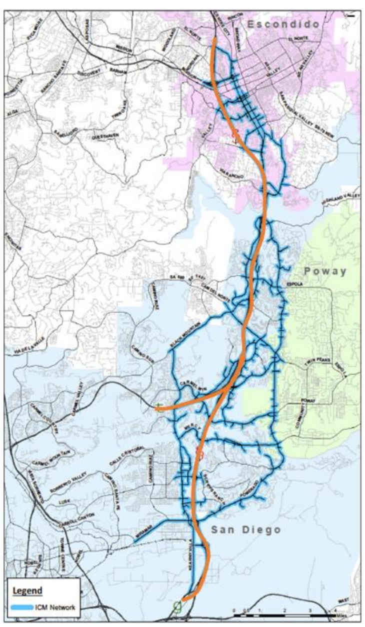
Analysis, Modeling, and Simulation (AMS) Testbed Development and Evaluation to Support Dynamic Mobility Applications (DMA) and Active Transportation and Demand Management (ATDM) Programs

San Diego Testbed Analysis Plan



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16. Abstract

The primary objective of this project is to develop multiple simulation Testbeds/transportation models to evaluate the impacts of DMA connected vehicle applications and the active and dynamic transportation management (ATDM) strategies. The outputs (modeling results) from this project will help USDOT prioritize their investment decisions for DMA and ATDM programs.

The primary purpose of this report is to document the Analysis Plan for AMS San Diego Testbed. The report expands on detailed testbed description including the geographic location, modes, operational conditions and cluster analysis details. In addition, the plan also provides details on the analysis scenarios, DMA/ATDM applications and strategies that are evaluated using the Testbed and the plan to answer DMA/ATDM-specific research questions. The analysis plan provides details on the evaluation approach used to answer specific research questions.

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Chapter 1. Introduction

The United States Department of Transportation (USDOT) initiated the Active Transportation and Demand Management (ATDM) and the Dynamic Mobility Applications (DMA) programs to achieve transformative mobility, safety, and environmental benefits through enhanced, performance-driven operational practices in surface transportation systems management. In order to explore a potential transformation in the transportation system's performance, both programs require an Analysis, Modeling, and Simulation (AMS) capability. Capable, reliable AMS Testbeds provide valuable mechanisms to address this shared need by providing a laboratory to refine and integrate research concepts in virtual computer-based simulation environments prior to field deployments.

The foundational work conducted for the DMA and ATDM programs revealed a number of technical risks associated with developing an AMS Testbed which can facilitate detailed evaluation of the DMA and ATDM concepts. Therefore, instead of selecting a single Testbed, it is desirable to identify a portfolio of AMS Testbeds and mitigate the risks posed by a single Testbed approach by conducting the analysis using more than an "optimal" number of Testbeds, reduces the resources available to enhance or improve the Testbeds to address the gaps. At the conclusion of the AMS Testbed selection process, four (4) AMS Testbeds were initially selected to form a diversified portfolio to achieve rigorous DMA bundle and ATDM strategy evaluation: San Mateo (US 101), San Diego, ICM Dallas and Phoenix Testbeds. In addition, the AMS Testbed Team added ICM San Diego Testbed and the Chicago Testbed to the selected Testbeds to be able to cover the overall scope of the project and to further the research answers of the project. The analysis plan describes the overall approach for modeling and evaluating the impacts of DMA bundles and ATDM strategies. In addition, the analysis plan helps to test the hypotheses of the DMA and ATDM Programs and evaluate the implementation's costs of their applications.

The primary purpose of this report is to document the analysis plan approach for the San Diego Testbed. The San Diego Testbed facility comprises of the interstate I-15 and associated parallel arterials and extends from the interchange with SR 78 in the north to the interchange with Balboa Avenue. It includes the cities of Escondido, Poway, and San Diego. This Testbed will be used to test ATDM strategies including Predictive Traveler Information, Dynamic HOV/Managed Lanes, Dynamic Routing, Dynamic Speed Limits and Dynamic Merge Control as well as DMA application bundles including: INFLO (queue warning, speed harmonization, cooperative adaptive cruise control) and MMITSS bundles. The Testbed will integrate third party software implementing these strategies and applications, with a general data bus to link all systems as well as AIMSUN-based network serving the virtual reality.

This report is organized into ten chapters in addition to the Appendix as follows:

- Chapter 1 – Introduction: This chapter presents the report overview and objectives of the analysis plan.
- Chapter 2 – Testbed Description: This chapter presents the regional characteristics of the Testbed (e.g., geographic characteristic) and the proposed operational conditions. It also expands on the current testbed modeling capabilities.
- Chapter 3 – Analysis Hypotheses: This chapter identifies the DMA/ATDM hypotheses that will be tested by the Testbed. The hypotheses to be tested will, in many cases, determine the analysis approach and the operational scenarios to be considered for the specific Testbed.

- Chapter 4 – Analysis Scenarios: This chapter describes the analysis scenarios (combination of operational conditions and alternatives) to be evaluated. The description will include demand considerations, vehicle type mix and characteristics, presence and severity of incidents, traveler characteristics, user acceptance rates (key consideration), and others. This chapter also expands on the performance measures used in the evaluation, the phases of analysis as well as the specific research questions that are answered.
- Chapter 5 – Data Needs and Availability: This chapter illustrates the data needs and gaps for the Testbed. In addition, this chapter will provide a detailed plan for data collection and data mining to fill the identified gaps.
- Chapter 6 – Key Assumptions and Limitations: This chapter identifies assumptions and limitations that are foreseen as of now. This chapter will evolve as analysis proceeds between different phases.
- Chapter 7 – Modeling Approach: This chapter details the modeling approach to test the hypothesis and generate performance measure statistics to compare alternatives and thus evaluate them.
- Chapter 8 – Model Calibration: This chapter outlines the calibration approach and criteria. It is especially important to establish a consistent calibration approach and criteria across multiple Testbeds in order to effectively compare and combine the results.
- Chapter 9 – Evaluation Approach: This chapter presents the system evaluation plan to answer the DMA/ATDM research questions based on the analysis conducted and the sensitivity analysis.
- Chapter 10 – Execution Plan: This chapter presents the proposed schedule, budget and resources required to complete the analysis, and key roles and responsibilities of team members.

Chapter 2. Testbed Description

2.1 Regional Conditions

This section details the geography, the demographic characteristics, the transportation system elements, and existing supply and demand characteristics of San Diego.

2.1.1 Geography and Demographics

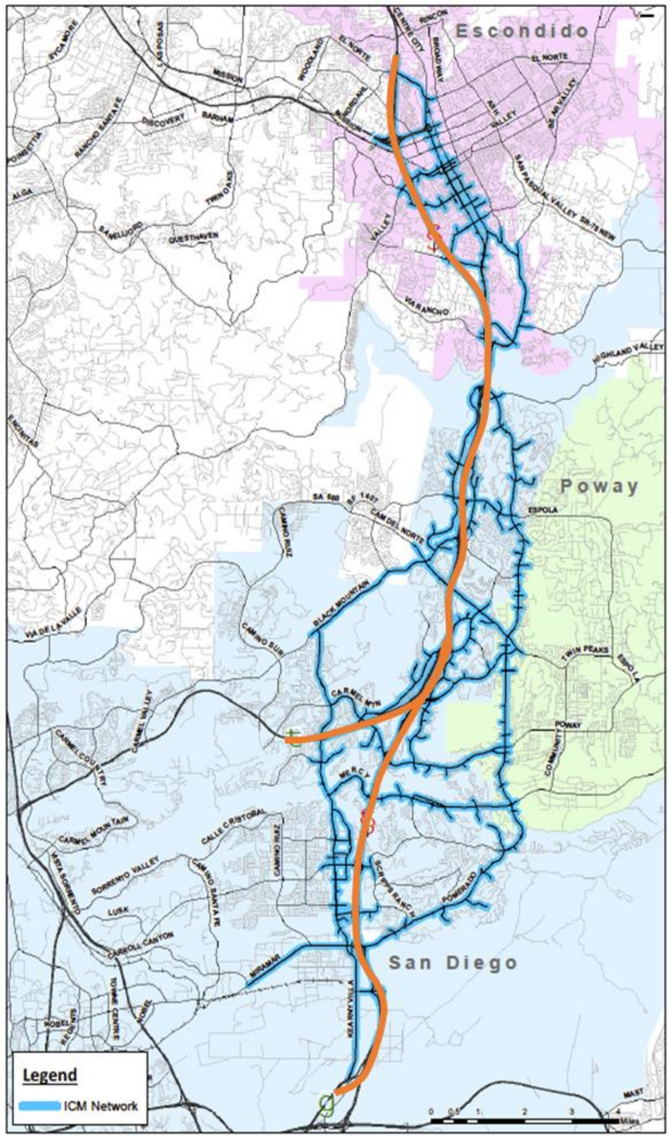

Figure 2-1: San Diego Testbed Geographic Extent [Source: TSS]

The San Diego Testbed facility comprises of a 22 mile stretch of interstate I-15 and associated parallel arterials and extends from the interchange with SR 78 in the north to the interchange with Balboa Avenue as shown in Figure 2-1. The current I-15 corridor operates with both general-purpose (GP) lanes and four express lanes from the Beethoven Drive DAR to the southern extent of the model. The express lanes are currently under construction from Beethoven Drive to SR-78 and will only be included in the future models. These lanes currently run with two northbound lanes and two southbound lanes and are free to vehicles travelling with two or more passengers in the car (High-Occupancy Vehicles, or HOVs); they also allow Single Occupancy Vehicles (SOV) to use the lanes for a fee, using a variable toll price scheme making them High Occupancy Tolled (HOT) lanes. In addition, it is possible to change the lane configuration of the express lanes with the use of barrier transfer (zipper) vehicles and the Reversible Lane Changing System (RLCS). The entry to the GP lanes is managed during the morning and evening peak hours throughout the corridor by the Ramp Metering Information System (RMIS) that has localized ramp meters running the San Diego Ramp Metering System algorithm. Along the arterials there are two corridors, which are running a Traffic Light Synchronization Program (TLSP) that allows for the use of a more responsive coordinated directional approach to manage the traffic in the peak directions. The TLSP corridors use an algorithm to step through the available timing plans to apply the appropriate plan for the corridor to handle the level of flow.

2.1.2 Transportation System

2.1.2.1 Roadways

The San Diego I-15 network currently includes 3 roadway classes, as well as a number of secondary roadways. The major roadways are arterials, freeways and the Manage Use Lanes (MULs), and the secondary type of roadways includes minor arterials, ramps, and driveways/centroid connectors. These classifications were initially set based on the SANDAG San Diego regional model's link functional class attributes and were updated through the initial calibration effort. Table 2-1 lists the different types and some key attributes associated with them.

Table 2-1: Roadway Type Attributes

Road Type	Number of Links	Lane Miles (miles)	Speed Limit Range (mph)
Dedicated-HOV-link	268	120.5	65-70
On-Ramp	157	32.5	30-50
Off-Ramp	101	35.3	30-50
Freeway	345	305.7	65-70
Arterial	1297	434.6	35-55
Local	1213	186.3	25-45

2.1.2.2 Travel Modes

The San Diego Testbed is a vehicle trip based model and does not represent travel modes that are not vehicle based. The different types of modes can be divided by those trips that can access the managed lanes for free (HOV & Bus); those that can enter for a toll (SOV + toll) and those that can't use the managed lanes (all other vehicles).

2.1.2.3 Types of Vehicles Included in the Testbed

The San Diego Testbed model includes 10 different vehicle types that originated from the SANDAG San Diego regional model's trip tables. These vehicles types are as follows:

- Single Occupancy Vehicle (SOV) + Toll;
- Single Occupancy Vehicle (SOV) + No Toll;
- High Occupancy Vehicle (HOV);
- Light Truck + Toll;
- Light Truck + No Toll;
- Medium Truck + Toll;
- Medium Truck + No Toll;
- Heavy Truck + Toll;
- Heavy Truck + No Toll;
- Bus;

The SOV + toll represents the vehicles that can enter the managed lanes but are required to pay a toll. All trucks and SOVs which belong to the "No Toll" vehicle types cannot enter the managed lanes within the corridor unless an open to all message is being displayed on the Variable Message Signs. HOV and Buses always have access to the managed lanes.

Metered ramp locations are illustrated in the following figure; in total there are 31 metered locations in the field in the testbed network.

2.1.2.4 ITS and Infrastructure Condition

The San Diego Testbed corridor was initially selected for Integrated Corridor Management (ICM) due to the availability of advanced ITS and infrastructure capabilities. The following lists the type of devices deployed along the corridor that are used as part of the ICM system and will be instrumental to the AMS testbed evaluation:

- 32+ Dynamic Message Signs and Variable Message Signs operated by CALTRANS;
- 42+ Ramp Metering Stations operated by CALTRANS;
- 140+ Mainline and Ramp Vehicle Detection Stations (VDS)
- 260+ Signalized intersections controlled by a Regional Arterial Management System;
- Variable Congestion Pricing with the Managed Lanes System;
- Arterial Detectors at various locations within the City of San Diego, Escondido and Poway;

Some of the Infrastructures elements also found within the corridor that also impact the operational conditions are:

- Managed Use Lane (MUL) system with a zipper vehicle for variable lane configurations;
- Direct Access Ramps (DAR) that allow vehicles to avoid the general purpose lanes and to access the MULs directly;
- Bus Rapid Transit (BRT) system that uses the MULs, and DARs to access dedicated 5 BRT stations along the corridor;

All of these systems have been combined within the ICM system and are part of the data that is stored in the ICM Data Hub.

2.1.3 Existing Traffic Conditions

The San Diego Testbed network was originally extracted from the SANDAG regional model to enhance the details of the network to be used to analyze operational conditions on a microscopic simulation level. Figure 2-2 shows the relationship of the testbed network to the regional model. The existing conditions of the San Diego Testbed network are summarized in Table 2-2 which shows the Vehicle Miles Traveled (VMT), Vehicle Hours Traveled (VHT) and total demand in (vehicles).

During the AM Peak period and the PM Peak period, as shown by the VHT when compared to the Inter Peak, the corridor exhibits a significant level of congestion. This results in queuing and congestion along the I-15 corridor in the South-bound direction in the AM and in the North-bound direction in the PM.

Table 2-2: Existing Conditions

Period	Time Period	VMT	VHT	Total Demand
AM Peak	6:00am-10:00am	2,621,849	60,894	378,000
PM Peak	3:00pm-7:00pm	3,197,581	77,974	494,450
Inter Peak	10:00am-2:00pm	1,837,553	37,993	304,850

The weather in San Diego is consistently dry for most of the year and hence is considered as a rare condition. For example, there have been stretches of greater than 9 months without rain. Therefore, only dry weather condition is included for the San Diego Testbed.

2.2 Operational Conditions

An operational condition is a specific combination of travel/traffic conditions, including: demand level, incident and other planned disruptions. Operational conditions identified for the San Diego area will represent the most frequently occurring conditions identified from field data. The ICM Evaluation Team has already conducted cluster analysis using observed data to identify conditions (or days) with similar characteristics, in terms of traffic demand, travel times, incidents and their frequency of occurrence. The AMS Team will utilize this analysis to develop optimum number of clusters and the corresponding representative day for calibrating the network. The team will use inputs from SANDAG and other stakeholders to identify the four top representative clusters and then identify one representative day for each of these using the shortest Euclidean distance demonstrated by the day from the cluster centroid.

The cluster analysis identified different clusters for AM-peak, mid-day and PM-peak time-slices. The team will identify representative days that match the cluster centroid for AM-peak and PM-peak and will be used to calibrate the operational conditions.

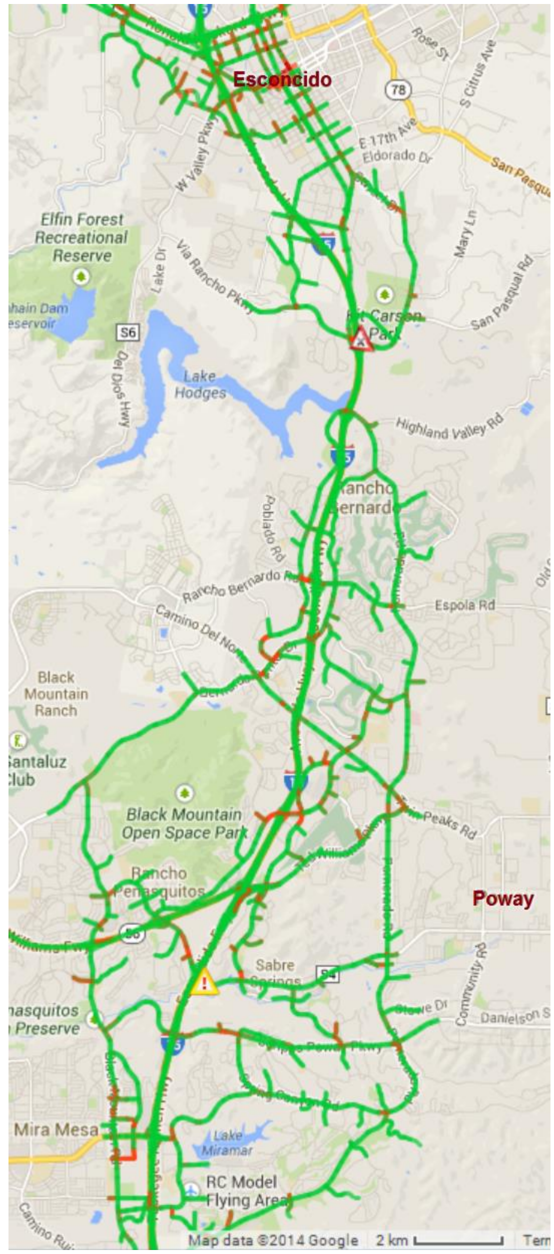

Figure 2-2: I-15 Extracted Corridor [Source: SANDAG]

2.2.1 Data Needs for Cluster Analysis

In general, there are three types of data needed for conducting the cluster analysis and identifying the prevalent operational conditions:

1. Type 1 data represents the underlying phenomena, i.e., data which are used as input to simulation models (e.g., traffic flows).
2. Type 2 data considers the non-recurring measurements (e.g., incident and work-zone data).
3. Type 3 data characterizes the system outcomes in terms of specific measures (e.g., travel time) in order to perform the cluster analysis.

For the San Diego AMS Testbed, the data collection effort will leverage the data feeds available as part of the ICMS project. These feeds will provide data for counts, transit and operations. As part of the ICMS project, a data collection plan was developed that details the information available on the existing data collection efforts and sources. Although it is not expected that new field data would need to be collected, the team will work with SANDAG to determine the best way to collect or assemble any new datasets that might be needed for calibration of the network and validation of some existing ATDM strategies.

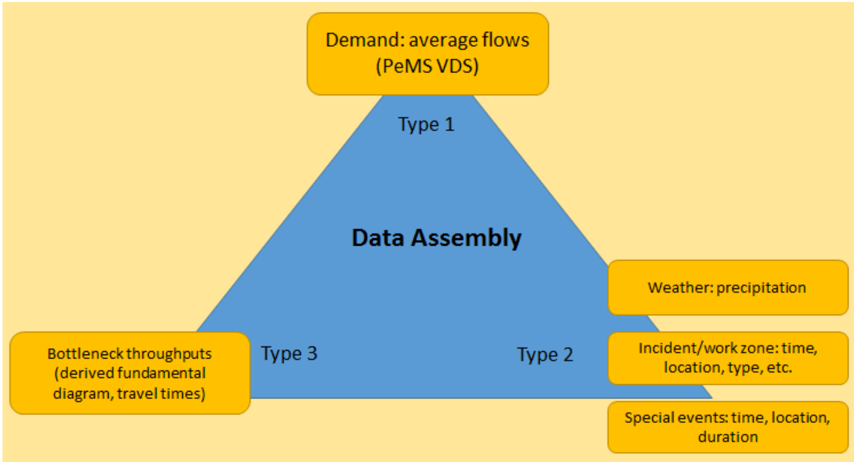

Figure 2-3: Data Assembly Components [Source: TSS]

The ICM San Diego demonstration project uses PeMS (Performance Measures System) for real-time monitoring. PeMS has recently been extended to Arterial-PeMS (aPeMS) and Transit-PeMS (tPeMS) to include real-time analysis of data collected from other domains of transportation system. The ICM system for San Diego uses an improvement of PeMS, called 3-PeMS, which includes aPeMS and tPeMS along with the traditional PeMS. 3-PeMS will support integration of data collected from different modes to support real-time multimodal analysis. Macroscopic and microscopic analysis tools are interfaced within the ICM San Diego AMS framework[1]. These platforms use real-time data to estimate trip tables and travel times across the network.

The current data sources used in San Diego Cluster Analysis are:

- **Caltrans Performance Measures System (PeMS)** - PeMS can provide a wealth of freeway data and will be used to collect speed, occupancy, and volumes for over 60 mainline locations. Furthermore, volume data for most on and off ramps throughout the network are available.
- **The Regional Arterial Management System (RAMS)** – The RAMS provides signal data for the City of San Diego, City of Escondido, City of Poway and Caltrans. This data provides both signal timing inventories and traffic volumes for approximately 100 approaches within the network.
- **The Ramp Metering Information System (RMIS)** – The RMIS system provides current ramp operations as well as enhancement of on-ramp count data.
- **The Congestion Pricing System (CPS)** – The CPS system provides the tolls and volumes for the Managed lanes along the I-15 corridor.
- **The Regional Transit Management System (RTMS)** – The RTMS system provides bus route inventories and the bus locations and travel times.
- **Internet aerial sites (Google Earth, and Bing satellite images)** will be used to verify roadway geometry from the models. Furthermore, as part of the ICM updates, field visits will be leveraged to ensure the geometry of the network is correct and up to date.

2.2.1.1 Type 1: Data to Represent Underlying Phenomena

In order to represent the underlying phenomena, historical data has been collected from the underlining systems listed above. In the most recent update, data from January 2015 to May 2015 has been collected. This data is used to build the corresponding pattern or demand data for the typical Mondays, Tuesday/Thursday, Wednesday and Fridays (previously 2013 data was used and is still used for Weekends and holidays). As each source data has a different time slice the data is aggregated to

[1] Integrated Corridor Management I-15 San Diego, California - Analysis Plan, FHWA-JPO-10-039

represent 5-minute data sets, and is mapped to show the statistical trends. Figure 4 shows a sample of the data mapping for a sample detector station.

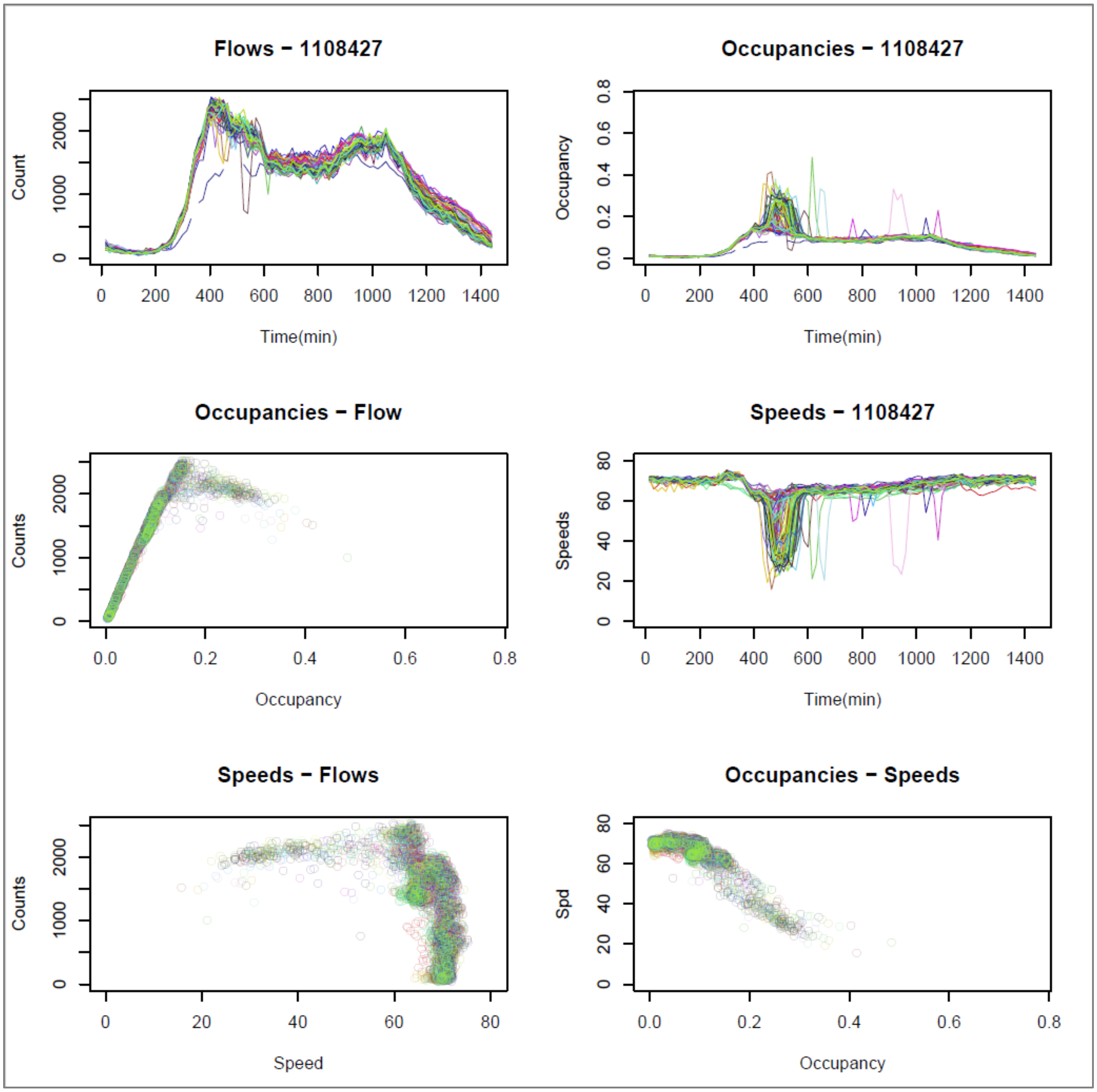

Figure 2-4: Station 1108427 – Flows, Occupancy, and Speed Graphs [Source: TSS]

With each station mapped several filters are applied to the data and any location with errant or no data is discarded from the set. Examples of errant locations are as follows:

- Data gaps, consecutive days or periods with 0 data values;
- Missing data points (some locations do not cover all lanes of traffic;
- Visual anomalies;

Figure 2-5 shows an example (SanDiego.1241.s) location that has been discarded.

