449	4.7183	3.3330	4.7194	2.2446

Table F-3: Route 2 Westbound (I-40 and Davis Dr. to I-440 and US 64 Bus) key percentiles.

	All Intervals	Unflagged	Flagged	AM Peak	PM Peak	Weekend
0.0001	0.8985	0.9005	0.5435	0.5479	0.6929	0.8940
0.05	0.9398	0.9398	0.9398	0.9346	0.9381	0.9423
0.1	0.9462	0.9461	0.9469	0.9397	0.9443	0.9508
0.15	0.9509	0.9507	0.9522	0.9434	0.9487	0.9555
0.2	0.9543	0.9541	0.9560	0.9475	0.9527	0.9587
0.25	0.9571	0.9570	0.9585	0.9510	0.9563	0.9615
0.3	0.9597	0.9595	0.9612	0.9541	0.9599	0.9640
0.35	0.9623	0.9621	0.9637	0.9571	0.9640	0.9669
0.4	0.9647	0.9645	0.9665	0.9602	0.9697	0.9685
0.45	0.9675	0.9674	0.9683	0.9641	0.9758	0.9704
0.5	0.9696	0.9695	0.9703	0.9694	0.9809	0.9706
0.55	0.9706	0.9706	0.9707	0.9758	0.9861	0.9714
0.6	0.9726	0.9725	0.9731	0.9829	0.9923	0.9736
0.65	0.9766	0.9765	0.9774	0.9902	1.0123	0.9765
0.7	0.9821	0.9819	0.9829	1.0045	1.0326	0.9810
0.75	0.9878	0.9876	0.9893	1.0333	1.0597	0.9862
0.8	0.9948	0.9942	1.0029	1.0561	1.1257	0.9904
0.85	1.0262	1.0252	1.0322	1.1115	1.2384	0.9992
0.9	1.0462	1.0455	1.0504	1.2369	1.4829	1.0322
0.95	1.1630	1.1612	1.1777	1.5134	2.1048	1.0515
0.9999	4.6769	4.4241	4.8635	4.4168	4.8220	2.7146

Table F-4: Route 2 Eastbound (I-440 and US 64 Bus to I-40 and Davis Dr.) key percentiles.

	All Intervals	Unflagged	Flagged	AM Peak	PM Peak	Weekend
0.0001	0.8911	0.8904	0.8941	0.5386	0.7356	0.8878
0.05	0.9430	0.9419	0.9487	0.9307	0.9481	0.9473
0.1	0.9501	0.9490	0.9566	0.9376	0.9550	0.9555
0.15	0.9546	0.9534	0.9623	0.9416	0.9602	0.9604
0.2	0.9585	0.9570	0.9669	0.9454	0.9649	0.9638
0.25	0.9615	0.9600	0.9709	0.9484	0.9701	0.9667
0.3	0.9643	0.9627	0.9742	0.9510	0.9760	0.9695
0.35	0.9671	0.9651	0.9760	0.9532	0.9831	0.9718
0.4	0.9697	0.9677	0.9792	0.9554	0.9943	0.9737
0.45	0.9723	0.9701	0.9852	0.9576	1.0127	0.9749
0.5	0.9746	0.9724	0.9963	0.9597	1.0531	0.9752
0.55	0.9754	0.9745	1.0114	0.9618	1.1284	0.9766
0.6	0.9777	0.9753	1.0440	0.9641	1.2106	0.9783
0.65	0.9807	0.9773	1.1886	0.9667	1.3301	0.9809
0.7	0.9854	0.9798	1.3514	0.9696	1.4860	0.9840
0.75	0.9924	0.9838	1.5470	0.9730	1.7150	0.9878
0.8	1.0026	0.9893	1.8161	0.9774	1.9875	0.9942
0.85	1.0174	0.9981	2.2020	0.9842	2.4067	1.0024
0.9	1.0896	1.0080	2.7097	0.9959	2.8587	1.0097
0.95	1.6189	1.0307	3.2056	1.0387	3.2156	1.0310
0.9999	6.7611	2.4538	7.3019	6.6969	5.5469	4.2102