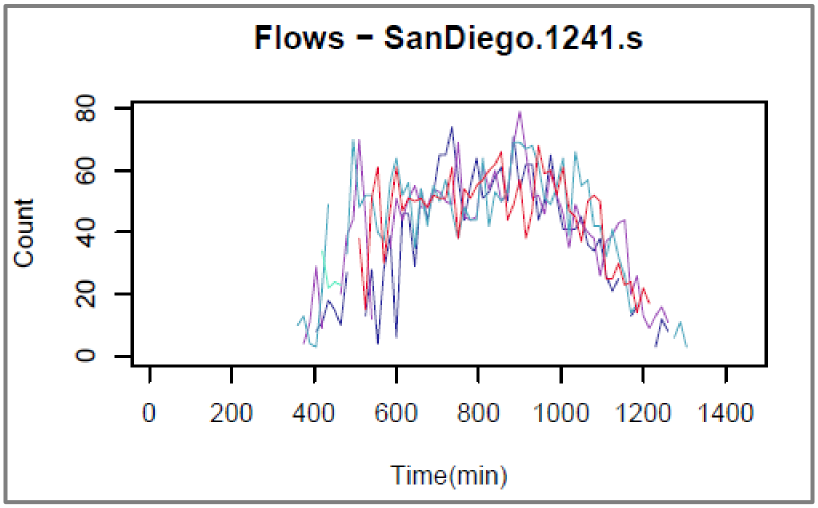

Figure 2-5: SanDiego.1241.s Mapped Available Data [Source: TSS]

As mentioned above, the remaining historical daily time series data were grouped by type of day for the weekdays. For each location and the median data values were calculated to be used to develop the daily demands in 15-minute time slices. Figure 2-6 shows the plotted lines for all Wednesday within the collection period in orange and the median value in black.

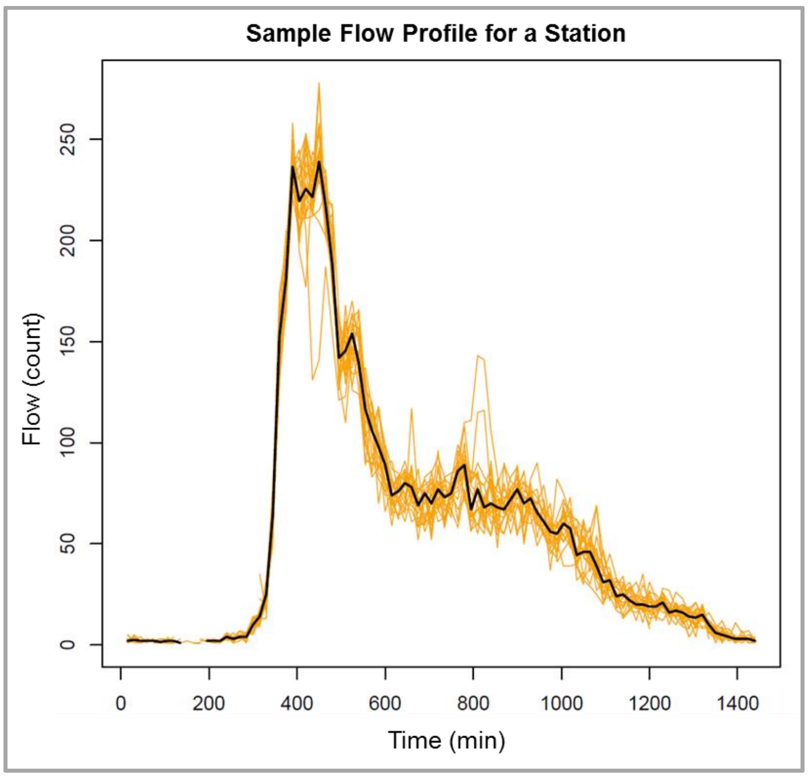

Figure 2-6: Sample Plotted Flow Data (Station 1100498) [Source: TSS]

These median values are then used within the Aimsun-based microsimulation model with the seed matrices provided by the regional model to generate needed demand matrices by executing both static and dynamic adjustments. Starting with the execution of the static adjustment, one adjustment is done for every 15 minutes for each day type, taking into account the 11 vehicle types. These adjusted matrices are then used to create a set of path assignment files using a 1-hour macroscopic assignment for every 15 minute period. Combining the initial adjusted matrices and the path assignment files a dynamic adjustment is started. The dynamic adjustment helps in redistributing the demand along the day, taking into account the travel to avoid a shift in peak hours between the demand matrices and the real values experienced in the model/road. At the completion of the dynamically adjusted matrices for all 11 vehicle types the demand profiles can be established. Figure 2-7 and Figure 2-8 show the profiles for the AM and PM peak periods during a typical Tuesday/Thursday.

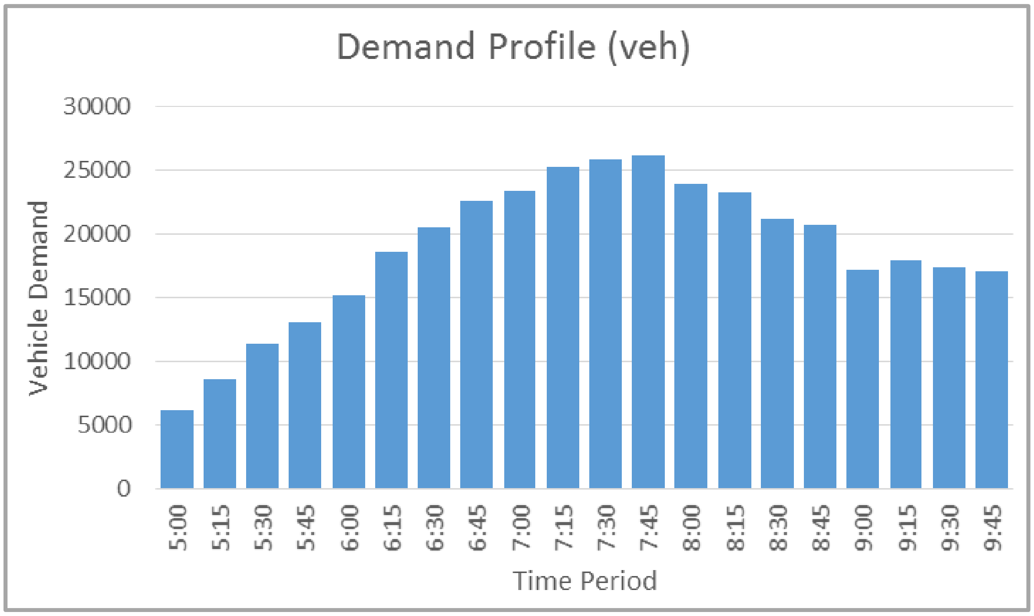

Figure 2-7: AM Peak Period Tuesday/Thursday Traffic Demand Profile [Source: TSS]

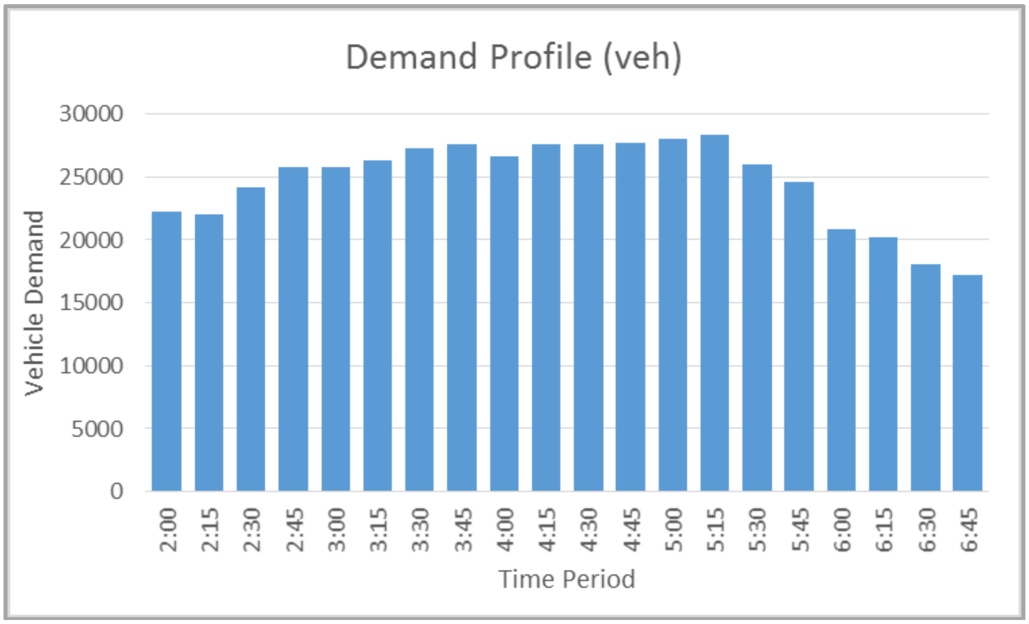

Figure 2-8: PM Peak Period Tuesday/Thursday Traffic Demand Profile [Source: TSS]

2.2.1.2 *Type 2: Data to Represent Non-Recurrent Conditions*

Non-recurrent conditions represent those times on the network when and unexpected event occurs. These events can include traffic accidents, construction and others. For the San Diego Testbed, the typical type of non-recurrent condition are traffic incidents where any number of the lanes on a section the network is blocked over a period of time causing higher than normal levels of congestions. The results of the ICM evaluation cluster analysis should be able to highlight the best non-recurrent conditions to be modeled.

2.2.1.3 *Type 3: Data to Represent System Outcomes*

The San Diego Testbed will rely on the current I-15 ICM microscopic operational model that provides all typical outputs, such as:

- Delay;
- Speeds, Speed Contour Diagrams and bottlenecks;
- Travel Times;
- Densities;
- Volume/Capacity

Through standard post processing of these results most MOEs used to determine the outcomes of a system can be derived including total time savings, travel time index and travel time reliability.

2.2.2 Cluster Analysis Approach

The general cluster analysis methodology suggested in the Draft Traffic Analysis Toolbox Volume 3 Update[2] was implemented by the San Diego Testbed team. As part of the ICM San Diego Evaluation, a cluster analysis was performed for the post-deployment analysis by Battelle[3]. Table 2-3 through Table 2-8 summarizes the findings of this analysis that was principally focused on analyzing incidents within the corridor. The AM peak hours start at 5AM and ends at 10AM. The interpeak hours start at 10AM and ends at 2PM. The PM peak hours start at 2PM and ends at 7PM:

- Incident Duration: This is the recorded duration of the incident as given in the California Highway Patrol (CHP) records.
- Demand: Average demand in the cluster in vehicles per hour.
- Travel Time: Average recorded end-to-end travel time in minutes for the I-15 freeway.
- Single Incident Delay Impact: This is the difference in the observed travel time versus free-flow travel time and is an indicator of the delay caused by the incident.
- Incidents per period is the average number of incidents in the analysis period and is computed as the ratio of the total number of incidents to the number of days (or periods).
- Total Cluster Delay Impact: This is the product of single incident delay impact and days in the cluster.
- Percent of Time Period: This represents the corresponding clusters representation in the total days.

[2] Wunderlich, Vasudevan and Wang, TAT Volume III Guidelines for Microsimulation: Key Features of the 2015 Update.
[3] To be published.

Table 2-3: ICM Evaluation Cluster Analysis - AM Peak Period NB

Cluster	Incident Duration (s)	Demand (vph)	Travel Time (min.)	Single Incident Delay Impact (min.)	Incidents Per Period	Days In Cluster	Total Cluster Delay Impact (min.)	Percent of Time Period	Total days in cluster
NB AM 1	489	4,812	15.23	1.26	1.0	1	1.26	1.0%	102
NB AM 2	37	4,788	15.13	1.16	6.6	20	23.27	19.6%	
NB AM 3	49	5,606	15.07	1.10	15.2	25	27.58	24.5%	
NB AM 4	59	7,272	14.98	1.01	7.4	39	39.52	38.2%	
NB AM 5	25	3,662	16.2	2.23	11.3	3	6.70	2.9%	
NB AM 6	841	5,603	15.08	1.11	2.5	2	2.23	2.0%	
NB AM 7	67	7,046	15.82	1.85	10.1	11	20.39	10.8%	
NB AM 8	73	4,453	16.62	2.65	39.0	1	2.65	1.0%	

Table 2-4: ICM Evaluation Cluster Analysis - AM Peak Period SB

Cluster	Incident Duration (s)	Demand (vph)	Travel Time (min.)	Single Incident Delay Impact (min.)	Incidents Per Period	Days In Cluster	Total Cluster Delay Impact (min.)	Percent of Time Period	Total days in cluster
SB AM 1	3,601	5,980	17.90	3.91	1.0	1	3.91	1.0%	103
SB AM 2	72	6,237	15.80	1.81	7.9	41	74.14	39.8%	
SB AM 3	57	6,285	17.02	3.03	13.8	48	145.36	46.6%	
SB AM 4	40	6,130	16.08	2.09	25.0	3	6.26	2.9%	
SB AM 5	44	5,496	20.38	6.39	43.0	2	12.78	1.9%	
SB AM 6	30	4,674	15.04	1.05	8.2	5	5.24	4.9%	
SB AM 7	57	5,764	21.64	7.65	16.5	2	15.30	1.9%	
SB AM 8	48	2,973	15.75	1.76	16.0	1	1.76	1.0%	

Table 2-5: ICM Evaluation Cluster Analysis - Inter Peak Period NB

Cluster	Incident Duration (s)	Demand (vph)	Travel Time (min.)	Single Incident Delay Impact (min.)	Incidents Per Period	Days In Cluster	Total Cluster Delay Impact (min.)	Percent of Time Period	Total days in cluster
NB MID 1	54	5,416	15.54	1.57	10.2	19	29.89	18.3%	104
NB MID 2	43	5,435	16.16	2.19	15.3	8	17.55	7.7%	
NB MID 3	58	7,186	15.52	1.55	9.6	59	91.64	56.7%	
NB MID 4	41	4,783	16.37	2.40	29.3	3	7.21	2.9%	
NB MID 5	502	6,738	15.45	1.48	5.0	2	2.97	1.9%	
NB MID 6	38	6,706	16.25	2.28	7.3	9	20.55	8.7%	
NB MID 7	662	6,507	16.33	2.36	9.0	1	2.36	1.0%	
NB MID 8	283	7,096	16.27	2.30	21.0	1	2.30	1.0%	
NB MID 9	46	7,305	15.45	1.48	26.5	2	2.97	1.9%	

Table 2-6: ICM Evaluation Cluster Analysis – Inter Peak Period SB

Cluster	Incident Duration (s)	Demand (vol. vph)	Travel Time (min.)	Single Incident Delay Impact (min.)	Incidents Per Period	Days In Cluster	Total Cluster Delay Impact (min.)	Percent of Time Period	Total days in cluster
SB MID 1	206	4,370	15.22	1.23	7.8	4	4.91	3.8%	104
SB MID 2	36	4,448	15.31	1.32	16.6	10	13.18	9.6%	
SB MID 3	40	4,359	15.37	1.38	8.6	24	33.08	23.1%	
SB MID 4	38	4,869	15.44	1.45	10.1	15	21.72	14.4%	
SB MID 5	40	4,571	15.02	1.03	7.7	15	15.42	14.4%	
SB MID 6	43	4,417	16.19	2.20	27.0	3	6.59	2.9%	
SB MID 7	42	4,385	15.9	1.91	12.5	10	19.08	9.6%	
SB MID 8	49	4,530	15.69	1.70	7.9	11	18.68	10.6%	
SB MID 9	43	5,138	15.13	1.14	12.1	8	9.11	7.7%	
SB MID 10	708	4,397	15.88	1.89	6.0	1	1.89	1.0%	
SB MID 11	48	4,359	15.9	1.91	36.0	2	3.82	1.9%	
SB MID 12	33	5,383	14.77	0.78	24.0	1	0.78	1.0%	

Table 2-7: ICM Evaluation Cluster Analysis - PM Period NB

Cluster	Incident Duration (s)	Demand (vol. vph)	Travel Time (min.)	Single Incident Delay Impact (min.)	Incidents Per Period	Days In Cluster	Total Cluster Delay Impact (min.)	Percent of Time Period	Total days in cluster
NB PM 1	36	6,277	15.9	1.93	10.7	20	38.67	19.6%	102
NB PM 2	38	6,387	22.43	8.46	28.0	2	16.93	2.0%	
NB PM 3	39	7,801	16.5	2.53	26.3	21	53.20	20.6%	
NB PM 4	42	7,680	18.85	4.88	22.5	4	19.53	3.9%	
NB PM 5	47	9,152	16.16	2.19	14.5	53	116.24	52.0%	
NB PM 6	753*	7,816	16.19	2.22	7.5	2	4.45	2.0%	

Table 2-8: ICM Evaluation Cluster Analysis - PM Period SB

Cluster	Incident Duration (s)	Demand (vol. vph)	Travel Time (min.)	Single Incident Delay Impact (min.)	Incidents Per Period	Days In Cluster	Total Cluster Delay Impact (min.)	Percent of Time Period	Total days in cluster
SB PM 1	42	4,763	14.85	0.86	7.3	15	12.87	14.7%	102
SB PM 2	35	4,928	15.09	1.10	26.0	7	7.69	6.9%	
SB PM 3	39	4,678	15.11	1.12	13.8	27	30.19	26.5%	
SB PM 4	40	4,990	15.03	1.04	12.9	31	32.19	30.4%	
SB PM 5	57	4,770	16.16	2.17	17.0	6	13.01	5.9%	
SB PM 6	402	4,786	14.67	0.68	2.0	1	0.68	1.0%	
SB PM 7	47	5,383	14.97	0.98	10.8	9	8.80	8.8%	
SB PM 8	61	5,405	15.18	1.19	21.0	5	5.94	4.9%	
SB PM 9	685	4,662	17.17	3.18	16.0	1	3.18	1.0%	

As shown in the last column of each table there are over 100 days in the clusters.

2.2.2.1 Recommended Existing Operational Conditions

As given in the previous sub-section, around 6 to 12 clusters have been identified for each of the analysis directions for each of the time-of-day segments. Given the extent and range of clusters generated by the cluster analysis procedure, the Team will work with SANDAG to identify the top four operational conditions they are interested in evaluating through the AMS Testbed procedure. The Cluster Analysis revealed that the mid-day cluster were not important since it does not reflect recurring congestion propagation and hence was not used in post deployment analysis. Hence, the analysis will take a hybrid approach where operational conditions from AM and PM peak time-of-day segments will be combined to identify unique days. For example, four operational conditions will be selected from each of the two time-slices (AM peak and PM peak) and will be combined to produce a representative day for each of these. In the case that a representative day is not available to represent the combination of these time-slices, the scenarios will be kept separate for AM and PM peak analysis.

2.3 Existing Testbed Modeling Infrastructure

The San Diego Testbed Modeling infrastructure is based on the I-15 ICM Predictive and Evaluation modeling system. The testbed will include the following modeling elements and tools to help facilitate the analysis of the ATDM and DMA strategies within this program.

2.3.1.1 Network Prediction System (NPS)

The ICM work flow diagram is shown in Figure 2-9 and shows how the Network Prediction System (NPS) and the Real Time Simulations System (RTSS) interact with the other elements of the ICM system. The real context data, as follows, is loaded into the NPS system every 5 minutes:

- Traffic Data – Counts, Occupancies, and Speeds;
- Signal Status;
- Ramp Metering Status;
- Dynamic Message Sign Status;
- MUL configuration Status;
- Congestion Pricing System Tools;
- Transit Status – Bus AVL data;
- Event Status – Incidents, Construction, etc.

Using the live traffic data, the system generates analytical predictions of each detection station (VDS) for the next 75 minutes, these predictions are in fifteen-minute time slices, and a new 75 minute forecast is performed every 5 minutes. These predictions are used to dynamically adjust on the fly the 15-minute demand matrices that are used by the microsimulation engine, this adjustment occurs every 15 minutes. The dynamically adjusted demands are then used within the microsimulation predictions with the rest of the real time context data to provide the one-hour predictions for the full network (every link and all MOEs). The simulated predictions are run every 5 minutes and are stored in the data hub. The 30-minute predicted simulation outputs are then used by the Business Rules Project Management System (BRPMS) to identify non-recurring congestion points and develop dynamic strategies to mitigate and manage the predicted congestion. These strategies are sent to the RTSS where they are simulated and compared against the do-nothing scenario. Assuming that the predetermined benefit threshold (also known as the response plan “score”) is met the response plan with the highest “score” is selected and implemented in the field. For the application of this AMS testbed, the real-time context data will be substituted with simulated data and the system can be used to analyze the benefits to higher quality predictions and different prediction periods.

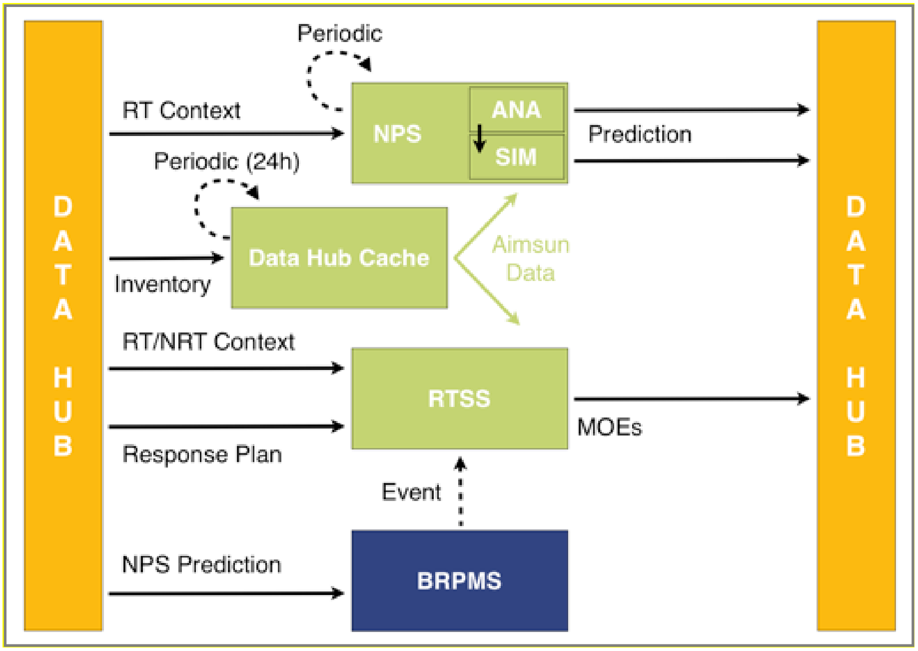

Figure 2-9: Data Hub Concept to Share Predicted and Real-Data between the Components [Source: TSS]

2.3.1.2 Aimsun Scenario Manager

The built-in Aimsun scenario manager will be set up with the use of other systems to generate and setup multiple scenarios within the Testbed. The current scenario manager is able to setup the following variables for simulations:

- Simulation Start time/Duration
- Traffic – associated demand, associated public transit plans and path assignments;
- Traffic Signal Master Control plan;
- API's to be used (TSP, INFLO, Ramp Metering, etc.);
- Traffic Strategies and Conditions – Lane Closures, speed restrictions, etc.

Figure 2-10 shows a screenshot of the Scenario Manager with AIMSUN.

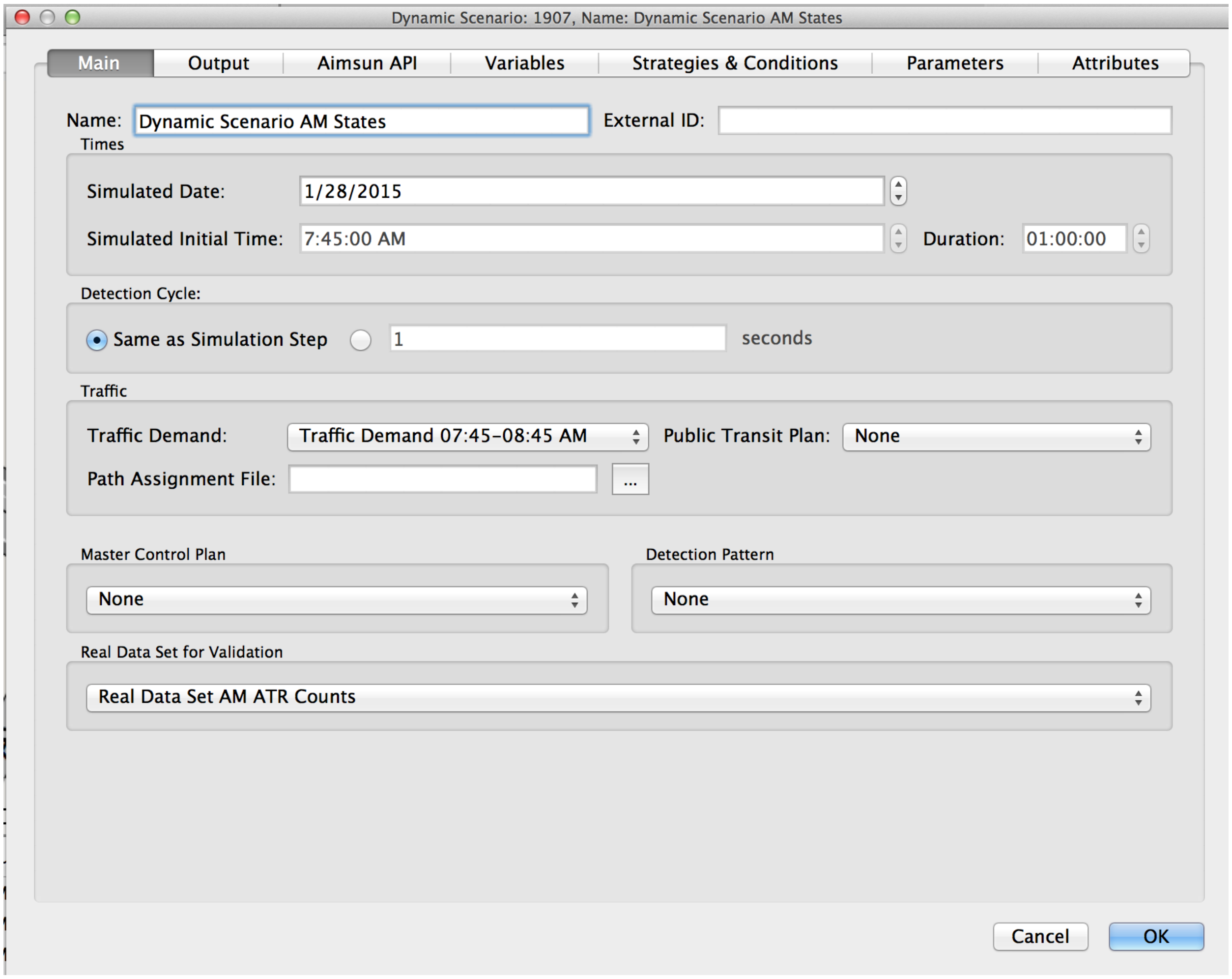

Figure 2-10: Screenshot of AIMSUN Scenario Manager [Source: TSS]

2.3.1.3 System Manager: SANDAG Aimsun Offline

The System Manager will be based off of the SANDAG Aimsun Offline tools that was used to build offline simulations of any situation simulated as part of the ICM system and to build simulations for periods greater than 1 hour. Figure 2-11 and Figure 2-12 shows the Graphical User Interfaces of the tool. The tool loads the initial state starting points and demand files from the online database, based on the time-stamp entered and populates the other areas based on a set of XML files generated by the ICM system. The XML files used are:

- Events_Caltrans-D11 –Caltrans event details including start time, duration and lane blockages;
- CpsManagedLanes – current lane configuration by section of the MUL;
- CpsPricingRequest – current sectional per mile prices for SOV vehicles;
- CpsScheduleActivation – current activation status;
- CpsTollRateLOS – base toll rates per section;
- CpsTollRateParams – current tolling parameters;
- CPSTollRateTOD – time of date parameters;
- ResponsePlan_all – any current response plans in place;
- RmisControlSchedule – ramp metering schedule parameters;
- RmisInitialParameter – ramp metering initial parameters;

- Rmisinitialstatus – current status of the ramp meters;
- signalsCaltrans/Escondido/Poway/SanDiego/SanMarcos – current status of the signals by agency;
- VMSCaltrans-D11 – current Caltrans VMS sign status;
- VMSCPS – current CPS VMS sign status;
- Transit AVL data when available;

Through the development of an advanced file manager or through manual file development, these files will be generated for each scenario. For many cases a generic file will be acceptable for use.

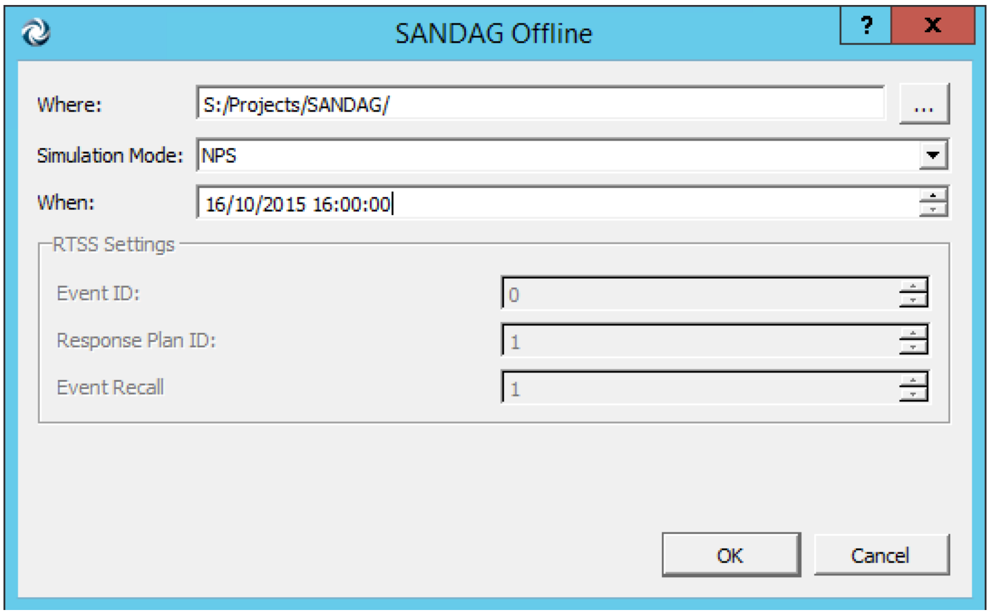

Figure 2-11: SANDAG Offline Tool [Source: SANDAG]

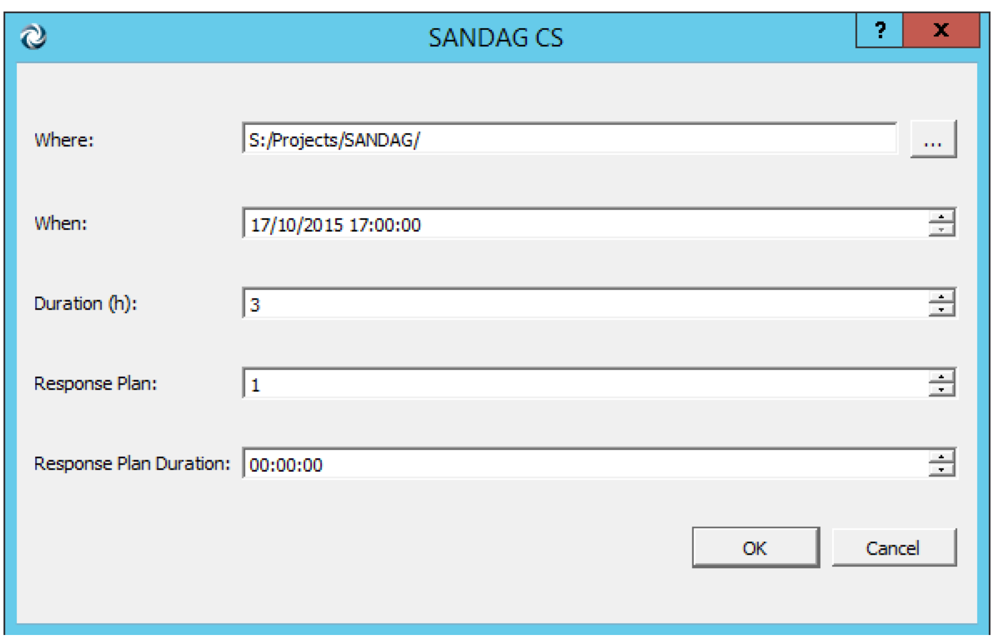

Figure 2-12: SANDAG CS – Longer Duration Tool [Source: SANDAG]

2.3.1.4 Demand Simulator: Pattern Matcher/APM Server

In the Testbed, the demand simulator will be developed to perform the combined tasks of the ICM Pattern Matcher and the Analytical Prediction Model (APM) Server.

The Pattern Matcher is the system within the Aimsun Online system that insures that the correct demand pattern is currently being used as the starting point for the demand adjustments. The APM server controls the predictions within the Aimsun Online system and schedules and sets up the analytical predictions, the microscopic simulated predictions and the demand adjustments. Figure 2-13 shows the Aimsun Online dashboard capture of the Pattern Matcher and APM Server message.

Figure 2-13: Pattern Matcher and APM Server [Source: TSS]

2.3.1.5 Microscopic Network Simulator: Aimsun

In the Testbed, the Aimsun microscopic traffic model will serve as the virtual reality base for testing ATDM/DMA strategies and application bundles and measuring their effectiveness. As such, the microscopic simulation model must be capable of capturing a realistic picture of traffic operations with a sufficiently large geographic scope. The factors that were considered in the scoping of the geographic coverage include the following:

- Roadway facilities: as many ATDM and DMA strategies and bundles are targeted at specific facilities, the sub-network must include both freeway facilities and arterials.
- ITS infrastructure: the sub-network will need to include a substantial amount of ITS measures as for benchmarking the field operational conditions.
- Data support: traffic count and traffic control data were collected and updated for a good number of intersections in the City for Year 2013 conditions. The sub-network will include as many such intersections as possible for both calibration and validation purposes.
- Corridor size: a number of sizeable corridors must be included for modeling both ATDM strategies and DMA bundles;

Chapter 3. Analysis Hypotheses

This section details the analysis hypotheses to address the different DMA and ATDM research questions by the San Diego Testbed as shown in Table 3-1 and

Table 3-2, respectively.

Table 3-1: DMA Research Questions and Corresponding Hypotheses.

ID	DMA Research Question	Preliminary Hypothesis
I	**Connected Vehicle Technology vs. Legacy Systems**	
1	Will DMA applications yield higher cost-effective gains in system efficiency and individual mobility, while reducing negative environmental impacts and safety risks, with wirelessly-connected vehicles, infrastructure, and travelers' mobile devices than with legacy systems? What is the marginal benefit if data from connected vehicle technology are augmented with data from legacy systems? What is the marginal benefit if data from legacy systems are augmented with data from connected vehicle technology?	The effectiveness of connected vehicle applications will be greatly improved by augmenting the connected vehicle data with data from legacy systems (e.g. loop detectors) especially at lower penetration of connected vehicles.
II	**Synergies and Conflicts**	
2	Are the DMA applications and bundles more beneficial when implemented in isolation or in combination?	DMA bundles that are synergistic will be more beneficial when implemented in combination than in isolation.
3	What DMA applications, bundles, or combinations of bundles complement or conflict with each other?	Certain DMA applications, bundles, or combinations of bundles will complement each other resulting in increased benefits, while others will conflict with each other resulting in no benefits or reduced benefits.
4	Where can shared costs or cost-effective combinations be identified?	Bundles that are highly synergistic will have shared connected vehicle technology deployment costs.
5	What are the tradeoffs between deployment costs and benefits for specific DMA bundles and combinations of bundles?	Incremental increase in deployment will result in higher benefit-cost ratio up to a certain deployment cost threshold, after which benefit-cost ratio will reduce.
III	**Operational Conditions, Modes, Facility Types with Most Benefit**	
6	What DMA bundles or combinations of bundles yield the most benefits for specific operational conditions?	Certain DMA bundles or combinations of bundles will yield the highest benefits under specific operational conditions. For example, a combination of CACC and SPD-HARM will have greater impact on days with high-demand and incidents than a combination of CACC and MMITSS.

ID	DMA Research Question	Preliminary Hypothesis
7	Under what operational conditions are specific bundles the most beneficial?	A DMA bundle will yield the highest benefits only under certain operational conditions. For example, on non-incident days, SPD-HARM will have limited impact.
8	Under what operational conditions do particular combinations of DMA bundles conflict with each other?	Certain combinations of bundles will conflict with each other under specific operational conditions, resulting in no benefits or reduced benefits.
9	Which DMA bundle or combinations of bundles will be most beneficial for certain modes and under what operational conditions?	Certain DMA bundles or combinations of bundles will yield the highest benefits for specific modes and under certain operational conditions.
10	Which DMA bundle or combinations of bundles will be most beneficial for certain facility types (freeway, transit, arterial) and under what operational conditions?	Certain DMA bundles or combinations of bundles will yield the highest benefits for specific facility types and under certain operational conditions.
11	Which DMA bundle or combinations of bundles will have the most benefits for individual facilities versus system-wide deployment versus region-wide deployment and under what operational conditions?	Certain synergistic DMA bundles will yield the most benefits when deployed together on individual facilities rather than as system-wide or region-wide deployments and under certain operational conditions and vice versa.
12	Are the benefits or negative impacts from these bundles or combinations of bundles disproportionately distributed by facility, mode or other sub-element of the network under specific operational conditions?	Benefits or negative impacts from bundles will be unevenly distributed by facility, mode or other sub-element of the network.
IV	**Messaging Protocols**	
13	Is SAE J2735 BSM Part 1 transmitted via Dedicated Short Range Communications (DSRC) every 10th of a second critical for the effectiveness of the DMA bundles? Will alternate messaging protocols, such as Probe Data Message (PDM), Basic Mobility Messages (BMM), etc., suffice? Given a set of specific messages, what combinations of bundles have the most benefit? Conversely, given a specific combination of bundles, what messages best support this combination?	Not addressed by San Diego
14	To what extent are messaging by pedestrians, pre-trip and en-route (e.g., transit riders) travelers critical to the impact of individual bundles or combinations of bundles? Does this criticality vary by operational condition?	Not addressed by San Diego
V	**Communications Technology**	
15	Will a nomadic device that is capable of communicating via both DSRC as well as cellular meet the needs of the DMA bundles? When is DSRC needed and when will cellular suffice?	Not addressed by San Diego
VI	**Communications Latency and Errors**	

ID	DMA Research Question	Preliminary Hypothesis
16	What are the impacts of communication latency on benefits?	Applications such as CACC rely on low-latency communication, whereas application such as SPD-HARM could work with higher-than-one-second latency.
17	How effective are the DMA bundles when there are errors or loss in communication?	Not addressed by San Diego
VII	**RSE/DSRC Footprint**	
18	What are the benefits of widespread deployment of DSRC-based RSEs compared with ubiquitous cellular coverage?	Not addressed by San Diego
19	Which technology or combination of technologies best supports the DMA bundles in terms of benefit-cost analysis?	Not addressed by San Diego
VIII	**Prediction and Active Management Investment**	
20	Can new applications that yield transformative benefits be deployed without a commensurate investment in prediction and active management (reduced control latency)? How cost-effective are DMA bundles when coupled with prediction and active management?	DMA bundles (Queue Warning and Speed Harmonization) will be most cost-effective only when coupled with prediction and active management.
IX	**Deployment Readiness**	
21	To what extent are connected vehicle data beyond BSM Part 1 instrumental to realizing a near-term implementation of DMA applications? What specific vehicle data are the most critical, and under what operational conditions?	Not addressed by San Diego
22	At what levels of market penetration of connected vehicle technology do the DMA bundles (collectively or independently) become effective?	As market penetration increases, the applications will perform better, but it is anticipated that 50 percent market penetration will provide most of the benefits, beyond which the increase in benefits will taper off.
23	What are the impacts of future deployments of the DMA bundles in the near, mid, and long term (varying market penetration, RSE deployment density, and other connected vehicle assumptions)?	Bundles that influence traveler decision-making and leverage widely deployed mobile device technology, such as EnableATIS, FRATIS, and IDTO, will yield measureable but geographically diffused system-level impacts under near-term deployment assumptions. Bundles that influence tactical driver decision-making and depend on emerging localized low-latency messaging concepts, e.g., MMITSS, Q-WARN and SPD-HARM, will yield measureable localized benefits in urban areas under near-term deployment assumptions, but limited system-level impacts until market penetration of connected vehicle technology reaches bundle-specific thresholds.
X	**Policy**	

ID	DMA Research Question	Preliminary Hypothesis
24	In simulating different policy conditions (such as availability of PII versus no PII), what are the operational implications? For example, what are the incremental values to certain applications of knowing travel itineraries in real-time versus with some delay (i.e., 1-5 minutes)?	Not addressed by San Diego
25	To what level are applications dependent upon agency/entity participation to deliver optimal results? What happens to the effectiveness of an application if, for example, local agency participation varies within a regional deployment?	Not addressed by San Diego
26	What are the variations if an application is set up to deliver system-optimal results versus user-optimal results? At what level of user "opt-in" does an application succeed/fail to deliver anticipated benefits, particularly to off-set costs, if costs are associated with it?	Not addressed by San Diego
27	How sensitive are individual applications to the availability (or lack thereof) of data from multiple sources/agencies?	Not addressed by San Diego
28	What type of data are necessary from non-transportation entities (for instance, hospitals or weather)? What data, and/or levels of participation by these entities would be required/optimal?	Not addressed by San Diego
29	What are the benefits to participants versus non-participants?	Applications such as MMITSS will yield more benefits for participants whereas applications such as INFLO will benefit both participants and non-participants

Table 3-2: ATDM Research Questions and Corresponding Hypothesis

ID	DMA Research Question	Preliminary Hypothesis
I	**Synergies and Conflicts**	
1	Are ATDM strategies more beneficial when implemented in isolation or in combination (e.g., combinations of ATM, ADM, or APM strategies)?	ATDM strategies that are synergistic (e.g., ADM, APM, ATM) will be more beneficial when implemented in combination than in isolation.
2	Which ATDM strategy or combinations of strategies yield the most benefits for specific operational conditions?	An ATDM strategy will yield higher benefits only under certain operational conditions. Certain combinations of ATDM strategies will yield the highest benefits for specific operational conditions.
3	What ATDM strategies or combinations of strategies conflict with each other?	Certain ATDM strategies will be in conflict with each other, resulting in no benefits or reduced benefits.
II	**Prediction Accuracy**	
4	Which ATDM strategy or combination of strategies will benefit the most through increased prediction accuracy and under what operational conditions?	Improvements in prediction accuracy will yield higher benefits for certain ATDM strategies and combinations of strategies than for others. An ATDM strategy or combinations of strategies will yield the most benefits with improvements in prediction accuracy only under certain operational conditions.
5	Are all forms of prediction equally valuable, i.e., which attributes of prediction quality are critical (e.g., length of prediction horizon, prediction accuracy, prediction speed, and geographic area covered by prediction) for each ATDM strategy?	Increased prediction accuracy is more critical for certain ATDM strategies over others, with certain attributes (e.g., length of prediction horizon, prediction accuracy, prediction speed, and geographic area covered by prediction) of prediction quality being most critical.
III	**Active Management or Latency**	
6	Are the investments made to enable more active control cost-effective?	Not addressed by San Diego
7	Which ATDM strategy or combinations of strategies will be most benefited through reduced latency and under what operational conditions?	Reductions in latency will yield higher benefits for certain ATDM strategies and combinations of strategies than for others. An ATDM strategy or combinations of strategies will yield the most benefits with reduced latency only under certain operational conditions.
IV	**Operational Conditions, Modes, Facility Types with Most Benefit**	
8	Which ATDM strategy or combinations of strategies will be most beneficial for certain modes and under what operational conditions?	Certain ATDM strategies and combinations of strategies will yield the highest benefits for specific modes and under certain operational conditions.
9	Which ATDM strategy or combinations of strategies will be most beneficial for certain facility types (freeway, transit, arterial) and under what operational conditions?	Certain ATDM strategies and combinations of strategies will yield the highest benefits for specific facility types and under certain operational conditions.
10	Which ATDM strategy or combinations of strategies will have the most benefits for individual facilities versus system-wide	Not addressed by San Diego

ID	DMA Research Question	Preliminary Hypothesis
	deployment versus region-wide deployment and under what operational conditions?	
V	**Prediction, Latency and Coverage Tradeoffs**	
11	What is the tradeoff between improved prediction accuracy and reduced latency with existing communications for maximum benefits?	Incremental improvements in prediction accuracy will result in higher benefits, when latency is fixed up to a certain threshold, after which marginal benefits will be reduced and vice-versa. Maximum system benefit will be obtained at an intermediate point balancing prediction accuracy and latency.
12	What is the tradeoff between prediction accuracy and geographic coverage of ATDM deployment for maximum benefits?	Not addressed by San Diego
13	What is the tradeoff between reduced latency (with existing communications) and geographic coverage for maximum benefits?	Not addressed by San Diego
14	What will be the impact of increased prediction accuracy, more active management, and improved robust behavioral predictions on mobility, safety, and environmental benefits?	Not addressed by San Diego
15	What is the tradeoff between coverage costs and benefits?	Not addressed by San Diego
VI	**Connected Vehicle Technology and Prediction**	
16	Are there forms of prediction that can only be effective when coupled with new forms of data, such as connected vehicle data?	Prediction will be most effective only when coupled with connected vehicle data capture and communications technologies that can systematically capture motion and state of mobile entities, and enable active exchange of data between vehicles, travelers, roadside infrastructure, and system operators.
VI	**Short-term and Long-term Behaviors**	
17	Which ATDM strategy or combinations of strategies will have the most impact in influencing short-term behaviors versus long term behaviors and under what operational conditions?	Certain ATDM strategies and combinations of strategies will influence short-term behaviors more than long-term behaviors under certain operational conditions, while others will influence long-term behaviors more than short-term behaviors under certain operational conditions.
18	Which ATDM strategy or combinations of strategies will yield most benefits through changes in short-term behaviors versus long-term behaviors and under what operational conditions?	Certain ATDM strategies and combinations of strategies will have the most impact through changes in short-term behaviors under certain operational conditions, while others will have the most impact through changes in long-term behaviors under certain operational conditions.

Chapter 4. Analysis Scenarios

This section describes the analysis scenarios to test the different DMA/ATDM applications. An analysis scenario is defined as "*a combination of operational conditions, applications (or combination of applications) and the alternatives to be used to test hypotheses*".

4.1 DMA and ATDM Applications/Strategies to be addressed by Testbed

Table 4-1 and **Error! Reference source not found.** summarize the applications to be evaluated by the San Diego Testbed

Table 4-1: The DMA Applications Evaluated/Addressed by the San Diego Testbed

DMA Bundle	Application	Addressed?
Enable ATIS	Multimodal Real-Time Traveler Information (ATIS)	No
	Smart Park-and-Ride (S-PARK)	No
	Universal Map Application (T-MAP)	No
	Real-Time Route-Specific Weather Information (WX-INFO)	No
INFLO	Queue Warning (Q-WARN)	**Yes**
	Dynamic Speed Harmonization (SPD-HARM)	**Yes**
	Cooperative Adaptive Cruise Control (CACC)	**Yes**
MMITSS	Intelligent Traffic Signal System (ISIG)	**Yes***
	Transit Signal Priority (TSP)	**Yes***
	Mobile Accessible Pedestrian Signal System (PED-SIG)	No
	Emergency Vehicle Preemption (PREEMPT)	**Yes***
	Freight Signal Priority (FSP)	No
IDTO	Connection Protection (T-CONNECT)	No
	Dynamic Transit Operations (T-DISP)	No
	Dynamic Ridesharing (D-RIDE)	No
FRATIS	Freight Real-Time Traveler Information with Performance Monitoring (F-ATIS)	No
	Drayage Optimization (DR-OPT)	No
	Freight Dynamic Route Guidance (F-DRG)	No
R.E.S.C.U.M.E.	Emergency Communications and Evacuation (EVAC)	No
	Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESPSTG)	No
	Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)	No

*** To be finalized based on the MMITSS-specific support to be received from University of Arizona.**

Table 4-2: ATDM Applications Evaluated/Addressed by the San Diego Testbed

ATDM Strategy Type	ATDM Strategy	Addressed?
Active ***Traffic*** Management Strategies	Dynamic Shoulder Lanes	No
	Dynamic Lane Use Control	**Yes**
	Dynamic Speed Limits	**Yes**
	Queue Warning	No
	Adaptive Ramp Metering	No
	Dynamic Junction Control	No
	Dynamic Merge Control	**Yes**
	Dynamic Traffic Signal Control	No
	Transit Signal Priority	No
	Dynamic Lane Reversal Or Contraflow Lane Reversal	No
Active ***Demand*** Management Strategies	Dynamic Ridesharing	No
	Dynamic Transit Capacity Assignment	No
	On-demand Transit	No
	Predictive Traveler Information	**Yes**
	Dynamic Pricing	No
	Dynamic Fare Reduction	No
	Transfer Connection Protection	No
	Dynamic HOV/Managed Lanes (w/ dynamic pricing)	**Yes**
	Dynamic Routing	**Yes**
Active ***Parking*** Management Strategies	Dynamically Priced Parking	No
	Dynamic Parking Reservation	No
	Dynamic Wayfinding	No
	Dynamic Overflow Transit Parking	No

4.2 Performance Measures

The performance measures quantify the achievement of DMA/ATDM program objectives. The specific performance measures that would be derived for this Testbed will include:

1. **Average Travel Speed**: Average speed of vehicles are computed based on individual vehicle's average spot speeds over the entire operational period.
2. **Average Vehicle Delay**: Delay of vehicles are computed as the deviation in individual vehicle's travel-time during the simulation from its anticipated travel-time during free flow conditions. This delay would be averaged for all vehicles in the simulation to derive average delay.
3. **System Throughput**: This represents the average number of vehicles served in a given simulation time.
4. **Average Travel Time**: This is a simulation-based performance measure and could be either at an aggregate or VHT level or at a disaggregate O-D or sub-path O-D level.
5. **Average Person Hours of Delay**: This is a simulation-based performance measure and is aggregated average of individual vehicle delay multiplied by the occupancy.
6. **Maximum Speed Differential**: Average speed variation between adjacent sub-sections of the highway and the maximum speed variation within a sub-section of the highway are used as potential safety metric. Vehicles within a 0.5-mile long adjacent sub-section of the highway is used for this analysis.
7. **Ratio of VMT-Demand and VMT-Served**: Both measures incorporate the notion of vehicle-miles traveled (VMT), and each captures a separate perspective on that statistic. VMT-Demand captures any effect that the ATDM strategy has on the net demand for using the facilities, such as a scheme to spread in time or even discourage demand at certain times of the day. VMT-Served

captures the throughput of the facility, which an ATDM strategy seeks to modulate. These statistics are interesting independently and as a ratio.

8. **Reliability Measures**: Here, the cumulative distribution function (CDF) of point-to-point travel time of relevant sub-path O-D's is the most important performance measure. Important point statistics include the 95th percentile travel time for the given sub-path O-D. The logic here is that this metric captures the travel time a journey-to-work traveler must budget for in order to be on time all but one day a month (i.e., assuming that there are 20 work-days in a month). A rational case can similarly be made for any other percentile – that is, other than the 95th – of the travel time CDF.
9. **Travel Time Index (TTI)**: It is the ratio of the actual travel time and the free-flow travel time. ATDM strategies like variable speed limit signs, for example, aim specifically to increase reliability – the predictability of travel times -- by increasing the travel time relative to the free-flow travel time. The variable speed limit sign thus reduces the likelihood of a breakdown in flow, increasing the likelihood of a predictable, reliable travel time for a facility that is frequently or occasionally close to the facility's critical density.
10. **Travel Time Ratios**: Ratios such as 75th or 95th percentile travel time to the median or mode (most likely or typical) travel time may also be used to supplement the above measures.
11. **Maximum Intersection Queues**: Maximum length of queue at signalized intersections characterizes the MMITSS application.

4.3 Analysis Phases

The San Diego Testbed will focus on the analysis of the following ATM and ADM strategies:

- Dynamic Lane Use
- Dynamic Speed Limits
- Dynamic Merge Control
- Predictive Traveler Information
- Dynamic HOV / Managed Lanes
- Dynamic Routing

Furthermore, it will also analyze the following DMA applications:

- INFLO - Queue Warning (Q-WARN)
- INFLO - Dynamic Speed Harmonization (SPD-HARM)
- INFLO – Cooperative Adaptive Cruise Control (CACC)
- MMITSS – Suite of Applications*

* MMITSS is subject to availability and applicability of current APIs or systems. The Team is working with the developers of these application to estimate the level of effort required to add them to the Aimsun Model.

In addition, the analysis will also use advanced communications analysis in terms of latency and losses of Basic Safety Messages using tools such as Trajectory Converter Algorithm (TCA) and BSM Generators. TCA is an application developed by Noblis that aims at advanced data capture and generating BSM data from simulations in real-time conforming to SAE J2735 for any given set of communication attributes (latency, losses, RSE locations etc.). BSM Generator is a communications tool developed by University of Arizona that generates and communicates BSM messages from simulations in real-time to the MMITSS-controllers for signal optimization.

The analysis is structured into the three phases as defined below. Each phase consists of scenarios that represent the application or strategy combination that will be tested in each Phase. Additionally for DMA applications, sub-scenarios will be used to determine the effect of Connected Vehicle market penetration. For scenarios with prediction capabilities, additional sub-scenarios will be done using different values of prediction horizon. The market penetration values represent the set of drivers who are both equipped to receive the dynamic messages as well as who implement them. For example 25 percent MP would be similar to 50% equipped vehicles with 50% compliant drivers.

4.3.1 Phase 1

Phase 1 will include scenarios to developing preliminary results from the San Diego Analysis and represent applications in isolation as well as simulations with the baseline networks. The simulations will be replicated for at least 10 runs under different random seeds and depending on the standard deviation of the results as well as the baseline values. Phase 1 analysis will extend from February 2016 to April 2016 and will primarily answer DMA/ATDM research questions related to operational conditions and market penetration.

There are 16 different scenarios in Phase 1 as described in the following table:

Table 4-3: Phase 1 Scenarios, Operational Conditions, and Applications

Scenarios	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
High Level Analysis Setting																
Prediction Engine (Yes/No)																
Detailed Communication Modeling (Yes/No)																
Detailed System Manager Emulation (Yes/No)					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Operational Conditions																
Operational Condition 1	X				X				X				X			
Operational Condition 2		X				X				X				X		
Operational Condition 3			X				X				X				X	
Operational Condition 4				X				X				X				X
Dynamic Mobility Applications (DMA)																
INFLO/Queue Warning (Q-WARN)																
INFLO/Dynamic Speed Harmonization (SPD-HARM)																
INFLO/Cooperative Adaptive Cruise Control (CACC)																
MMITSS/Intelligent Traffic Signal System (ISIG)																
MMITSS/Transit Signal Priority (TSP)																
Active Transportation and Demand Management (ATDM)																
ATM/Dynamic Lane Use					X	X	X	X								
ATM/Dynamic Speed Limits									X	X	X	X				
ATM/Dynamic Merge Control													X	X	X	X
ADM/Predictive Traveler Information																
ADM/Dynamic HOV/Managed Lanes					X	X	X	X								
ADM/Dynamic Routing																

4.3.2 Phase 2

Phase 2 analysis will extend the results of Phase 1 analysis with more scenarios as well as applications that require modeling effort from the Team. This analysis will extend from April 2016 to June 2016 and will assess advanced applications such as CACC and MMITSS as well as sensitivity of certain applications to prediction elements, such as prediction horizon, latency, etc.

There are 16 different scenarios in Phase 2 as described in the following table.

Table 4-4: Phase 2 Scenarios, Operational Conditions and Applications

Scenarios	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
High Level Analysis Setting																
Prediction Engine (Yes/No)					**Yes**	**Yes**	**Yes**	**Yes**								
Detailed Communication Modeling (Yes/No)									**Yes**	**Yes**	**Yes**	**Yes**				
Detailed System Manager Emulation (Yes/No)					**Yes**	**Yes**	**Yes**	**Yes**								
Operational Conditions																
Operational Condition 1	**X**				**X**				**X**				**X**			
Operational Condition 2		**X**				**X**				**X**				**X**		
Operational Condition 3			**X**				**X**				**X**				**X**	
Operational Condition 4				**X**				**X**				**X**				**X**
Dynamic Mobility Applications (DMA)																
INFLO/Queue Warning (Q-WARN)	**X**	**X**	**X**	**X**												
INFLO/Dynamic Speed Harmonization (SPD-HARM)	**X**	**X**	**X**	**X**												
INFLO/Cooperative Adaptive Cruise Control (CACC)													**X**	**X**	**X**	**X**
MMITSS/Intelligent Traffic Signal System (ISIG)									**X**	**X**	**X**	**X**				
MMITSS/Transit Signal Priority (TSP)									**X**	**X**	**X**	**X**				
Active Transportation and Demand Management (ATDM)																
ATM/Dynamic Lane Use																
ATM/Dynamic Speed Limits																
ATM/Dynamic Merge Control																
ADM/Predictive Traveler Information					**X**	**X**	**X**	**X**								
ADM/Dynamic HOV/Managed Lanes																
ADM/Dynamic Routing					**X**	**X**	**X**	**X**								
Market Penetration (e.g., 20% equipped)	**10, 25, 50**	**10, 25, 50**	**10, 25, 50**	**10, 25, 50**					**10, 25, 50**	**10, 25, 50**	**10, 25, 50**	**10, 25, 50**	**10, 25, 50**	**10, 25, 50**	**10, 25, 50**	**10, 25, 50**
Prediction Horizon (minutes)					**15, 30**	**15, 30**	**15, 30**	**15, 30**								

4.3.3 Phase 3

Phase 3 analysis will include final analysis scenarios as described in this subsection. It will extend from June 2016 to August 2016 and will be followed by reporting results and sharing the codes with the FHWA's OSADP open source portal. This phase will primarily consist of strategically selected combination scenarios were multiple applications/strategies will be tested together. The scenarios are expected to answer advanced research questions such as synergies and conflicts between the application, role of active management and prediction etc.

There are 15 different scenarios in Phase 3 as described in the following table:

Table 4-5: Phase 3 Scenarios, Operational Conditions and Applications

Scenarios	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
High Level Analysis Setting															
Prediction Engine (Yes/No)					**Yes**				**Yes**	**Yes**	**Yes**	**Yes**			
Detailed Communication Modeling (Yes/No)													**Yes**	**Yes**	**Yes**
Detailed System Manager Emulation (Yes/No)	**Yes**	**Yes**					**Yes**								
Operational Conditions															
Operational Condition 1	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				**X**	**X**	**X**
Operational Condition 2										**X**					
Operational Condition 3											**X**				
Operational Condition 4												**X**			
Dynamic Mobility Applications (DMA)															
INFLO/Queue Warning (Q-WARN)			**X**	**X**	**X**	**X**		**X**					**X**	**X**	
INFLO/Dynamic Speed Harmonization (SPD-HARM)			**X**	**X**	**X**	**X**		**X**					**X**	**X**	
INFLO/Cooperative Adaptive Cruise Control (CACC)								**X**							
MMITSS/Intelligent Traffic Signal System (ISIG)						**X**									**X**
MMITSS/Transit Signal Priority (TSP)						**X**									
Active Transportation and Demand Management (ATDM)															
ATM/Dynamic Lane Use	**X**														
ATM/Dynamic Speed Limits	**X**			**X**											
ATM/Dynamic Merge Control		**X**	**X**				**X**								
ADM/Predictive Traveler Information					**X**				**X**	**X**	**X**	**X**			
ADM/Dynamic HOV/Managed Lanes	**X**	**X**					**X**								
ADM/Dynamic Routing							**X**								
Market Penetration (e.g., 20% equipped)			**10, 25, 50**	**10, 25, 50**	**10, 25, 50**	**10, 25, 50**		**10, 25, 50**					**10, 25, 50**	**10, 25, 50**	**10, 25, 50**
Prediction Horizon (minutes)									**15, 30**	**15, 30**	**15, 30**	**15, 30**			
TCA Integration - Latency													**0 to 3 sec**		**0 to 3 sec**
TCA Integration – Message Loss														**0 to 20 %**	

4.4 Analysis Scenarios

As demonstrated in the Section 4.3, the analysis will include three phases and 33 scenarios. It has to be noted that some of the scenarios will include sub-scenarios to assess the application and strategies under varying market penetration as well as prediction attributes. The number of runs required to generate statistically significant results will be assessed based on the standard deviation of the baseline results. The Aimsun Scenario Manager will be programmed to manage the scenarios defined in Table 4-3 through Table 4-5.

4.5 Research Questions

As far as the research questions that would be answered by the Testbed are concerned, the scenarios developed around answering 12 out of 18 ATDM questions and 16 out of 29 DMA questions.

4.5.1 ATDM Research Questions

Research questions related to ATDM in San Diego testbed are as following:

Table 4-6: ATDM Research Questions Answered by the Testbed

ID	ATDM Research Question	Answered? (Y/N)
	Synergies and Conflicts	
1	Are ATDM strategies more beneficial when implemented in isolation or in combination (e.g., combinations of ATM, ADM, or APM strategies)?	Yes
2	Which ATDM strategy or combinations of strategies yield the most benefits for specific operational conditions?	Yes
3	What ATDM strategies or combinations of strategies conflict with each other?	Yes
	Prediction Accuracy	
4	Which ATDM strategy or combination of strategies will benefit the most through increased prediction accuracy and under what operational conditions?	Yes
5	Are all forms of prediction equally valuable, i.e., which attributes of prediction quality are critical (e.g., length of prediction horizon, prediction accuracy, prediction speed, and geographic area covered by prediction) for each ATDM strategy?	Yes
	Active Management or Latency	
6	Are the investments made to enable more active control cost-effective?	
7	Which ATDM strategy or combinations of strategies will be most benefited through reduced latency and under what operational conditions?	Yes
	Operational Conditions, Modes and Facility Types	
8	Which ATDM strategy or combinations of strategies will be most beneficial for certain modes and under what operational conditions?	Yes
9	Which ATDM strategy or combinations of strategies will be most beneficial for certain facility types (freeway, transit, arterial) and under what operational conditions?	Yes
10	Which ATDM strategy or combinations of strategies will have the most benefits for individual facilities versus system-wide deployment versus region-wide deployment and under what operational conditions?	
	Prediction, Latency and Coverage Tradeoffs	
11	What is the tradeoff between improved prediction accuracy and reduced latency with existing communications for maximum benefits?	Yes
12	What is the tradeoff between prediction accuracy and geographic coverage of ATDM deployment for maximum benefits?	

ID	ATDM Research Question	Answered? (Y/N)
13	What is the tradeoff between reduced latency (with existing communications) and geographic coverage for maximum benefits?	
14	What will be the impact of increased prediction accuracy, more active management, and improved robust behavioral predictions on mobility, safety, and environmental benefits?	
15	What is the tradeoff between coverage costs and benefits?	
Connected Vehicle Technology and Prediction		
16	Are there forms of prediction that can only be effective when coupled with new forms of data, such as connected vehicle data?	Yes
Short-Term and Long-Term Behaviors		
17	Which ATDM strategy or combinations of strategies will have the most impact in influencing short-term behaviors versus long term behaviors and under what operational conditions?	Yes
18	Which ATDM strategy or combinations of strategies will yield most benefits through changes in short-term behaviors versus long-term behaviors and under what operational conditions?	Yes

As shown, not all questions can be answered using the San Diego Testbed. The AMS Project Team intends to use the portfolio of Testbeds to answer a more comprehensive set of research questions and will be indicated in the Evaluation Plan document.

4.5.2 DMA Research Questions

Research questions related to DMA in San Diego testbed are as following:

Table 4-7: DMA Research Questions Answered by the Testbed

ID	DMA Research Question	Answered? (Y/N)
Connected Vehicle Technology vs Legacy Systems		
1	Will DMA applications yield higher cost-effective gains in system efficiency and individual mobility, while reducing negative environmental impacts and safety risks, with wirelessly-connected vehicles, infrastructure, and travelers' mobile devices than with legacy systems? What is the marginal benefit if data from connected vehicle technology are augmented with data from legacy systems? What is the marginal benefit if data from legacy systems are augmented with data from connected vehicle technology?	
Synergies and Conflicts		
2	Are the DMA applications and bundles more beneficial when implemented in isolation or in combination?	Yes
3	What DMA applications, bundles, or combinations of bundles complement or conflict with each other?	Yes
4	Where can shared costs or cost-effective combinations be identified?	Yes
5	What are the tradeoffs between deployment costs and benefits for specific DMA bundles and combinations of bundles?	Yes
Operational Conditions, Modes and Facility Types		
6	What DMA bundles or combinations of bundles yield the most benefits for specific operational conditions?	Yes
7	Under what operational conditions are specific bundles the most beneficial?	Yes
8	Under what operational conditions do particular combinations of DMA bundles conflict with each other?	Yes

ID	DMA Research Question	Answered? (Y/N)
9	Which DMA bundle or combinations of bundles will be most beneficial for certain modes and under what operational conditions?	Yes
10	Which DMA bundle or combinations of bundles will be most beneficial for certain facility types (freeway, transit, arterial) and under what operational conditions?	Yes
11	Which DMA bundle or combinations of bundles will have the most benefits for individual facilities versus system-wide deployment versus region-wide deployment and under what operational conditions?	Yes
12	Are the benefits or negative impacts from these bundles or combinations of bundles disproportionately distributed by facility, mode or other sub-element of the network under specific operational conditions?	
	Messaging Protocols	
13	Is SAE J2735 BSM Part 1 transmitted via Dedicated Short Range Communications (DSRC) every 10th of a second critical for the effectiveness of the DMA bundles? Will alternate messaging protocols, such as Probe Data Message (PDM), Basic Mobility Messages (BMM), etc., suffice? Given a set of specific messages, what combinations of bundles have the most benefit? Conversely, given a specific combination of bundles, what messages best support this combination?	
14	To what extent are messaging by pedestrians, pre-trip and en-route (e.g., transit riders) travelers critical to the impact of individual bundles or combinations of bundles? Does this criticality vary by operational condition?	Yes
	Communications Technology	
15	Will a nomadic device that is capable of communicating via both DSRC as well as cellular meet the needs of the DMA bundles? When is DSRC needed and when will cellular suffice?	
	Communication Latency and Errors	
16	What are the impacts of communication latency on benefits?	Yes
17	How effective are the DMA bundles when there are errors or loss in communication?	Yes
	RSE/DSRC Footprint	
18	What are the benefits of widespread deployment of DSRC-based RSEs compared with ubiquitous cellular coverage?	Yes
19	Which technology or combination of technologies best supports the DMA bundles in terms of benefit-cost analysis?	
	Prediction and Active Management Investment	
20	Can new applications that yield transformative benefits be deployed without a commensurate investment in prediction and active management (reduced control latency)? How cost-effective are DMA bundles when coupled with prediction and active management?	Yes
	Deployment Readiness	
21	To what extent are connected vehicle data beyond BSM Part 1 instrumental to realizing a near-term implementation of DMA applications? What specific vehicle data are the most critical, and under what operational conditions?	
22	At what levels of market penetration of connected vehicle technology do the DMA bundles (collectively or independently) become effective?	Yes
23	What are the impacts of future deployments of the DMA bundles in the near, mid, and long term (varying market penetration, RSE deployment density, and other connected vehicle assumptions)?	Yes
	Policy	

ID	DMA Research Question	Answered? (Y/N)
24	In simulating different policy conditions (such as availability of PII versus no PII), what are the operational implications? For example, what are the incremental values to certain applications of knowing travel itineraries in real-time versus with some delay (i.e., 1-5 minutes)?	
25	To what level are applications dependent upon agency/entity participation to deliver optimal results? What happens to the effectiveness of an application if, for example, local agency participation varies within a regional deployment?	
26	What are the variations if an application is set up to deliver system-optimal results versus user-optimal results? At what level of user "opt-in" does an application succeed/fail to deliver anticipated benefits, particularly to off-set costs, if costs are associated with it?	
27	How sensitive are individual applications to the availability (or lack thereof) of data from multiple sources/agencies?	
28	What type of data are necessary from non-transportation entities (for instance, hospitals or weather)? What data, and/or levels of participation by these entities would be required/optimal?	
29	What are the benefits to participants versus non-participants?	Yes

As shown, not all questions can be answered using the San Diego Testbed. The AMS Project Team intends to use the portfolio of Testbeds to answer a more comprehensive set of research questions and will be indicated in the Evaluation Plan document.

Chapter 5. Data Needs and Availability

This section illustrates the data needs for the San Diego Testbed as well as data availability and gaps. In addition, this section will provide a detailed plan for data collection and data mining to fill the identified gaps. If some of the gaps cannot be filled, the team will develop a plan to overcome issues pertaining to lack of data in order to ensure that the Testbed can be successfully built.

5.1 Data Needs

For the San Diego Testbed, two major categories of data are needed to support analysis, modeling and simulation of ATDM/DMA strategies and application bundles.

1. The first data category is basic traffic modeling input data. Input data include both sides of transportation system supply and travel demand, as well as traveler behavior and model calibration and validation data. Transportation system supply data are the following:
   - Network topology and junction geometric layout;
   - Traffic control and management, including lane restrictions, junction control types (e.g., yield signs, all-way or two-way stops and intersection signals and ramp meters), control plans, and speed limits;

   Travel demand input data include:

   - User classes such as SOV, HOV, or trucks.
   - Traffic demand usually in the form of time-varying origin-destination matrices, or trip chain lists;

   Travel behavior data:

   - Driving behavior such as car following, lane changing and lateral movement behavior, different to various modeling tools;
   - Travel cost differentiation and perception (e.g., value of time)
   - Route choice and departure time choice resulting from above travel cost differentiations as well as provisions of traveler information

   Calibration and validation data are usually aggregated traffic operational performance data. For example, traffic counts, corridor or link travel times in 5-min/15-min/hourly increments and queue lengths will be used as calibration and validation target data.

2. The second data category is relevant to build baseline models for all scenarios of different operational conditions. Except for network and control data, all other basic model input data will need a separate dataset for each additional operational conditions (planned events, major accident and work zones). To properly model different operational conditions, the following data will be needed:

   Work zone and incident data:

   - Traffic impact information, including start/end date/time, impacted road segments, lane closures

Planned event data:

- Event time and dates.

In the AMS Testbed development plan, clustering analysis has been proposed to develop typical operational conditions. Needed data for cluster analysis will include all relevant traffic data for a longer observation, for example, at least two months. These data will include calibration and validation data, work zone and incidents data.

5.2 Available Data

The San Diego Testbed is primarily focused on ATDM and DMA strategies and applications. As such, the need for operational traffic data will be extensive. The following Table 5-1 lists relevant data in the development context of both, baseline and operational scenarios.

Table 5-1: Relevant Data for San Diego Testbed

Data category	Relevance to scenario development	Relevance to ATDM/DMA	Current availability
Demographic data, land use data, travel behavior data	• Already applied in one baseline development; not relevant to other baseline refinement	• Not relevant	SANDAG Regional Model Available
Traffic count – PeMS archive	• Bottleneck location • Traffic flow data in various granularity (e.g., 5-min, 1 hour, daily) • Calibration target data	• Freeway capacity and performance	Currently available
Traffic count – arterial ATMS archive	• Calibration target data • Trend analysis and pattern clustering	• Arterial link capacity and performance	Limited availability
Corridor travel time	• Available for 19 major corridors in Testbed network • Calibration and validation target for Testbed DTA model development	• Validation of baseline condition performance for concerned arterial corridors (signalized intersections)	INRIX and PeMS data Available
Traffic control – control types	• Freeway junction control and arterial intersection control types • Used in (normal day) baseline condition DTA model development	• Validation of baseline condition performance for all arterials in Testbed network	Type 170 - DC08, 200, 223 and 233 firmware
Traffic control – urban signals	• Phasing diagrams and timing plans for (normal day) baseline conditions, and holiday/event day conditions • Applicable to planned event day baseline controls	• Validation of baseline condition performance for all relevant intersections	RAMS system data, automatically imported within the network

Data category	Relevance to scenario development	Relevance to ATDM/DMA	Current availability
Traffic control – ramp meters	• Time-of-day metering rates used in data environment development	• Validation of baseline conditions at ramps • Baseline benchmarking for adaptive ramp metering	RMIS data feeds available
Video surveillance data	• Archived in data environment • Applicable for validation of baseline conditions	• Validation of baseline conditions for equipped freeway sections	CCTV available with limited application for this testbed.
Incident data	• Archived in data environment • Available for query and re-alignment to Testbed network	• Validation of baseline conditions for relevant locations	Caltrans data feed and Evaluation Cluster Analysis
Work zone	• Archived in data environment (milepost based reference system) • Available for query and re-alignment to Testbed network	• Validation of baseline conditions for relevant locations	LCS data feed available

5.3 Preliminary Data Collection Plan to Address Gaps

The available data are sufficient for baseline model development. However, the primary data and information gap lies in the lack of support data for user behavior changes to ATDM strategies and operational conditions. As a critical support data for the evaluation of impacts from ATDM strategies, this support data set is not available for the San Diego Testbed area as currently no ATDM strategies have been deployed at this time. The primary data collection approach will be through literature research of existing project reports and research papers, to develop reasonable estimate transferrable to the San Diego Testbed context. These will include:

- Users compliance rate to dynamic routing guidance;
- Speed and capacity changes produced by ATM strategies.

Chapter 6. Key Assumptions and Limitations

The San Diego Testbed team foresees certain challenges in incorporating certain DMA applications within the network.

The current version of MMITSS application has been developed for Vissim simulation platform and was developed for Econolite controllers. In order to develop MMITSS for Aimsun, the following changes need to be done:

1. I/O sockets need to be reprogrammed to get the data in real-time from equipped vehicles and detectors in the Aimsun network.
2. BSM Generator needs to be reprogrammed to work with AIMSUN API.
3. Current implementation of MMITSS produces NTCIP commands for Econolite controllers. Understanding that the San Diego network uses McCain 170-type controllers, a translator needs to be developed to accommodate this change.

In addition, the MMITSS applications are coded as Docker Containers with specific IP addresses to enable communication between simulation controllers and the application. Limitations related to assigning number of IP addresses will limit the number of MMITSS-controlled intersections. The team is expanding on options to include a controller wrapper on Aimsun controllers so that can provide NTCIP interface for the MMITSS applications.

As far as Cooperative Adaptive Cruise Control is concerned, the Team had back and forth discussion with several other teams developing the application. The application API developed by the Saxton Transportation Operations Laboratory (STOL) team was found to be most applicable based on the discussions with Leidos. The current version, coded as a driver behavior model for Vissim need to be recoded for Aimsun given the fact that Vissim uses a "single" driver behavior model that defines a driver in terms of gap-acceptance, lane-change, car-following etc., whereas these are different models in the Aimsun interface.

INFLO application require infrastructure elements coded into the application. This will require extra effort for coding these new elements required by the application, both inside the simulation program as well as in the application configuration. The application can only run as a single instance with only one freeway direction being harmonized for speed.

TCA Tool which is currently coded for Vissim and Paramics need a new wrapper to replicate the simulated data capture features from Aimsum simulation. As the team is working with Noblis' developer team to expand on this tool and add the new wrapper, there may be further limitations to the addition which are unknown at this time.

Chapter 7. Modeling Approach

This section details the modeling approach to test the hypothesis, and generate performance measure statistics to compare alternatives and thus evaluate them. This section describes the analysis framework, application-specific algorithms (existing ones and ones to be built), the tools needed for this analysis, and analysis phases or multi-tier approach to be used to conduct the overall modeling effort.

7.1 Analysis Framework

The San Diego Testbed will be developed based on the modularized structure for all AMS Testbeds as shown in Figure 7-1. Note that each block represents one module, and the arrows denote the data and information flow between these modules. The system elements are organized in a modularized structure for easy updates and upgrades.

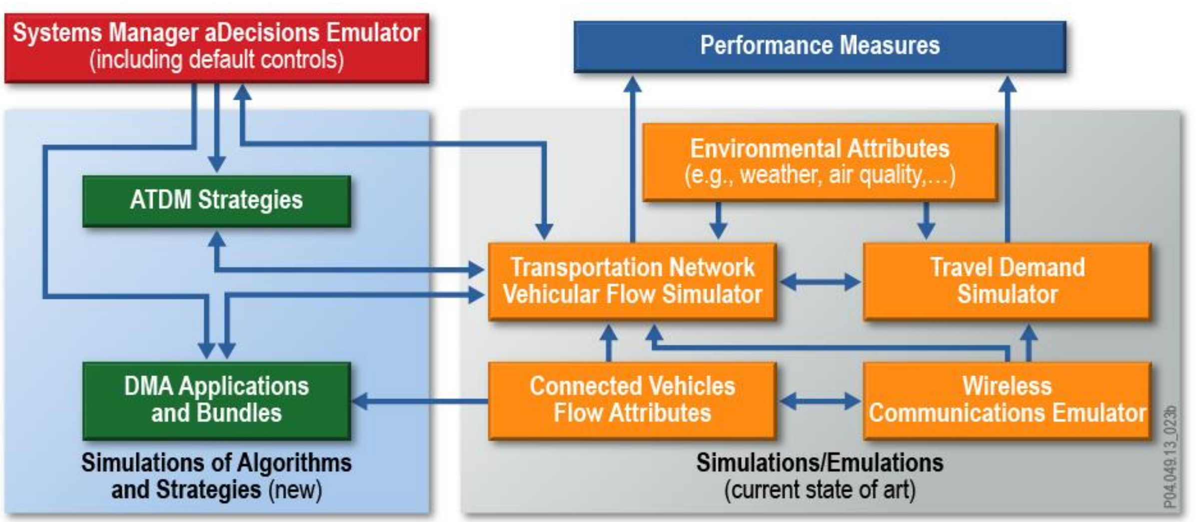

Figure 7-1: Generic Modeling Framework [Source: Booz Allen]

The next sections will introduce each module and required analysis, modeling and simulation (AMS) capabilities specific to San Diego implementation.

7.2 Application-Specific Algorithm and Needed Tools

This section lists and describes different components of the San Diego testbed in terms of tools, applications and models**.**

7.2.1 Microscopic Traffic Simulator: Aimsun

The Aimsun platform integrates different traffic models, where one component is the microsimulator. Figure 7-2 depicts the different elements of Aimsun environment, where the main elements are:

1. Data Importers and Interfaces contains all modules that allow to input all data to the transport database.
2. Model Database is an extensible transport object model that stores all objects and attributes for applying different traffic tools such as microsimulator, mesoscopic simulator.
3. Traffic Tools implement all modules for assessing any analysis on a transport facility.

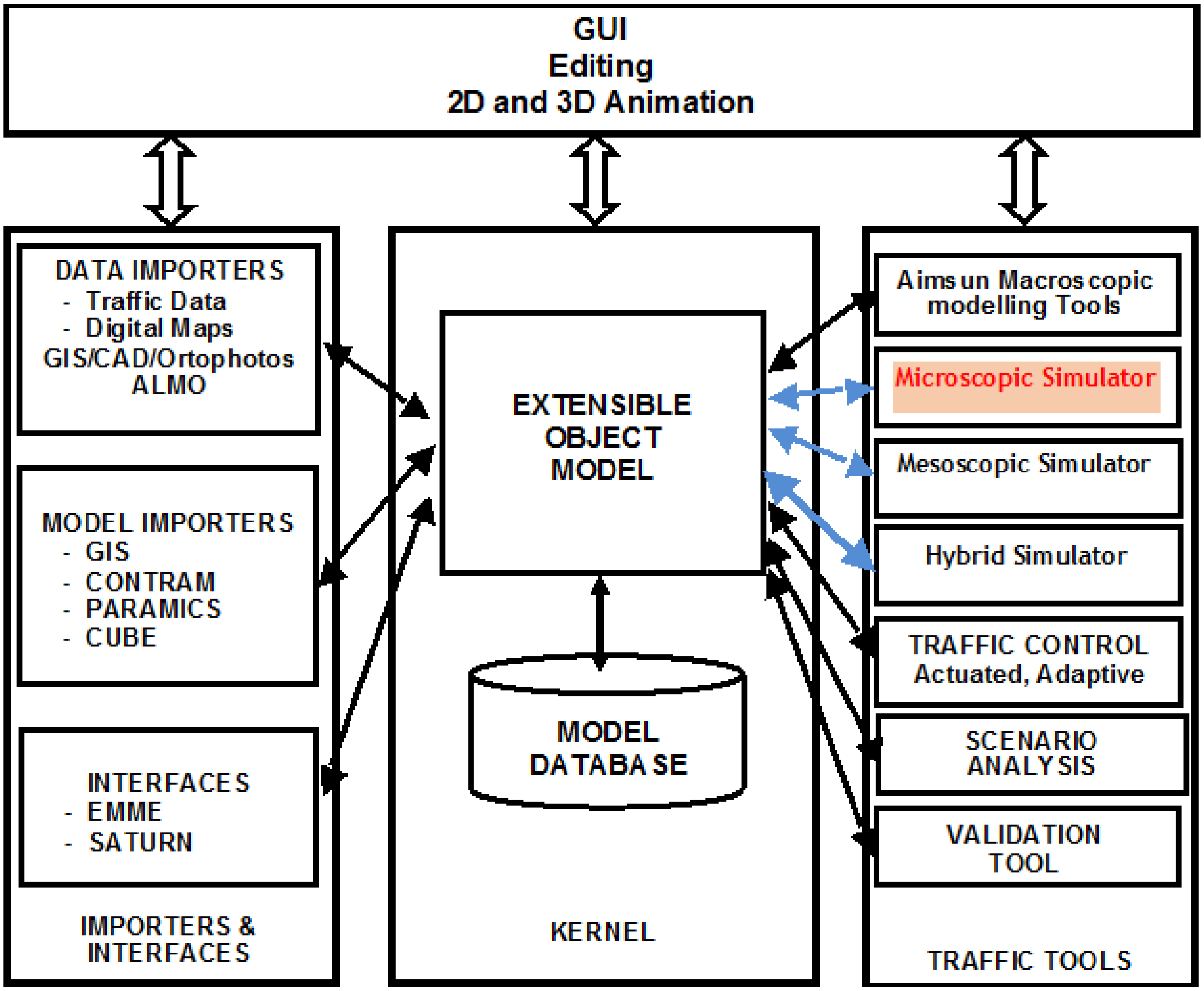

Figure 7-2: AIMSUN Platform [Source: TSS]

The Microsimulator follows a microscopic simulation approach. This means that the behavior of each vehicle in the network is continuously modelled throughout the simulation time period while it travels through the traffic network, according to several vehicle behavior models (e.g., car following, lane changing). The Microscopic simulator (highlighted in red) in Aimsun is a combined discrete/continuous simulator. This means that there are some elements of the system (vehicles, detectors) whose states change continuously over simulated time, which is split into short fixed time intervals called simulation cycles or steps. There are other elements (traffic signals, entrance points) whose states change discretely at specific points in simulation time. The system provides highly detailed modelling of the traffic network, it distinguishes between different types of vehicles and drivers, it enables a wide range of network geometries to be dealt with, and it can also model incidents, conflicting maneuvers, etc. Most traffic equipment present in a real traffic network is also modelled in the Microsimulator: traffic lights, traffic detectors, Variable Message Signs, ramp metering devices, etc. The two-way blue arrows represent the dynamic vehicle models being shared by multiple modules and the object model. These modules are Microscopic, Mesoscopic and Hybrid Simulators.

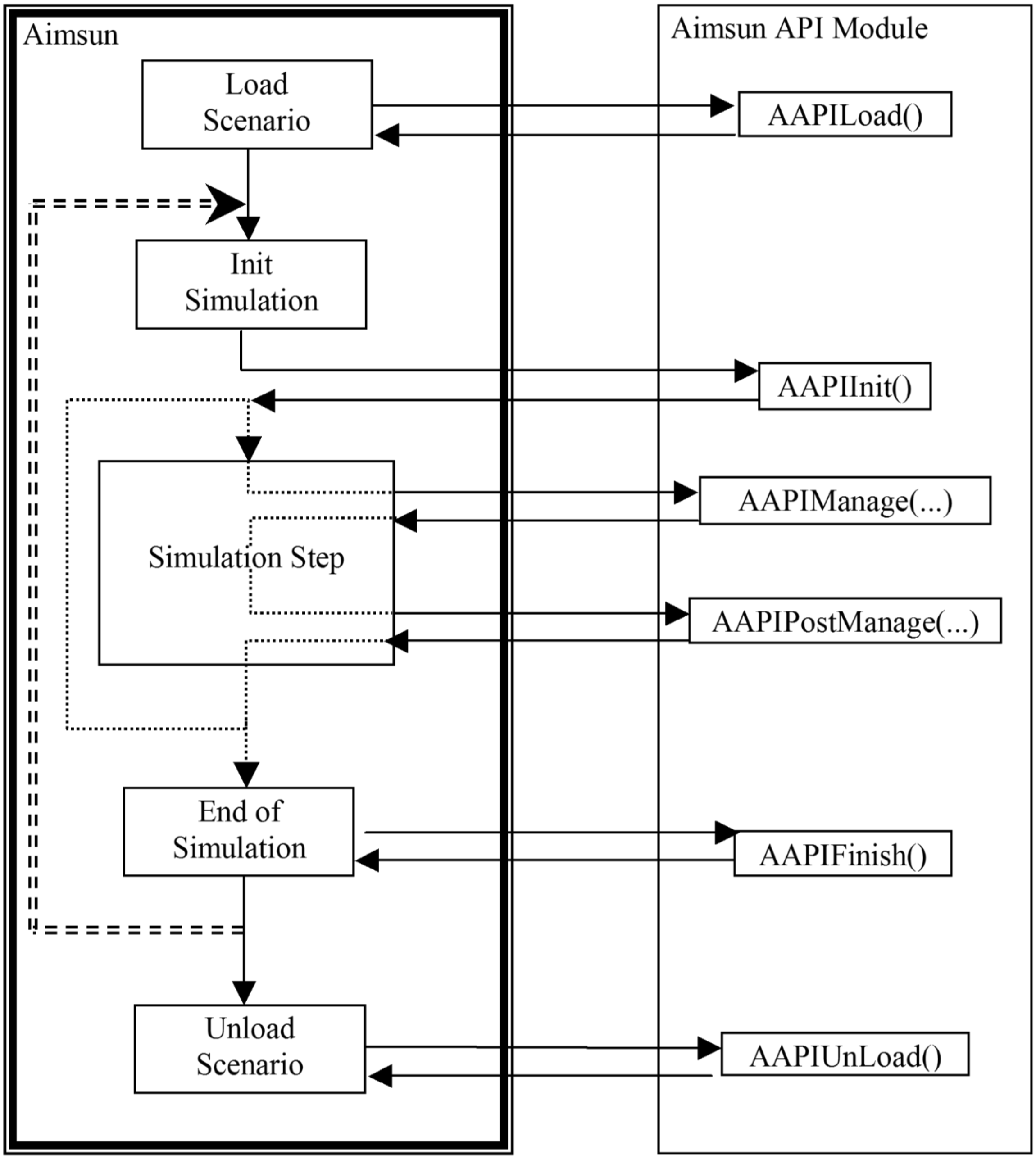

Figure 7-3: Scheme How Aimsun and Aimsun API Module Interact [Source: TSS]

The microsimulator in Aimsun can simulate vehicles and pedestrians at the same time. The pedestrians are simulated by using an embedded Legion pedestrian simulator engine. Refer to the Legion for Aimsun section for more details about pedestrians in Aimsun. The microsimulator in Aimsun could be interfaced with external applications using an API. The integration of the API into the microsimulator is done using the Micro API. The Micro API module has six high-level functions defined in order to guarantee the communication between the Aimsun API Module and the Aimsun Simulation model: AAPILoad, AAPIInit, AAPIManage, AAPIPostManage, AAPIFinish, and AAPIUnLoad.

1. AAPILoad(): It is called when the module is loaded by Aimsun.
2. AAPIInit(): It is called when Aimsun starts the simulation and can be used to initialize whatever the module needs.
3. AAPIManage(double time, double timeSta, double timeTrans, double cycle): This is called in every simulation step at the beginning of the cycle, and can be used to request detector measures, vehicle information and interact with junctions, metering and VMS in order to implement the control and management policy.
4. AAPIPostManage(double time, double timeSta, double timeTrans, double cycle): This is called in every simulation step at the end of the cycle, and can be used to request detector measures, vehicle information and interact with junctions, metering and VMS in order to implement the control and management policy.
5. AAPIFinish(): It is called when Aimsun finish the simulation and can be used to finish whatever the module needs.
6. AAPIUnLoad(): It is called when the module is unloaded by Aimsun.

Figure 7-3 shows graphically how Aimsun and a Micro API Module interact.

It has five additional functions that are called when certain events occur. They are: AAPIEnterVehicle and AAPIExitVehicle, AAPIEnterVehicleSection, AAPIExitVehicleSection and AAPIPreRouteChoiceCalculation

1. AAPIEnterVehicle(int idveh, int idsectionOrTurn): This is called when a new vehicle enters the system that is, when the vehicle enters its first section or a turn (it is only possible when loading an initial state), not when it enters to the Virtual queue (in case it exists).
2. AAPIExitVehicle (int idveh, int idsection): this is called when a new vehicle exits the system.
3. AAPIEnterVehicleSection(int idveh, int idsection, double atime): This is called when a new vehicle enters a new section.
4. AAPIExitVehicle (int idveh, int idsection, double atime): this is called when a new vehicle exits the system.
5. AAPIPreRouteChoiceCalculation(double time, double timeSta): This function is called just before a new cycle of route choice calculation is about to begin. It can be used to modify the sections and turnings costs to affect the route choice calculation.

The Micro API in the context of this project has the following set of functions to get and set information during the simulation:

- Infrastructure information:
  - Network information: Section, nodes, centroids.
  - Signalized intersection description
  - Actuated parameters access
  - Ramp Metering description and its control
- Dynamic information
  - Detector measurements
  - Statistics with different level of aggregation
- Traffic Management
  - Rerouting
  - Dynamic speed limits
- Vehicle information (vehicle properties and dynamic attributes such speed, position, acceleration every simulation step)
  - Access to vehicle information by section or nodes.

- Access to vehicle information of a subset of vehicles (tracked vehicles in Aimsun nomenclature)

7.2.2 Prediction Tool: Aimsun Online

The prediction tool will be built off of the Aimsun Online model used within the ICM project, the only difference will be that the system will be configured to use simulation data rather than real data to perform the Analytical projects. Figure 7-4 shows the Aimsun Online Architecture and Figure 7-5 shows the I-15 Aimsun Prediction work flows. The main difference with this approach is the fact that the real time context data for devices and counts will be substituted by running a simulation and generating the data files. The prediction system will perform both analytical prediction for the VDS within the network and simulation full network predictions for any 15-minute interval. This system will run predictions starting on the 5-minute intervals and analytical predictions will provide the 15, 30, 45, 60 and 75 minute predictions of speed, occupancy and flow while the simulated predictions will provide all operational MOEs for the full network for the 15, 30, 45,and 60 minute forecasts.

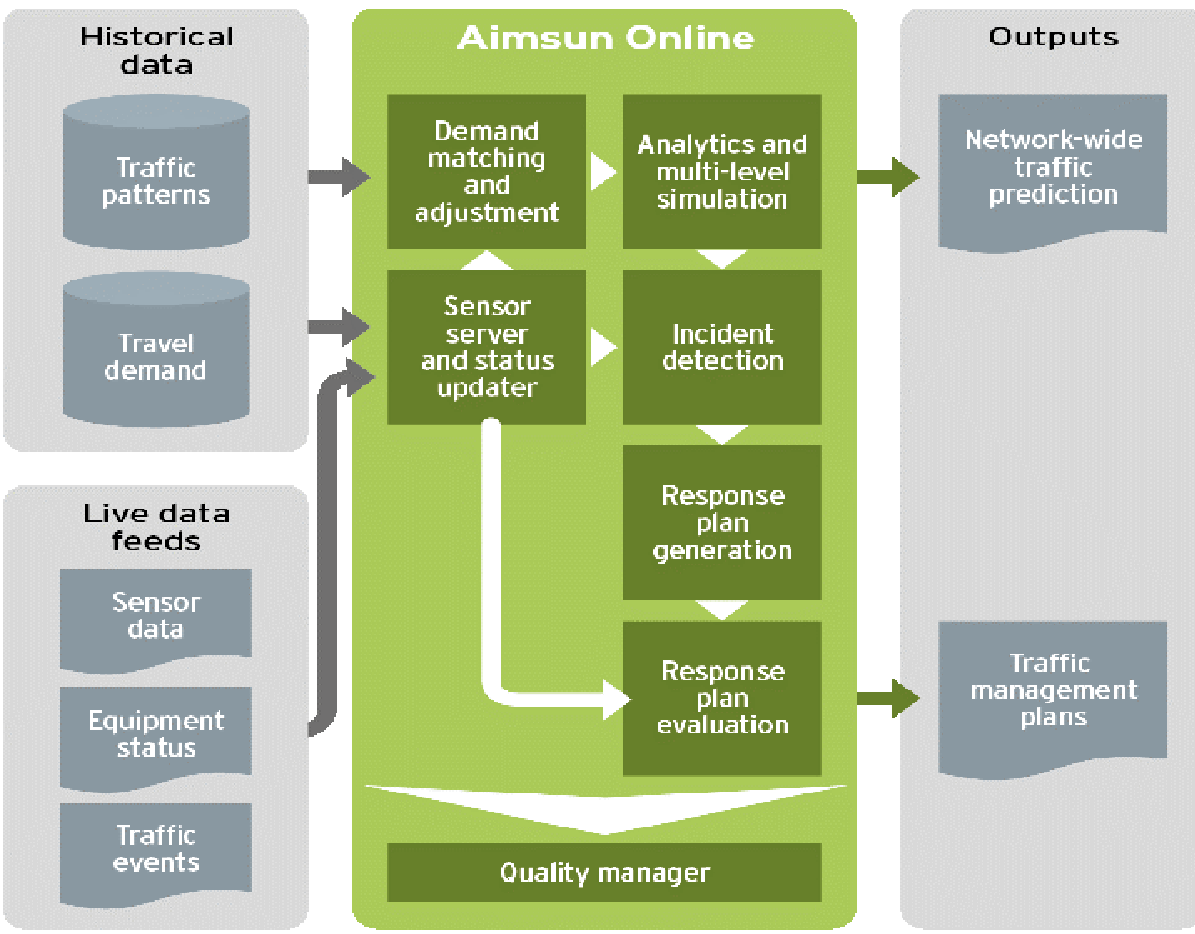

Figure 7-4: Aimsun Online Architecture [Source: TSS]

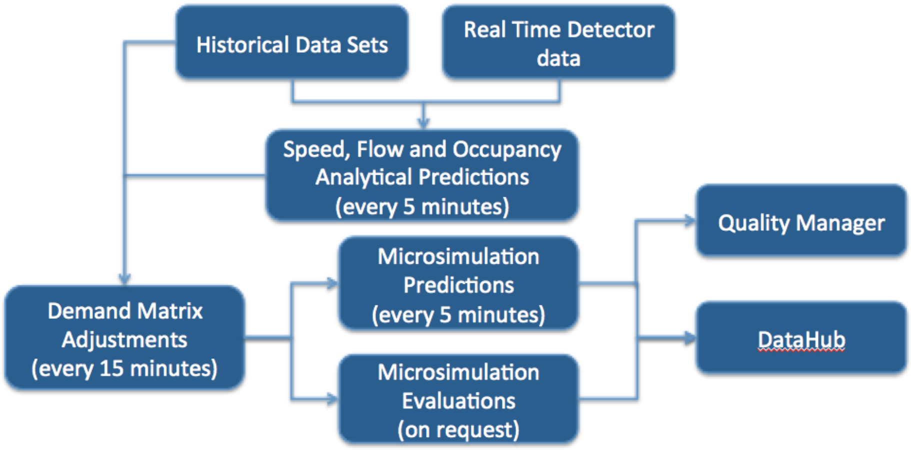

Figure 7-5: ICM Aimsun Prediction Workflow [Source: TSS]

7.2.3 Calibration Toll: Aimsun

Aimsun platform has different tools for assist the validation and calibration process of a traffic model. The main components are:

1. Network Checker & Fixer: Aimsun offers a tool for checking whether there are errors in the network definition or not, and also give facilities for fixing this errors. Figure 7-6 depicts an example of output of this functionality.

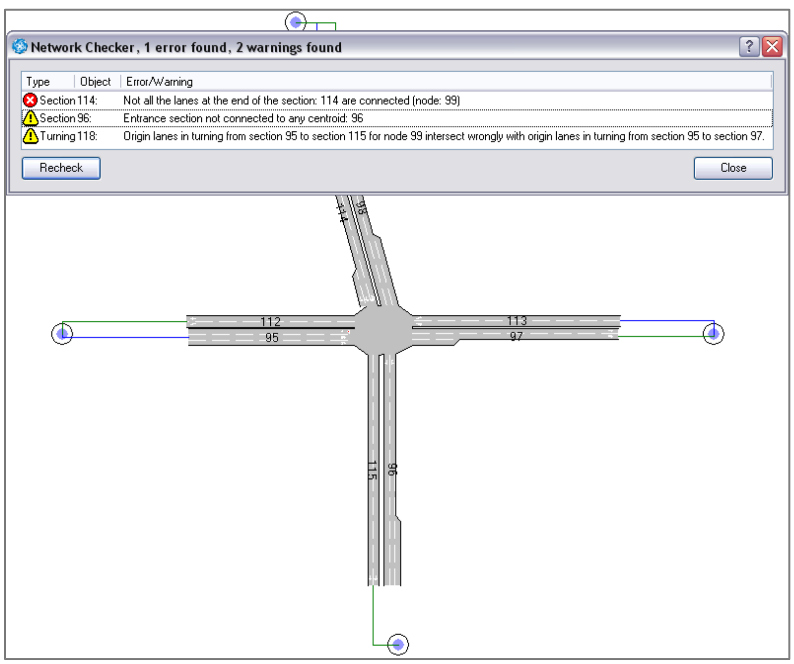

Figure 7-6: Example of Network Checker and Fixer Output [Source: TSS]

2. Microsimulator Network Checker: The Microsimulator Network Checker's purpose is to detect problems within a running simulation.

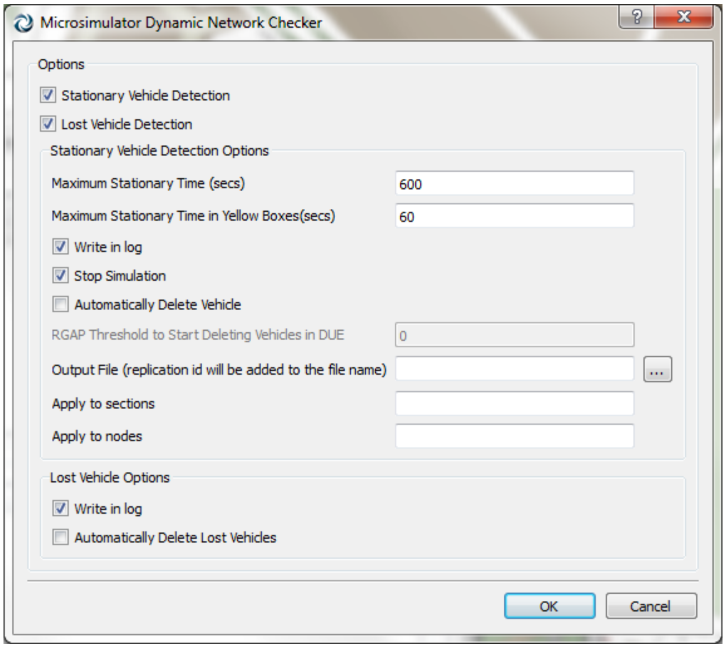

Figure 7-7: Example of Microsimulator Network Checker Editor [Source: TSS]

3. Statistical Model Validation Tools:
   a. Validation summary: Once a dynamic simulation has been run or an average of simulations has been calculated the replication editor, result editor or average editor will have data in their Validation folder. The aim of the Validation folder is to be able to compare real data with simulated data. The type of plots available are:

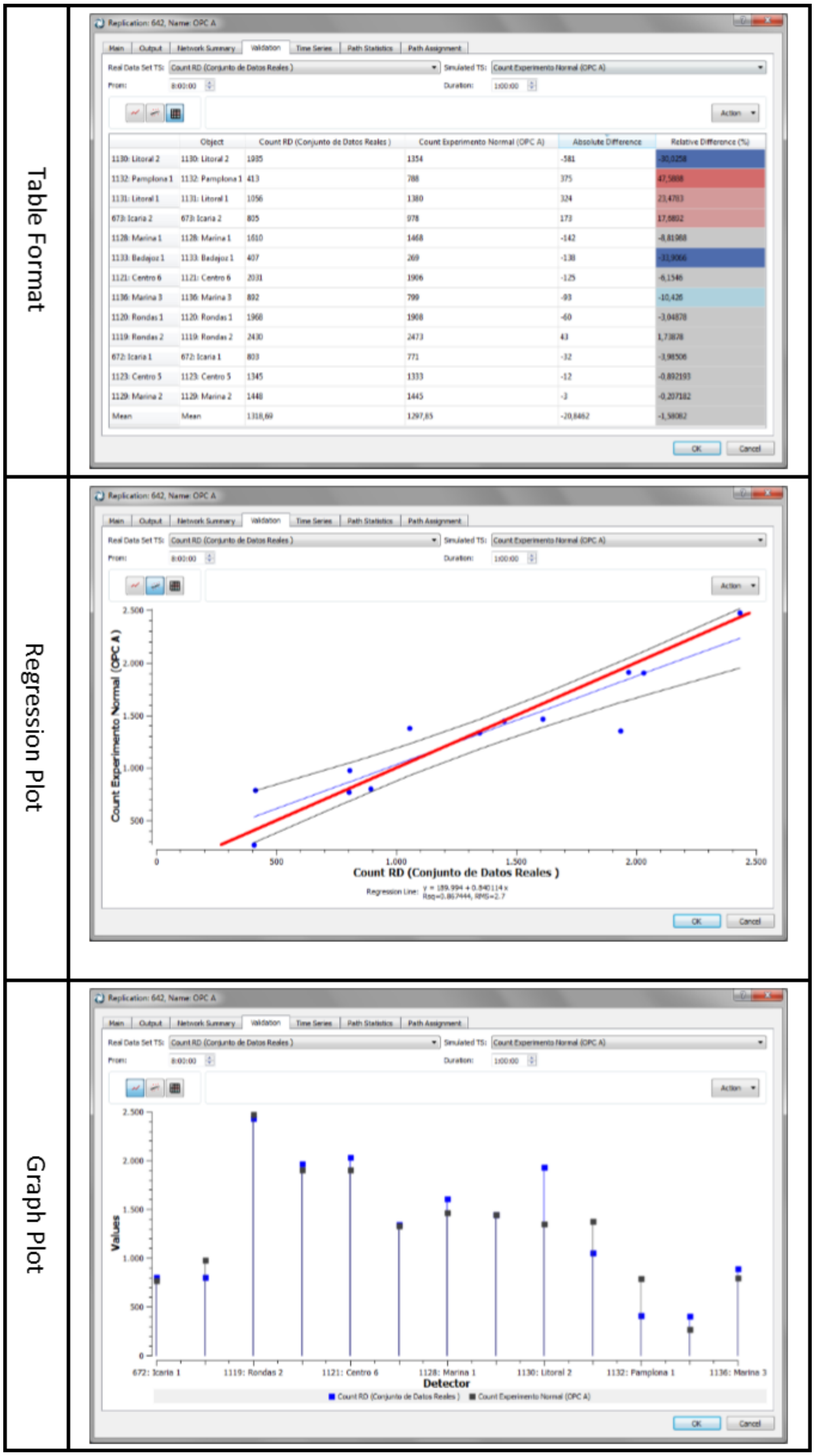

Figure 7-8: Aimsun Data Validation Tools [Source: TSS]

b. Validation GEH index and Theil's coefficient: It calculates both indexes for each detector. For example for GEH index defines the range 0 - 5 as "good fit", 5 -10 as "requires further investigation" and > 10 as "unacceptable". Figure 7-9 shows an example of this output.

Figure 7-9: Example Validation of GEH Statistics [Source: TSS]

c. Outputs Validation: Aimsun offers different options for comparing experiments or averages. Four options are available:
   - Regression
   - Hypothesis test.
   - Percentage Difference
   - Decision table Comparison.

4. Path Analysis tool or Link Analysis: To get the insight into what is happening in a traffic assignment (either static or dynamic), the user should have access to the analysis of the used paths. There are two main sources of information:
   - Path Assignment: the user can view all considered probabilities when a vehicle enters the system.
   - Path Statistics: the user can view all paths statistics result of a dynamic traffic assignment.

   These are shown in Figure 7-10.

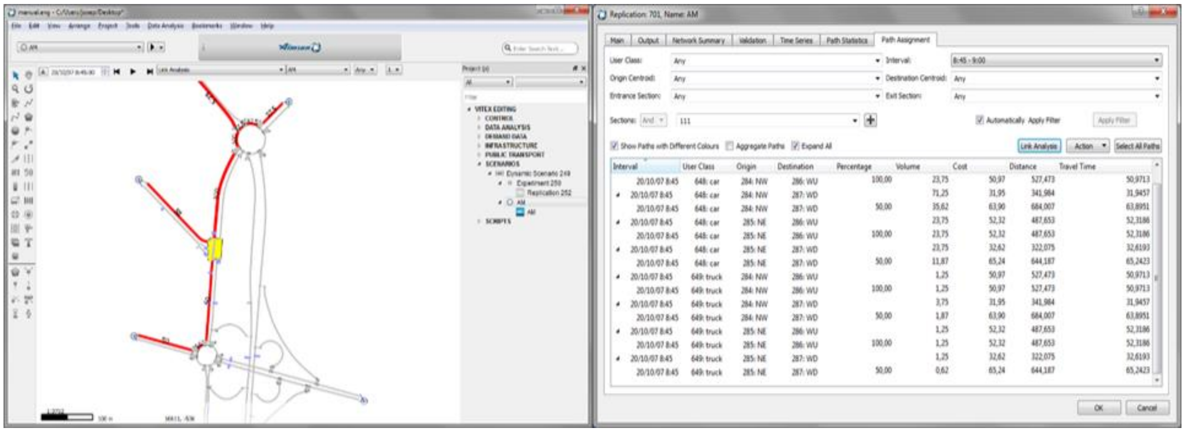

Figure 7-10: Path/Link Analysis Tool Snapshot [Source: TSS]

7.2.4 Scenario Generator: Aimsun

The Scenario generator is included in Aimsun as default tool in its GUI, where there is a scenario editor. The scenario editor is divided into several tab folders. Of these three folders are described here. The first one contains the most important data: what is going to be simulated. The second one sets the statistical data that will be collected (if any). In the third folder the user can add Aimsun APIs and Enhanced Aimsun APIs (there is a difference between both of them in their access to the user interface).

1. Main folder: Here the user sets the traffic demand, the public transport plan and the collection of control plans (a master control plan) to be used. The first entry is mandatory: no simulation can be run without a traffic demand. The rest is optional.

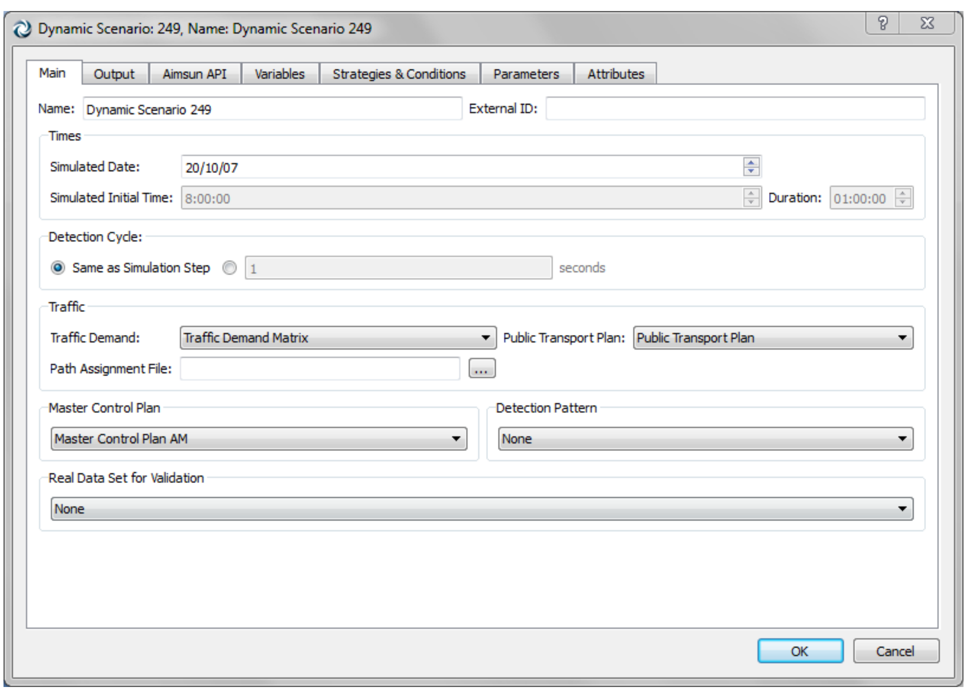

Figure 7-11: Example of Scenario Editor (Main Folder) [Source: TSS]

2. Output folder: Defines the simulation outputs
3. Aimsun API: An Aimsun API is an external library that the user can create to access the simulator information online during simulation and modify it or check it as needed. The Enhanced Aimsun

APIs can also access the simulator information and furthermore it gives access to the graphical user interface allowing the creation of new menus, editors. In this folder the available Enhanced Aimsun APIs are listed and can be selected to be used in the simulation. When selecting one and clicking on the Properties button, a new dialog will appear where several parameters may be defined for the selected Enhanced Aimsun API.

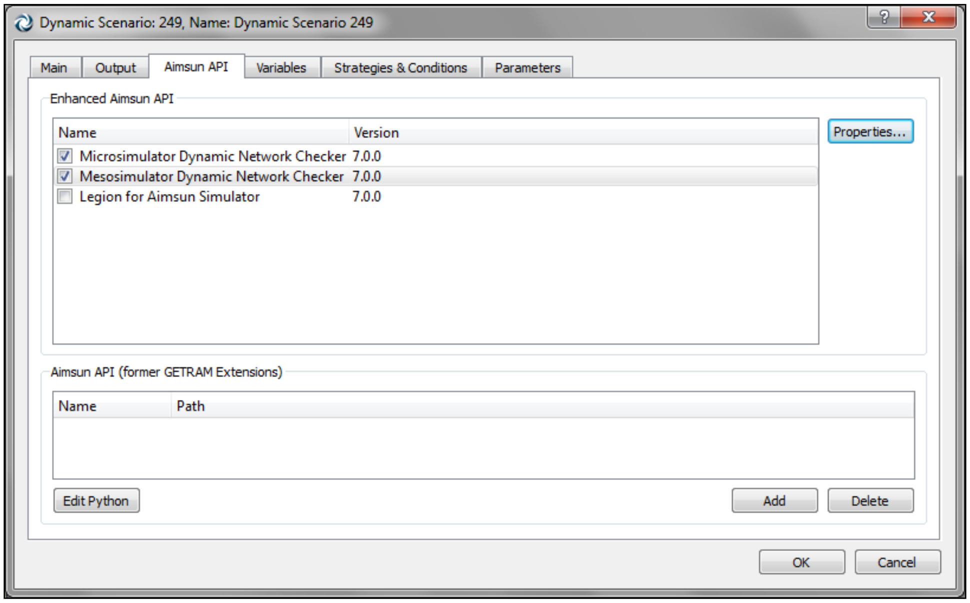

Figure 7-12: Example of Scenario Editor (AIMSUN API Folder) [Source: TSS]

7.2.5 INFLO Applications

Intelligent Network Flow Optimization bundle consists of three different applications:

1. **Q-WARN** provides a vehicle operator with sufficient warning of an impending queue backup, thereby minimize the occurrence and impact of traffic queues by using connected vehicle technologies, including vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communications.
2. **SPD-HARM** dynamically adjust and coordinate vehicle speeds in order to maximize traffic throughput and reduce crashes. By reducing speed variability among vehicles, traffic throughput is improved, flow breakdown formation is delayed or even eliminated, and collisions and severity of collisions are reduced.
3. **CACC** or Cooperative Adaptive Cruise Control dynamically and automatically coordinate cruise control speeds among platooning vehicles; coordinating in-platoon vehicle movements; reducing drag.

The three applications within the INFLO bundle are cross-functional as described in Figure 7-13.

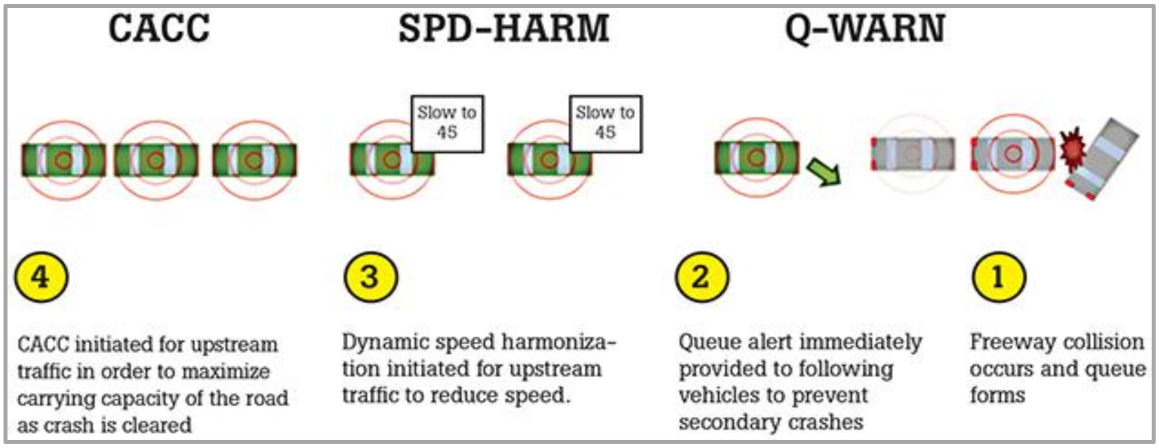

Figure 7-13: INFLO Application [Source: TTI]

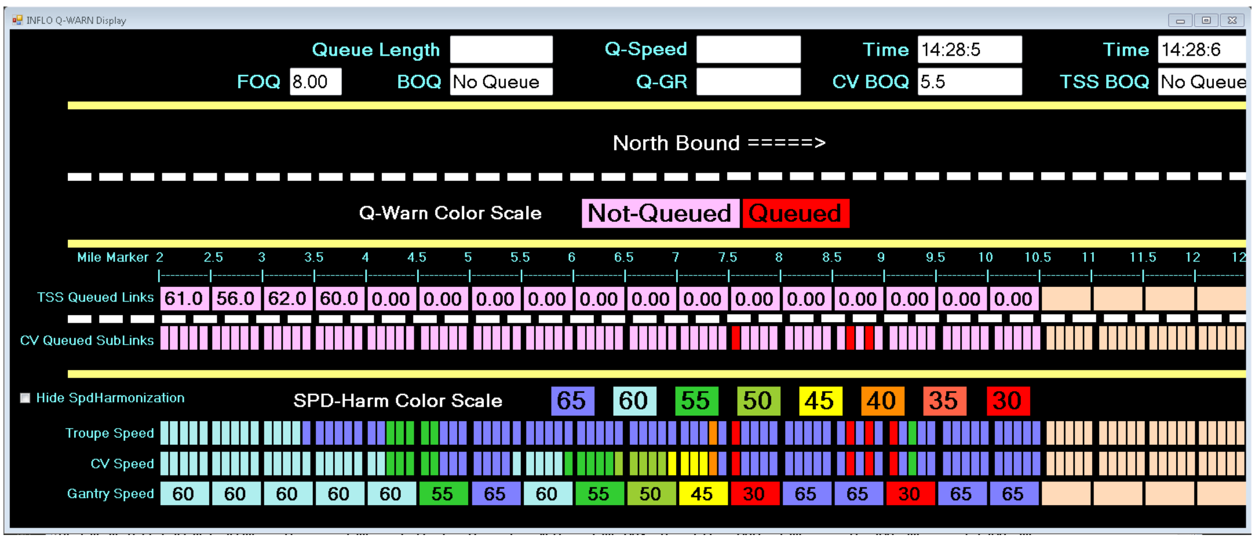

Figure 7-14: Screenshot of Q-WARN and SPD-HARM Application Developed by TTI [Source TTI]

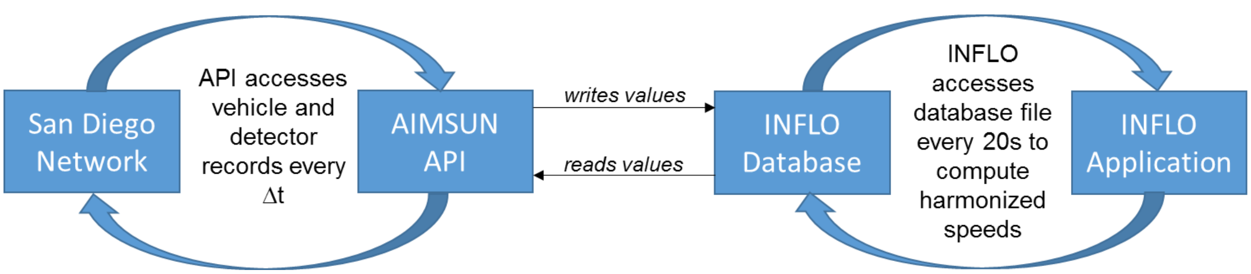

Figure 7-15: INFLO Integration into AIMSUN Testbeds [Source: TSS]

Q-WARN and SPD-HARM were developed as a Windows application (Figure 7-14) and was included in the evaluation in the San Mateo Testbed. Specifically, the applications were modeled together for VISSIM and uses two inputs from the simulation – Infrastructure Sensor Data and Connected Vehicle Data. Infrastructure Sensor Data represented the loop-detector data of speed, occupancy and volumes and were collected from a series of data collection devices. Connected vehicle data represented the speed, link ID (position and heading), and queued status. The team will use AIMSUN's programming interface to develop a socket between INFLO application and the simulation network. A tentative implementation diagram is given in Figure 7-15.

Figure 7-16 shows the implementation area for the INFLO application. INFLO will be evaluated for I-15 freeway on the South Bound. The current INFLO prototype deployed onto the OSADP allows only one-instance of the application which will only be for one direction of a roadway.

In order to emulate INFLO application along the I-15 freeway, the team will assume ubiquitous and perfect cellular coverage across the freeway and avoids predetermined or stochastic losses or errors in data flow between simulated vehicles, infrastructure and the INFLO application.

CACC Application is prototyped separately as a driver behavior model for VISSIM by Saxton Lab developers. This application, available from the OSADP, will be used to recode car-following, gap-acceptance and lane-change models for use in Aimsun. The CACC application will be calibrated for the following parameters in discussion with the ICM Stakeholders for use in the AMS Project:

1. Maximum Platoon Size.
2. Short Headway
3. Long Headway
4. Leading Critical Gap
5. Lagging Critical Gap
6. Leading Speed Differential
7. Lagging Speed Differential

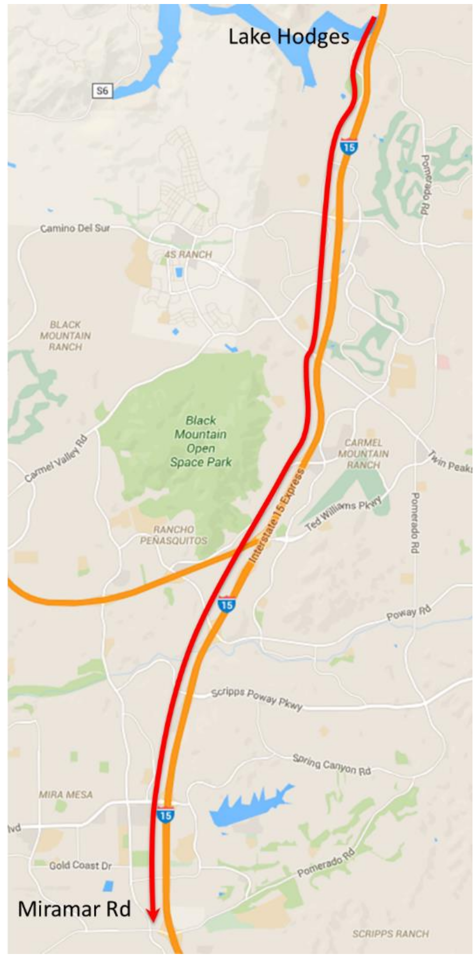

Figure 7-16: INFLO Application will be Assessed on I-15 SB from Lake Hodges to Miramar Road [Source: TSS]

7.2.6 MMITSS

Multi-Modal Intelligent Traffic Signal Systems bundle (MMITSS) is a next-generation traffic signal system that seeks to provide a comprehensive traffic information framework to service all modes of transportation. Figure 7-17 below illustrates an example of the MMITSS applications. MMITSS consists of five different applications which all are prototyped together as a single MMITSS application by University of Arizona as a Software-in-the-Loop system. The five applications are described below and are modeled using combinations of functions that are turned on in Linux-based Docker Containers.

1. **I-SIG** aims at maximizing the throughput of passenger vehicles and minimizing the delay of priority vehicles under saturated conditions and minimizing the total weighted delay during under-saturated conditions.
2. **TSP** allows transit agencies to manage bus service by adding the capability to grant buses priority.
3. **PED-SIG** integrates information from roadside or intersection sensors and new forms of data from pedestrian-carried mobile devices.
4. **PREEMPT** will integrate with V2V and V2I communication systems in preempting signal phases for emergency vehicles.

5. **FSP** provides signal priority near freight facilities based on current and projected freight movements.

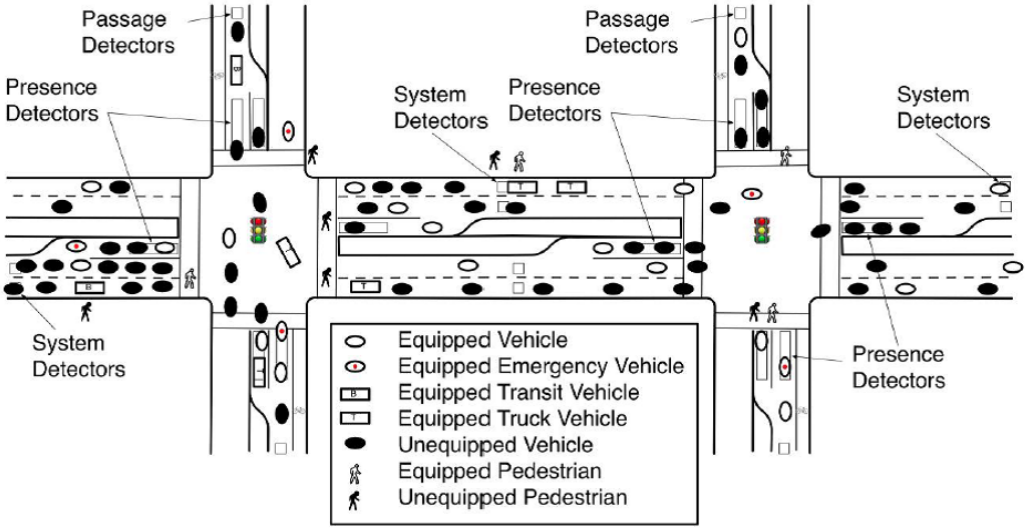

Figure 7-17: Illustration of MMITSS Concept[4] [Source: FHWA]

The Testbed team has acquired the MMITSS system and is using subversion system to receive updated files from its developers, University of Arizona. The MMITSS system is a software-in-the-loop system and uses NTCIP-based commands to modify the innate signal control behavior. The system also uses two inputs: Loop-detector inputs and Connected Vehicle Data. The Team is working with University of Arizona on porting MMITSS, which is currently designed for Vissim to the AIMSUN system. This will involve coding AIMSUN API to translate NTCIP commands to AIMSUN-based signal control variables.

Based on discussions with SANDAG, MMITSS applications would be coded to specific signalized corridors based on the selected operational conditions.

7.2.7 Trajectory Conversion Algorithm

The TCA tool is designed to test different strategies for producing Connected Vehicle information from the simulation in real-time, transmitting the messages to the applications as well as storing the generated data. .The TCA reads in and uses vehicle trajectory information, Roadside Equipment (RSE) location information, cellular region information, event region information, and strategy information to produce a series of snapshots that the vehicle would produce. Vehicles can be equipped to generate and transmit Probe Data Messages (PDMs), Basic Safety Messages (BSMs), ITS Spot messages, and/or European Cooperative Awareness Messages (CAM) which can be transmitted by either Dedicated Short Range Communication (DSRC), cellular or both. The TCA program assumes perfect communication between vehicles and RSEs or cellular ranges unless the user defines a latency or loss rate in the input files. As soon as a vehicle equipped to transmit via DSRC is in range of a RSE, it will download all of its messages directly. Similarly, if the vehicle is equipped to transmit via cellular, it will download all its snapshot information directly. In either transmission, snapshots might be lost or delayed due to user-defined loss rate and latency. The current TCA tool is available in the USDOT's OSADP portal for Vissim and Paramics simulation tools. The testbed team will develop an Aimsun wrapper to replace the data-capture part of the TCA and make it available for Aimsun platform.

[4] Multi-Modal Intelligent Traffic Signal Systems (MMITSS) Impacts Final Report, USDOT, FHWA-JPO-15-238

Chapter 8. Model Calibration

8.1 San Diego Testbed Baseline Models and Calibration Guidelines

In order to prepare for the calibration steps it is important to have an understanding of the model approach to be implemented. The calibration approach within this document and to be applied to the San Diego I-15 ICM Aimsun Online model is based off of the approaches laid out by the FHWA within the Traffic Analysis Toolbox Volume IV[5] and Volume III[6]. Figure 8-1 (based on Figure 45 from Volume IV[3]) summarizes within a flow chart the basic iterative structure of the approach.

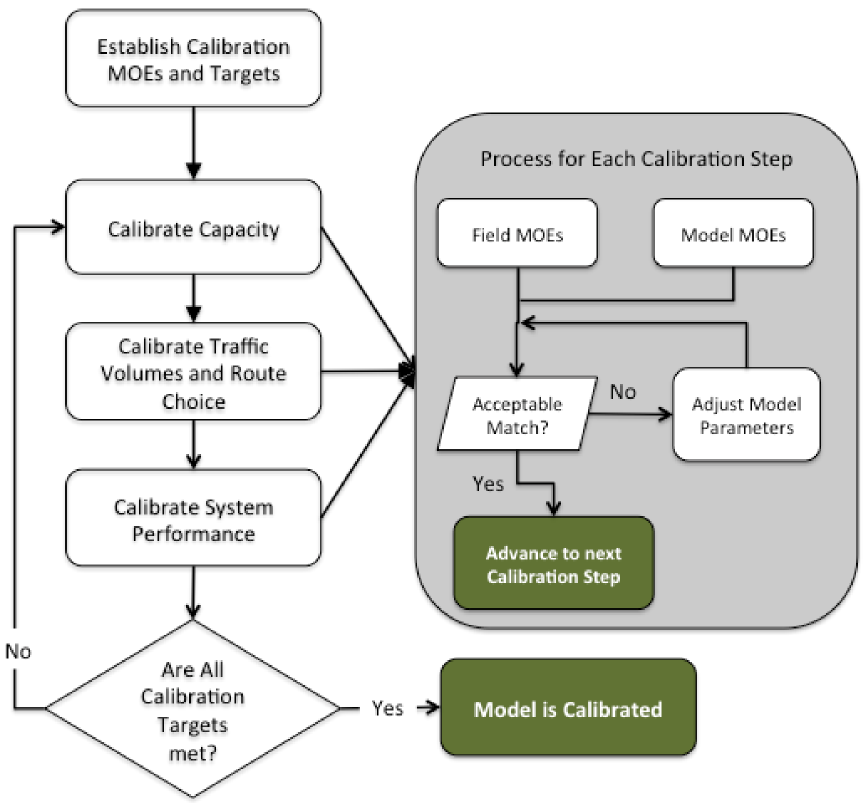

Figure 8-1: Flowchart of Calibration Approach [Source: TSS]

[5] Peter Holm, Daniel Tomich, Jaimie Sloboden, Cheryl Lowrance, Traffic Analysis Toolbox Volume IV: Guidelines for Applying CORSIM Microsimulation Modeling Software, FHWA-HOP-07-079, Federal Highway Administration, January 2007

[6] Dowling, R., A. Skabardonis, and V. Alexiadis, Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software, FHWA-HRT-04-040, Federal Highway Administration, July 2004

With each step of this approach the observed field observations and Measures of Effectiveness (MOEs) are compared with the model results and MOEs and the model parameters for each step are adjusted until the established targets for that step are achieved. Once the modeled MOEs match the targets for all three steps the model is deem calibrated and a good representation of real world conditions. In some special cases where the model is unable to meet the targets for all occasions the model can be seen as valid as long as a justifiable reason is provided and approval given by the SANDAG review team. An example of one such situation where the targets are not met could arise when the confidence in the some field results is not a 100%. In this case the observed data at the location in question may not line up with other observed data. For this reason, the analyst may choose to not include this location as part of the calibration data. This situation would be raised with the client and either the approach approved or new data retrieved.

8.1.1 Calibration MOEs and Targets

In order to ensure an efficient and quality calibration, it is important to identify the MOEs that will be used to compare the real world operations and performance to the model operations and performance. These MOEs should be available both from the real world operations and data collection, and the model results. In principle, for the San Diego I-15 ICM Aimsun Online model, the required MOEs given in 4.2 will be used within the FHWA guidelines for calibration. The three types of MOEs defined by the Chapter 5 of Traffic Analysis Toolbox are:

1. Capacity Calibration
2. Traffic Volume and Route Choice Calibration
3. System Performance Calibration

8.1.1.1 Capacity Calibration

For the capacity calibration, the MOE used is calculated capacity, represented by saturation flows, bottleneck flows and signal approach capacity. Chapter 5 goes into greater detail in how to estimate the field capacity and the modeled capacity for both freeway sections and arterial sections.

Point of Calibration

The Data Collection Plan (DCP) and its appendices goes through in detail the data points to be collected and the sources for those data points. This data is intended to be used to calibrate and validate the base 24-hour model. The following lists the data type and either is current source or its projected source:

- Capacity Related Flows
  - For arterial capacities, video of congested intersections will be collected to calculate the flow per green cycle rates.
  - For mainline capacity, the flow, bottleneck, and speed data will be collected from the PeMS databases.
  - For the EL capacity, the flow and speed data will be collected from the CPS data feeds.
- Traffic Volumes and Flows
  - Type: 24-hour mainline freeway counts; Source: PeMS & IMTMS;
  - Type: 24-hour ramp counts; Source: PeMS, IMTMS & ATR counts if needed;
  - Type: 24-hour EL counts; Source: PeMS, IMTMS & CPS;
  - Type: 24-hour arterial link counts; Source: Sensys, RAMS & ATR counts;
  - Type: 24-hour turning movement counts; Source: Manual counts & some previously collected data;
- Travel Times
  - Travel times for the major corridors throughout the model will be manually collected when it is unavailable from Sensys Database or INRIX system.

- Where available Transit Vehicle Travel Times will be used for Validation of the Transit Operations; The source of this data would be from the AVL system and the RTMS;
- Queue Data
  - Where available, INRIX data will be used.
  - Interviews with the city officials will be used in collaboration with field observations to create an overall understanding of queuing within the study area.
  - Where collected thru the other data collection methods video of queues will be also used. It should be noted that the data collection plan does not call for independent collection of queue videos.
- Bottlenecks and Speed Contours
  - Where available, INRIX data will be used.
  - 5-minute aggregated speed data will be collected from the PeMS database for each section of the I-15 corridor.
- Ramp Metering (ITS API calibration)
  - 30 second data from the RMIS system will be collected and used for the calibration of the ramp metering API within the Aimsun model.
- CPS System (ITS API calibration)
  - 6 minute data will be collected from the CPS system for speeds, travel times and assigned prices. This data will be used to calibrate the CPS API within the Aimsun model.

Although the DCP outlines the locations where no data is currently available (hence, the potential need to collect data at these locations) Appendix E outlines an alternative approach to identifying the key locations for data collection. This was done to try and control the amount of manual data collection needed. Therefore, the complete list of data collection locations will not be completed till after a first calibration has been completed using only data that is currently available.

Spatial Aggregation

For the mainline and arterial sections the model validation will be performed as a cross section sectional analysis and the validation match criteria will not be performed for each lane. Where the visual audit of the model raises any questions about the lane utilization within the model, the calibration would be revisited and detector values for each lane would be compared against the model for sections in question. Figure 8-2 below shows how the model can represent one cross-section or each individual lane.

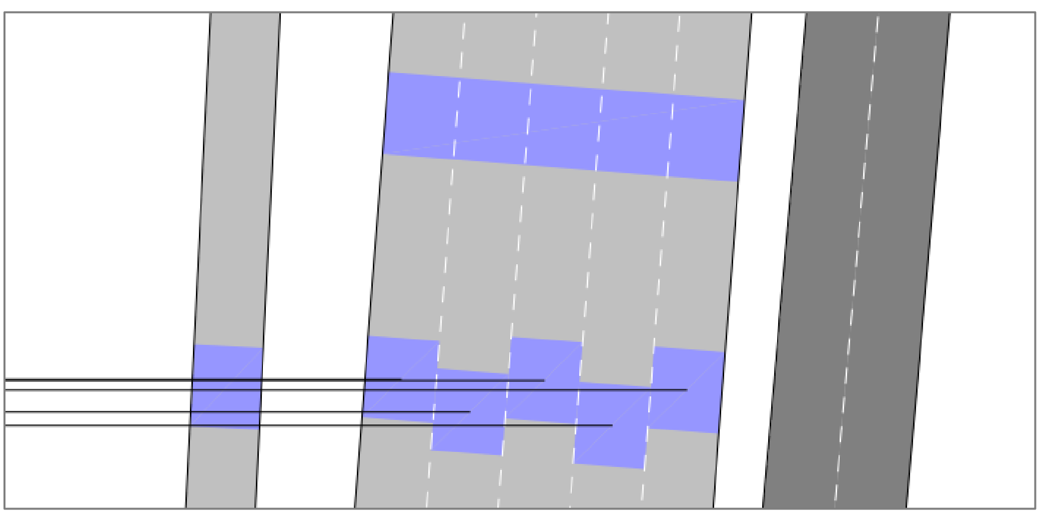

Figure 8-2: Sample of Spatial Aggregation - Cross Sectional and by Lane [Source: TSS]

Temporal Aggregation

Validation will be conducted for the 24-hour period based on 1-hour aggregation. In order to aid the analyst with the calibration process, all real field data can be loaded into Aimsun to perform the comparison between real and simulated data within the software, as shown in Figure 8-3.

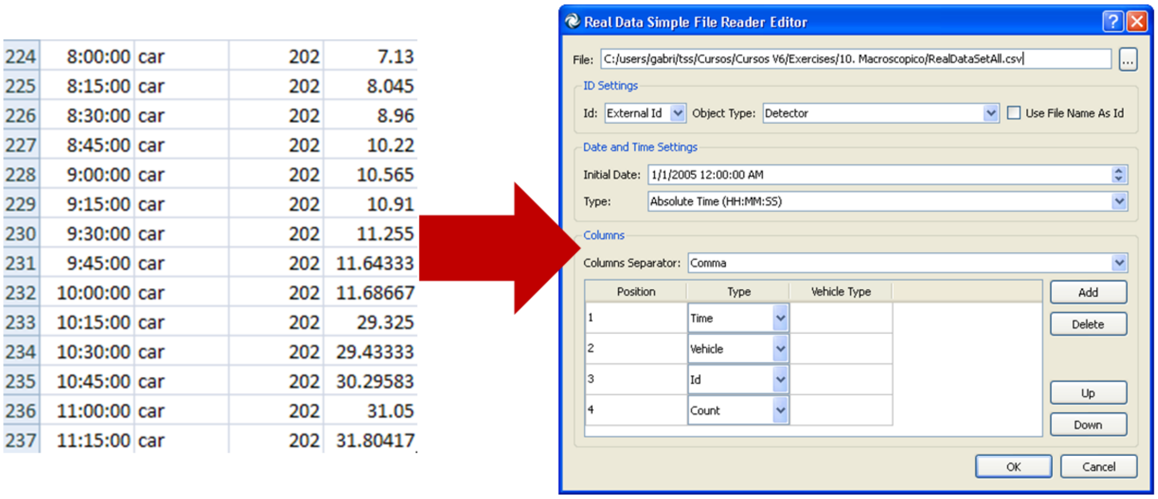

Figure 8-3: Aimsun Example GUI for Importation of Field Observed Data [Source: TSS]

It should be noted that the 24-hour period will only be used with the validation criteria for hourly traffic volumes and system performance. Capacity calibration requires congested or near congested conditions and therefore would not be performed for the off-peak periods. The off-peak periods will be observed to insure the capacity calibration is not resulting in any unusually behavior.

Validation Criteria

The calibration targets for the base model are keeping with the targets used both by the I-15 ICM project and the AMS post evaluation and following the approached based on the FHWA guidelines. Some of the targets will require meeting a certain percentages and others will require meeting a visual acceptance. Table 8-1 outlines the proposed calibration targets to be met for each step.

Table 8-1: List of Model Calibration Targets

MOE Criteria	Calibration Acceptance Targets
Capcity (Model versus Observed)	
Lane Capacity (veh/hr)	Within 15% for >85%
Visual Audit	Visual acceptance of bottleneck development to analyst's satisfaction
Hourly Traffic Volumes (Model versus Observed)	
>2,000 veh/hr	Within 15% of field flow for >85% of all cases
Sum of all link flows	Within 5% of sume of all link counts
System Performance	
Journey Times, Network	Within 15% of observed travel times for >85% of all cases
Speed Contours	Visually acceptable freeway based speed contour comparison t SANDAG's satisfaction
Individual Link Speeds	Visually acceptable speed-flow relationship to SANDAG's satisfaction
Bottlenecks	Visually acceptable queuing to SANDAG's satisfaction

8.1.1.2 Volume and Route Choice Calibration

For the calibration of traffic volumes and route choice within the model, MOEs to be used will be traffic volumes and flows. For the freeway sections, the volumes will be compared for the on-ramps, off-ramps, general purpose (GP) sections and express lane (EL) sections. For the arterial sections, the volumes will be compared for the intersection approaches, the turn movements and the mid-block sections. These results will only be collected where available quality data has been collected and will be summarized on an hourly basis. The data collected by both the online data sources and the manual sources will be checked for quality and consistency.

Calibrating the traffic volumes is the second step of the calibration that takes place once the capacity calibration has been successfully completed. This step helps to ensure that the modeled volumes throughout the study area match those in the field and is generally only require in models with multiple route choice, as is the case with the San Diego I-15 ICM model. Should the model be unable to meet the MOE criteria for this step it will thus prove difficult for the System Performance to be properly calibrated.

This second step in the model calibration process is achieved by comparing the link and turning volumes to those observed in the field. This is an iterative process where with each run of the model the different parameters that impact route choice (link costs, turning penalties, etc.) are adjusted to get closer and closer to meeting the targets until they are met.

Due to the size of the San Diego I-15 ICM model, it is assumed that not all counts will be considered during the calibration but that the calibration will focus more on the areas of congestion and bottleneck as well as critical intersections. These locations will be identified once the data collection has been completed Once the model is able to match within 15% of observed volumes for the links with volumes greater than 2,000 veh/hr for 85% of cases and the sum of all model link flows is within 5% of the sum of all link counts, the analyst can move on to the system performance calibration, the final step.

Main aspects that need to be considered in the calibration of the Route choice are:

- Compare flows or/and travel time
- Check calculated paths
- Capacity weight
- Tolls/user-defined costs
- Tune route choice parameters
- Lane connectors

The parameters to be considered in the calibration of the Route Choice include but are not limited to the following list:

- Experiment parameters
  - Cycle
  - Number of intervals
  - Capacity weight
  - User defined cost weight
  - Use of OD Routes and Path Assignment Results
  - Route Choice Model
    - Type
    - Parameters
    - En-route percentage
- Section parameters
  - Capacity
  - User Defined Costs
- Turning parameters

    - Cost function
        - Initial
        - Dynamic
- Centroid parameters
    - Entrance and exit percentages
    - Use Best Entrance

8.1.1.3 System Performance Calibration

In order to show the calibration of the I-15 mainline speed, contour diagrams similar to Figure 8-4 will be produced for each direction (although the model is being calibrated for 24 hours, speed contours will only be produce for the peak and midday periods). This output will be obtained based on the specific tool Aimsun provides, the Space Time diagram, creating specific Detector Sets for each I-15 direction. Once the speed contours have been produced for both the PeMS real world data and the modeled data, they will be submitted for approval.

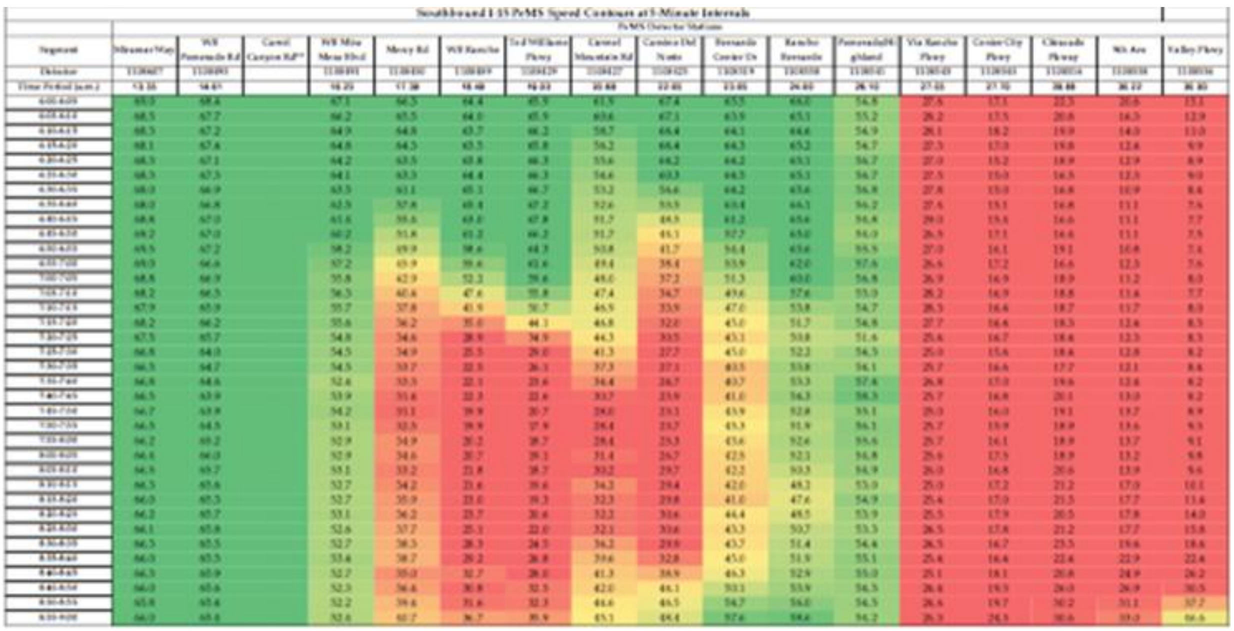

Figure 8-4: Sample PeMS I-15 Speed Contour Plot [Source: PeMS]

8.2 Model Calibration to Operational Conditions

The following are the results of the most recent calibration update performed as part of the ICM post deployment evaluation effort. This will be the starting point for the minor calibration adjustment as part of the AMS project. The calibration demonstrated in this section is to a typical day. The team will make calibration adjustments to match the network performance to the representative days to be identified in the cluster analysis.

Link Count Comparisons

A total of 86 freeway mainline stations and 7 managed lanes stations in the AM peak period, 89 mainline stations and 7 managed lanes stations during the PM peak period and 70 mainline stations in the Inter peak period had over 8000 vehicles (equivalent of 2000 vph). None of the available arterial stations meet the 8000-vehicle threshold.

Table 8-2 shows the count comparison for all I-15 locations that meet the thresholds for the typical day. Table 8-3 through Table 8-7 show the AM, PM, and Inter peak four-hour volume comparisons of the mainline and managed lanes for the observed versus modeled link counts. Link count differences and percent differences are also shown in these tables.

The summary of link count reasonableness assessment (for the use of this model to evaluate the benefit of various operational strategies) results for a typical, no incident day include:

- 91 of the 93 links (97 percent) meet the 15 percent comparison criterion described in Table 8-1 for the AM peak – Criterion 1 is met for the AM Peak.
- 91 of the 96 links (94 percent) meet the 15 percent comparison criterion described in Table 8-1 for the PM peak period- Criterion 1 is met for the PM Peak.
- 69 of the 70 links (98 percent) meet the 15 percent comparison criterion described in Table 8-1 for the Inter peak period- Criterion 1 is met for the Inter Peak.
- The sum of all model link flows across all periods 6,881,464 while the sum of observed link counts is 6,879,770. These volume sums are well within 5 percent and thus Criterion 2 is met for the three combined periods.
- The sum of all model link flows in the AM peak period is 2,407,128 while the sum of observed link counts is 2,407,567. These volume sums are within 5 percent and thus Criterion 2 is met for the AM peak period.
- The sum of all model link flows in the PM peak period is 2,625,769 while the sum of observed link counts is 2,613,164. These volume sums are within 5 percent and thus Criterion 2 is for the PM peak period.
- The sum of all model link flows in the Inter peak period is 1,848,567 while the sum of observed link counts is 1,859,046. These volume sums are within 5 percent and thus Criterion 2 is for the Inter peak period.
- For all the peak periods none of the arterial counts meet the required 2000 veh/hr, thus there is no criterion to meet. Although there are differences between observed and modeled arterial volumes these counts are all included with the model sums for each period and hence the general flow of traffic along freeways and arterials meets Criterion 2.

Table 8-2: Count Comparison for all I-15 Locations above VPH Threshold – Typical Day

Modeled			Observed			Difference			Percent Error		
6-10 AM	3-7 PM	10AM-2PM	6-10 AM	3-7 PM	10AM-2PM	6-10 AM	3-7 PM	10AM-2PM	6-10 AM	3-7 PM	10AM-2PM
2,407,128	2,625,769	1,848,567	2,407,567	2,613,164	1,859,046	439	12,604	10,479	0.0%	0.5%	0.6%

Table 8-3: AM Peak Period I-15 Link Count Comparison – Typical Day

Object	Ext ID	Observed Vol.	Modeled Volume	Absolute Difference	Relative Difference (%)
S/O Mercy Road	1115838	42599	43364	766	2%
Carroll Canyon Road	1108148	41446	43340	1894	5%
N/O NB I-15/163 Merge	1115721	40638	40139	499	1%
Miramar Road	1108495	39682	40750	1069	3%
Miramar Way	1108536	38096	37541	555	1%
Mercy Road	1108450	37622	38034	412	1%
North of SR?56	1123003	37611	37735	125	0%
Mira Mesa Boulevard	1108491	36794	39181	2387	6%
15 S SO Ca del Norte	1123006	36375	36920	545	1%
VIA PKWY	1121112	35691	34377	1314	4%
15 N NO Carmel Mtn	1123031	34912	36190	1279	4%
Green Vly Ck	1121105	34747	34436	311	1%
POMERADO	1121125	34567	34404	163	0%
Bernardo Ctr	1121038	34171	33947	224	1%
Pomerado Road	1108541	33550	33397	153	0%
Carmel Moutain Road	1108427	33392	34413	1022	3%
Bernardo Center Drive	1108519	33190	32159	1031	3%
Miramar Road	1120167	33168	32847	321	1%
N/O Carroll Canyon Road	1115739	32845	32644	201	1%
Rancho Penasquitos	1108489	31639	32079	441	1%
VIA PKWY	1121066	31386	30211	1175	4%
S/O Mercy Road	1115749	30869	30508	361	1%
Carrroll Canyon Road	1108439	30797	31616	820	3%
S/O I-15 HOV Lanes	1115713	30703	29711	992	3%
Via Rancho Parkway	1108543	30163	28531	1632	5%
Camino Del Norte	1108425	30131	30966	835	3%
Ted Williams Parkway	1108429	29996	30017	21	0%
Rancho Bernardo Road	1108538	29682	30465	784	3%
I-15 NB Ted Williams	1123002	28810	29100	290	1%
N/O 52	1116158	28513	28628	115	0%
Mira Mesa Boulevard	1108415	27464	26724	740	3%
15 NB N/O Poway Rd	1122487	27380	27670	291	1%
Centre City Parkway	1108545	27345	25374	1971	7%
15 N SO Ca del Norte	1123030	26914	26185	729	3%
Mercy/Scripps Poway	1108717	26638	26368	270	1%
Kearny Villa Road	1108721	26399	27164	765	3%
Poway/Rancho Penasquitos	1108585	26050	25827	223	1%
Valley Parkway	1108556	25889	24967	922	4%
15 SB N/O Felicita	1125879	25868	26843	975	4%
Citricado Parkway	1108516	25775	23413	2362	9%
Carmel Mountain Road	1108590	24727	24232	495	2%
15 SB Felicita/DelLago	1125865	24423	25339	917	4%
Ted Williams Parkway	1113985	24226	24068	158	1%
S/O I-15 HOV Lanes	1115802	24207	25973	1766	7%
South of SR?78	1125265	23368	22491	877	4%
VIA PKWY	1121118	22775	21925	850	4%

Table 8-4: AM Peak Period I-15 Link Count Comparison – Typical Day (con't)

Object	Ext ID	Observed Vol.	Modeled Volume	Absolute Difference	Relative Difference (%)
9th Avenue	1108558	22730	24199	1470	6%
Bernardo Ctr	1121037	22527	22173	354	2%
Camino Del Norte	1108592	22106	21688	418	2%
Woodland Parkway	1108700	21854	19026	2828	13%
Green Vly Ck	1121099	21363	21466	104	0%
POMERADO	1121131	21076	20794	282	1%
SR-78 WB	1126022	21065	21157	92	0%
Pomerado Road	1108562	20856	20292	564	3%
El Norte Parkway	1108554	20484	19186	1298	6%
Via Rancho Parkway	1108767	20365	19425	940	5%
SR-78 EB	1126016	20295	20303	8	0%
Citricado Parkway	1108769	20122	18465	1657	8%
Rancho Bernardo Road	1108595	20115	19553	562	3%
15 NB N/O Felicita	1125886	20018	20010	8	0%
SB 15 @ CENTRE CITY	1119756	19731	20117	387	2%
Auto Park Way/9th Avenue	1108771	19362	17977	1385	7%
WB SR-78 W/O Nordahl	1115692	19336	20362	1027	5%
15 SB S/O Felicita	1125872	18881	18514	367	2%
San Diego/Imperial	1116098	16046	14630	1416	9%
San Diego/Imperial	1108570	12754	13256	503	4%
West of I?15	1125531	11515	11513	2	0%
BLACK MOUNTAIN RD	1125575	10857	10806	51	0%
Mercy Rd SB ML	55	10684	10022	662	6%
San Diego/Imperial	1125546	10630	10156	474	4%
Via Rancho Pkwy SB ML	46	10224	11002	778	8%
VIA PKWY	1121142	10193	11008	816	8%
POMERADO	1121158	10178	11022	845	8%
Green Vly Ck	1121138	10153	11029	876	9%
SB Centre City Parkway	1108708	9800	9488	312	3%
Bernardo Ctr Dr SB ML	49	9562	10213	651	7%
Miramar Rd SB ML	59	9440	9338	102	1%
Carmel Mtn Rd SB ML	51	9424	9242	182	2%
Poway Rd SB ML	53	9361	9215	146	2%
HOV South of MercyRd	1125288	9266	9009	257	3%
HOV North of SR56	1123014	9263	9243	20	0%
15 S HV NO Carmel Mt	1122967	9217	9244	28	0%
15 SB HOV S/O Mir Rd	1125280	9128	7650	1478	16%
VIA PKWY	1121151	9006	10225	1220	14%
15 SB HOV N/O Carrol	1125318	8991	8745	246	3%
Bernardo Ctr	1121051	8968	9674	706	8%
RCH BERN	1121165	8913	9732	820	9%
NB 15 @ CENTRE CITY	1119749	8827	8162	665	8%
15 SB HOV S/O Felic	1125499	8649	10263	1615	19%
Felicita Rd SB ML	41	8423	7410	1013	12%
NB I-15 N/O SR-78	1119736	8416	9345	930	11%
15 SB HOV S/O Camino	1122925	8233	8489	256	3%
HOV Valley Pkwy	1125321	8057	7405	652	8%

Table 8-5: PM Peak Period I-15 Link Count Comparison – Typical Day

Object	Ext ID	Observed Vol.	Modeled Volume	Absolute Difference	Relative Difference (%)
N/O NB I-15/163 Merge	1115721	43873	40972	2901	6.6%
N/O Carroll Canyon Road	1115739	42964	41011	1953	4.5%
S/O Mercy Road	1115749	40737	41434	697	1.7%
Miramar Way	1108536	40621	40391	230	0.6%
Carrroll Canyon Road	1108439	39463	38775	688	1.7%
Miramar Road	1120167	39150	37447	1703	4.3%
I-15 NB Ted Williams	1123002	38453	39838	1385	3.6%
VIA PKWY	1121118	37794	37497	297	0.8%
Mercy/Scripps Poway	1108717	36709	37035	326	0.9%
Green Vly Ck	1121099	35904	36283	380	1.1%
15 N SO Ca del Norte	1123030	35851	35712	139	0.4%
S/O Mercy Road	1115838	35840	34253	1587	4.4%
Miramar Road	1108495	35757	33817	1940	5.4%
Mira Mesa Boulevard	1108415	35622	35554	68	0.2%
POMERADO	1121131	34860	35352	493	1.4%
15 NB N/O Poway Rd	1122487	34551	36116	1565	4.5%
Pomerado Road	1108562	34279	34323	45	0.1%
Carroll Canyon Road	1108148	33694	32310	1384	4.1%
Bernardo Ctr	1121037	33388	32230	1158	3.5%
Poway/Rancho Penasquitos	1108585	33035	33559	525	1.6%
Rancho Bernardo Road	1108595	32558	31584	974	3.0%
Carmel Mountain Road	1108590	32479	32295	184	0.6%
Via Rancho Parkway	1108767	31845	31333	512	1.6%
North of SR?56	1123003	31650	31573	77	0.2%
Citricado Parkway	1108769	31053	29754	1299	4.2%
15 NB N/O Felicita	1125886	31015	31310	296	1.0%
Mercy Road	1108450	30773	29286	1487	4.8%
15 S SO Ca del Norte	1123006	30640	29886	754	2.5%
Ted Williams Parkway	1113985	30594	31440	846	2.8%
Camino Del Norte	1108592	30380	30285	95	0.3%
15 N NO Carmel Mtn	1123031	29805	29434	371	1.2%
Auto Park Way/9th Avenue	1108771	29780	28461	1319	4.4%
Mira Mesa Boulevard	1108491	29749	29708	41	0.1%
Rancho Penasquitos	1108489	28111	26696	1415	5.0%
15 SB S/O Felicita	1125872	27439	28386	947	3.5%
Carmel Moutain Road	1108427	27039	26712	327	1.2%
N/O 52	1116158	26938	29273	2335	8.7%
S/O I-15 HOV Lanes	1115713	26427	26135	292	1.1%
Ted Williams Parkway	1108429	26204	24349	1855	7.1%
VIA PKWY	1121112	25961	25029	932	3.6%
Bernardo Ctr	1121038	25629	24644	985	3.8%
SR-78 EB	1126016	25605	24994	611	2.4%
VIA PKWY	1121066	25110	24935	175	0.7%
Green Vly Ck	1121105	24326	23724	602	2.5%
San Diego/Imperial	1116098	24230	23548	682	2.8%
POMERADO	1121125	24186	23717	469	1.9%
Bernardo Center Drive	1108519	24178	23399	779	3.2%

Table 8-6: PM Peak Period I-15 Link Count Comparison – Typical Day (con't)

Object	Ext ID	Observed Vol.	Modeled Volume	Absolute Difference	Relative Difference (%)
Camino Del Norte	1108425	24140	23231	909	3.8%
15 SB N/O Felicita	1125879	23834	24403	569	2.4%
Pomerado Road	1108541	23537	23072	465	2.0%
San Diego/Imperial	1108570	22977	22893	84	0.4%
NB 15 @ CENTRE CITY	1119749	22615	22578	37	0.2%
Kearny Villa Road	1108721	22313	25150	2837	12.7%
Centre City Parkway	1108545	22292	21987	305	1.4%
NB I-15 N/O SR-78	1119736	22035	24697	2662	12.1%
Via Rancho Parkway	1108543	21977	21283	694	3.2%
Citricado Parkway	1108516	21841	21366	475	2.2%
I-15 SB/S Centre City Parkway	1125865	21057	21929	873	4.1%
Rancho Bernardo Road	1108538	21052	20434	618	2.9%
Valley Parkway	1108556	20866	21239	373	1.8%
Woodland Parkway	1108700	20858	19836	1022	4.9%
El Norte Parkway	1119743	20642	20578	64	0.3%
SR-78 WB	1126022	19695	20242	547	2.8%
S/O I-15 HOV Lanes	1115802	19004	20997	1994	10.5%
9th Avenue	1108558	18628	20689	2062	11.1%
WB SR-78 W/O Nordahl	1115692	17406	20831	3426	19.7%
South of SR?78	1125265	12973	14001	1028	7.9%
Black Mt to 56E	1125201	12630	12952	323	2.6%
West of I?15	1125527	11943	12039	96	0.8%
Sabre Springs	23	11408	11394	14	0.1%
San Diego/Imperial	1125559	11151	10745	406	3.6%
RCH BERN	1121168	11055	12070	1015	9.2%
15 NB HOV S/O Mercy	1125292	10987	11400	414	3.8%
North of Poway Rd	1125299	10895	11404	509	4.7%
Via Rancho Pkwy NB ML	31	10862	10498	364	3.4%
Mira MEsa NB	22	10821	10779	42	0.4%
VIA PKWY	1121147	10802	10499	303	2.8%
POMERADO	1121161	10718	10487	231	2.2%
El Norte Parkway	1108554	10497	9658	839	8.0%
15N HOV CARROLL CYN	1115829	10496	10176	320	3.0%
Bernardo Ctr	1121052	10318	11345	1028	10.0%
SB 15 @ CENTRE CITY	1119756	10300	10452	153	1.5%
15 N HV NO Carmel Mt	1122962	10216	12266	2050	20.1%
Carmle Mtn Rd NB ML	27	10213	12262	2049	20.1%
15 NB HOV S/O Camino	1122926	10170	12272	2102	20.7%
Center City Pkwy NB ML	35	10133	10458	325	3.2%
VIA PKWY	1121154	10037	10083	46	0.5%
Green Vly Ck	1121135	10013	9544	469	4.7%
SB Centre City Parkway	1108708	9970	10056	86	0.9%
Miramar Way NB ML	19	9921	10159	238	2.4%
15 NB HOV S/O Feli	1125491	9898	10463	565	5.7%
Bernardo Ctr Dr NB ML	29	9897	11752	1855	18.7%
BERNARDO CTR	1121044	9861	10328	468	4.7%
E78 @ BROADWAY/LINCO	1113641	9634	10944	1311	13.6%
West of I?15	1125531	9514	9628	115	1.2%
HOV North of SR56	1123013	8776	9296	520	5.9%

Table 8-7: Inter Peak Period I-15 Link Count Comparison – Typical Day

Object	ID	Real Count	Modeled Count	Absolute Difference	Relative Difference (%)
N/O NB I-15/163 Merge	1115721	31320	31239	80.5	0%
Miramar Way	1108536	30084	30465	381	1%
S/O Mercy Road	1115838	29257	28558	698.5	2%
N/O Carroll Canyon Road	1115739	29024	28243	781	3%
S/O Mercy Road	1115749	27639	27794	155.5	1%
Carroll Canyon Road	1108148	27375	27322	52.5	0%
Miramar Road	1108495	27181	27184	3.5	0%
Carrroll Canyon Road	1108439	26862	27117	255	1%
North of SR?56	1123003	26762	26829	67	0%
I-15 NB Ted Williams	1123002	26528	26970	442.5	2%
Miramar Road	1120167	26307	26289	18	0%
15 S SO Ca del Norte	1123006	25800	25303	497	2%
Mercy Road	1108450	25644	24366	1277.5	5%
15 N NO Carmel Mtn	1123031	25207	24925	281.5	1%
15 N SO Ca del Norte	1123030	24750	24674	76	0%
Mercy/Scripps Poway	1108717	24714	24457	256.5	1%
VIA PKWY	1121118	24641	24053	588	2%
VIA PKWY	1121112	24260	23916	344	1%
15 NB N/O Poway Rd	1122487	24203	24656	453	2%
Mira Mesa Boulevard	1108491	24154	24713	559	2%
Bernardo Ctr	1121038	23619	22578	1040.5	4%
Mira Mesa Boulevard	1108415	23547	23697	150	1%
Green Vly Ck	1121099	23318	23639	321	1%
Green Vly Ck	1121105	23296	23044	252	1%
Bernardo Ctr	1121037	23289	23416	127	1%
Poway/Rancho Penasquitos	1108585	23258	23233	24.5	0%
VIA PKWY	1121066	23216	23106	110	0%
POMERADO	1121125	23084	23071	13	0%
Carmel Moutain Road	1108427	23031	22734	297	1%
POMERADO	1121131	22965	23137	172.5	1%
Rancho Penasquitos	1108489	22745	22479	266	1%
S/O I-15 HOV Lanes	1115713	22693	21355	1338	6%
Pomerado Road	1108562	22656	22440	215.5	1%
Bernardo Center Drive	1108519	22629	21549	1079.5	5%
Pomerado Road	1108541	22403	22382	20.5	0%
Carmel Mountain Road	1108590	22236	22006	229.5	1%
Ted Williams Parkway	1113985	21822	21667	154.5	1%
Rancho Bernardo Road	1108595	21599	21213	385.5	2%
Ted Williams Parkway	1108429	21586	20608	977.5	5%
Camino Del Norte	1108425	21560	20840	719.5	3%
Camino Del Norte	1108592	21474	21482	8	0%
15 SB N/O Felicita	1125879	21338	22272	934	4%
15 NB N/O Felicita	1125886	21110	20859	250.5	1%
Via Rancho Parkway	1108767	20848	20013	835	4%
Centre City Parkway	1108545	20818	20401	416.5	2%
Citricado Parkway	1108769	20680	19154	1525.5	7%
Via Rancho Parkway	1108543	20502	20180	322	2%
	1126016	20486	20595	109	1%
Auto Park Way/9th Avenue	1108771	20166	18869	1296.5	6%
Citricado Parkway	1108516	20163	19895	268	1%
Rancho Bernardo Road	1108538	19970	19967	3	0%
	1125865	19325	20415	1090.5	6%
Valley Parkway	1108556	19224	20730	1506.5	8%
15 SB S/O Felicita	1125872	19103	19230	127.5	1%
S/O I-15 HOV Lanes	1115802	19003	19045	42	0%
Woodland Parkway	1108700	18720	16643	2076.5	11%
	1126022	18662	18696	34.5	0%
9th Avenue	1108558	17813	19578	1765.5	10%
N/O 52	1116158	17736	18021	285	2%
WB SR-78 W/O Nordahl	1115692	16136	18412	2276.5	14%
Kearny Villa Road	1108721	15808	16190	382	2%
South of SR?78	1125265	13536	14266	730.5	5%
San Diego/Imperial	1116098	12891	11685	1206	9%
El Norte Parkway	1108554	12163	11231	931.5	8%
NB 15 @ CENTRE CITY	1119749	12077	11885	191.5	2%
SB 15 @ CENTRE CITY	1119756	11543	11846	303	3%
El Norte Parkway	1119743	11065	10318	746.5	7%
NB I-15 N/O SR-78	1119736	10888	12573	1685	15%
San Diego/Imperial	1108570	10291	11117	826	8%
SB Centre City Parkway	1108708	8352	8281	70.5	1%

Delay, Speed and Bottleneck Comparisons

Another component of the reasonableness assessment criteria listed in Table 8-1 is the visual audit of model speeds and bottlenecks. Modeled versus field-observed speeds and bottlenecks can be compared using speed contour diagrams. Table 8-8 lists the detector station IDs for the speed contours, while Table 8-9 through Table 8-20 compare the speed contours of southbound and northbound I-15 during a typical day, generated using detector speed data from the average of PeMS over the February to May 2015 period, and the offline simulation outputs.

Comparisons of the detector and model speed contour plots show that the model is able to represent the bottleneck temporal and spatial extents for both southbound and northbound I-15 sufficiently realistically. The comparison shows that recurring congestion exists along the freeway during the AM peak in the southbound direction and during the PM peak in the northbound direction. Modeled congestion is within acceptable thresholds for observed temporal and spatial extents of observed congestion on the I-15 freeway, the main exception being the last southbound observation point during the PM peak period: at this location congestion is caused because of bottlenecks and capacity constraints south of the network extents. Also when looking at the results some differences were seen that were then compare against google maps historical speed maps (this maps are difficult to show in a report) to insure that the model is still within reason.

Reasonableness Assessment Results – Incident Day

In addition to assessing the model's reasonableness for a typical day, the San Diego Team also conducted a reasonableness assessment for an incident day. A PM multiple lane northbound incident for October 16th was used, and the incident data were determined using a combination of the Aimsun online input data and the Caltrans incident report. The incident included three right lanes closed out of a total of five lanes. The duration of the incident was from 17:30 for approximately 1 hour and 45 minutes. Table 8-9 through Table 8-20 show observed and modeled speed contours from the incident.

Verifying that the model accurately represents the current traffic conditions in the field is an important component of the Reasonableness Assessment. This effort helps to ensure that the post-ICM deployment baseline model is capable of accurately representing road geometries, demands, and post-deployment operational conditions in 2014 and 2015. The changes made and the lessons learned through this assessment contribute to the continuous improvement of the AMS approach throughout the various stages of the ICM Initiative.

New and more current field data were collected and several adjustments to the model were completed in order to improve the baseline model. The presence of additional information therefore allowed for a more accurate observed dataset to be compared to the model outputs. For the evaluation of the incident case the model was fine-tuned to represent the incident by correctly adjusting the number of lanes associated with the closure, the passerby speed at the location of the incident, the incident duration, and the vehicle reactions approaching the incident. The model is a fair representation of the incident.

For a typical day with no incident the overall comparison of total model link flows against the aggregate field volumes showed that the model meets the suggested link count model calibration criteria. Plus, the overall results of the speed contour comparisons show that the model is able to sufficiently represent the bottleneck temporal and spatial extents for both southbound and northbound I-15. For an incident day the model is also able to sufficiently represent the bottleneck temporal and spatial extents during an incident.

Therefore, the San Diego AMS Team believes that the model is capable of adequately representing the post-deployment corridor operational conditions and corridor management strategies in the I-15 Corridor.

Table 8-8: Vehicle Detector Station IDs for Speed Contour Development

SouthBound	Direction of Flow	Northbound
1119756		1115713
1108554		1120611
1125265		1115721
1108556		1117909
1108558		1108536
1125879		1122469
1108516		1120167
1125865		1108439
1108545		1115739
1121066		1108415
1108543		1115749
1121112		1108717
1108541		1108585
1121125		1122487
1121105		1113985
1121034		1123002
1108538		1108590
1121038		1123030
1108519		1108592
1108425		1120994
1123006		1108597
1123031		1121037
1108427		1108595
1123003		1121099
1108429		1121131
1122494		1108562
1108489		1121118
1108450		1108767
1115838		1121067
1108491		1125872
1122479		1108769
1108148		1125886
1108495		1108771
1122272		1108773
1115820		1119736
1108607		1119743
1117899		1119749
1115811		
1115802		

Table 8-9: Southbound I-15 AM Observed Speed Contours – Typical Day

Time	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06
5:05 AM	71.1	71.8	71.5	72.9	70.7	74.4	72.5	72.2	70.4	74.8	71.4	74.0	74.0	73.5	73.4	73.3	73.8	72.7	73.1	73.7	70.1	71.0	72.9	69.2	73.0	73.9	73.2	72.3	69.8	72.8	70.3	70.2	71.0	70.3	70.3	70.0	70.0	76.7	70.6
5:10 AM	71.5	72.0	71.9	72.8	71.0	74.8	72.8	72.3	70.0	74.8	71.6	74.3	73.6	73.3	73.2	73.2	73.9	72.9	72.6	73.6	69.8	70.9	72.5	69.1	73.0	74.1	72.9	72.7	70.1	73.6	71.0	71.2	71.1	70.5	70.5	70.2	70.0	76.8	70.5
5:15 AM	71.5	71.7	72.0	73.3	71.5	74.5	72.7	72.4	69.9	74.5	71.9	74.1	73.6	73.4	73.5	73.6	74.0	73.0	73.2	73.6	69.6	70.4	72.5	69.0	72.6	74.0	73.0	72.8	69.9	73.1	70.8	70.2	71.4	70.7	70.7	70.6	70.3	76.6	70.4
5:20 AM	71.5	71.9	72.4	73.8	71.6	74.6	72.8	72.4	69.7	74.4	72.0	73.9	73.6	73.3	73.4	73.2	73.8	72.5	72.7	73.5	69.4	70.4	72.4	68.8	72.8	74.0	72.6	72.4	69.9	72.5	70.6	70.6	71.0	69.9	70.5	69.9	70.3	77.0	70.4
5:25 AM	71.0	71.5	71.7	73.8	71.5	74.5	72.8	72.1	69.6	74.4	71.8	74.1	74.0	73.8	73.7	73.3	73.9	72.6	72.7	73.5	69.3	70.5	72.4	68.5	72.8	73.8	73.0	72.1	69.6	72.6	70.5	70.4	71.1	70.0	70.5	69.9	70.0	77.0	70.5
5:30 AM	70.7	70.9	70.6	72.9	70.8	74.1	71.8	71.9	69.3	74.0	71.3	73.5	73.5	73.0	72.9	73.0	73.2	72.5	72.5	73.6	69.4	70.8	72.4	68.9	72.0	73.3	72.3	72.2	69.3	72.4	70.5	70.5	70.9	70.1	70.5	69.7	70.0	76.6	70.4
5:35 AM	70.4	70.4	70.5	72.8	70.6	73.5	71.5	71.1	70.4	73.5	70.3	72.6	72.8	72.4	72.2	72.4	72.7	72.1	72.2	73.3	69.4	70.6	72.0	68.9	72.1	73.0	71.9	72.1	69.1	72.3	70.3	70.2	70.7	69.8	70.3	69.5	69.7	76.3	70.2
5:40 AM	69.8	69.6	69.9	72.4	70.0	73.0	70.8	70.5	70.2	73.5	69.9	71.9	72.4	72.2	72.0	72.1	72.5	71.5	70.8	72.4	68.8	70.1	71.6	68.5	71.8	72.7	71.7	71.8	68.8	72.4	70.2	70.4	70.6	70.1	70.4	69.9	69.7	76.1	70.1
5:45 AM	69.5	69.5	69.5	72.0	69.7	72.6	69.9	70.0	70.0	72.3	69.4	71.8	71.9	71.9	71.2	71.8	72.1	71.5	70.7	72.3	68.8	70.4	71.8	68.8	71.6	72.2	71.8	71.7	68.3	72.4	69.7	69.9	70.3	70.2	70.0	69.5	69.6	75.9	70.0
5:50 AM	69.4	69.1	68.7	71.4	69.0	72.4	69.1	69.6	69.6	71.8	69.1	71.0	71.6	71.5	71.5	71.6	71.7	71.2	70.4	71.7	68.1	70.0	71.2	68.8	71.3	72.0	72.2	71.4	68.1	72.1	70.1	71.0	70.5	69.9	69.9	69.3	69.4	75.5	69.9
5:55 AM	69.1	68.8	68.4	71.2	68.6	71.9	68.7	69.3	69.5	71.5	68.6	70.8	71.0	70.6	71.0	70.6	71.1	70.4	69.8	71.5	67.8	69.8	71.0	68.2	71.0	72.0	71.6	70.9	68.0	71.6	69.6	69.9	70.3	69.9	70.0	69.6	69.5	75.5	70.0
6:00 AM	69.0	68.9	67.9	70.6	68.5	71.5	68.5	69.0	69.5	71.4	68.3	70.4	71.0	70.4	70.5	69.8	70.8	69.6	69.7	70.7	67.0	69.0	70.6	67.8	70.2	71.9	71.3	70.3	68.0	71.6	69.3	70.2	70.0	69.7	69.9	69.2	69.4	75.6	70.3
6:05 AM	67.4	65.3	63.5	66.9	64.4	70.0	64.4	67.5	65.9	67.6	64.5	67.0	67.8	67.5	67.6	66.7	67.5	66.5	67.3	67.7	64.6	66.3	68.3	65.0	67.4	71.4	68.6	67.5	67.3	69.3	66.8	68.0	68.1	67.2	69.4	66.8	69.1	75.4	69.8
6:10 AM	66.6	63.0	61.4	64.8	62.0	69.0	61.9	66.5	63.4	65.2	62.5	65.2	66.3	65.5	66.2	65.1	65.9	64.8	67.2	66.5	62.9	65.2	66.7	63.8	65.6	70.9	66.6	65.9	66.9	67.9	65.5	66.8	67.1	66.0	68.9	65.9	68.8	75.3	69.5
6:15 AM	65.7	62.3	59.8	63.1	60.9	67.8	59.8	65.0	61.6	63.4	60.9	63.7	65.2	64.4	64.8	63.7	64.5	64.0	65.7	65.7	62.1	64.5	65.8	63.3	64.7	70.0	65.9	65.2	66.2	67.1	64.5	65.9	66.5	65.9	68.3	65.2	68.5	75.1	69.2
6:20 AM	66.0	61.5	58.9	62.2	59.9	66.1	58.4	63.5	59.7	61.6	59.8	62.5	64.7	63.1	63.0	62.7	63.9	62.7	65.7	65.1	62.0	64.0	65.0	62.8	64.0	69.6	65.6	64.4	65.7	67.0	64.4	65.4	66.3	65.0	67.7	64.9	68.0	74.6	69.1
6:25 AM	65.6	61.3	58.1	61.3	58.4	64.5	55.9	61.6	57.1	59.3	58.1	60.9	63.9	62.5	62.4	61.4	62.3	61.5	64.4	64.5	61.2	63.6	65.0	62.5	63.9	69.5	65.5	63.8	64.9	65.9	64.0	64.4	66.1	65.0	67.3	64.6	67.8	74.3	69.0
6:30 AM	65.5	60.6	56.9	59.8	56.6	60.3	52.9	57.3	54.0	57.6	55.6	59.9	63.4	61.5	61.4	60.7	61.1	61.1	64.2	64.0	60.9	63.5	64.1	62.4	63.8	69.0	65.5	63.4	64.6	65.8	63.6	64.7	66.0	65.0	67.0	64.5	67.5	74.2	69.1
6:35 AM	65.5	60.5	54.6	58.8	47.0	50.1	48.6	54.4	50.6	52.5	51.4	58.6	62.3	61.0	60.6	59.9	60.7	60.0	64.2	63.7	60.6	63.5	63.8	62.1	63.0	68.8	65.0	63.1	64.1	65.6	63.6	64.8	65.5	64.5	66.4	64.5	67.4	73.9	68.8
6:40 AM	65.6	60.5	52.7	57.3	37.3	43.3	47.1	50.4	48.1	51.4	51.9	57.6	62.1	60.4	60.6	59.0	60.4	59.8	63.9	63.5	60.4	63.5	63.8	62.4	63.0	68.4	65.0	61.1	63.4	65.2	63.2	64.3	65.6	64.6	66.0	64.5	67.0	74.0	68.8
6:45 AM	65.6	61.0	51.1	53.0	31.5	37.2	43.9	49.3	46.0	48.3	48.9	57.0	62.1	59.6	60.8	59.7	60.8	59.9	63.0	63.3	60.1	64.0	63.5	62.3	63.3	68.4	64.3	59.7	63.1	64.8	63.5	64.8	65.6	64.9	65.7	64.4	67.1	73.9	68.6
6:50 AM	65.9	60.4	51.3	48.4	25.6	34.0	43.3	45.8	39.8	40.8	44.0	56.6	61.0	60.1	61.6	59.9	61.4	59.9	63.5	63.2	60.3	63.7	63.3	62.2	63.0	67.5	63.5	57.6	62.4	64.8	63.3	65.0	65.8	65.3	65.9	65.1	67.2	73.8	68.8
6:55 AM	65.8	61.0	45.3	46.9	23.0	31.8	35.1	43.4	37.8	39.7	45.9	56.9	61.8	60.6	62.2	59.8	62.1	59.8	64.1	63.6	60.5	64.1	63.5	62.8	63.3	67.5	63.3	56.4	62.4	64.9	63.5	65.2	66.1	65.3	65.9	65.5	67.4	73.8	68.7
7:00 AM	65.2	61.5	43.7	43.1	20.2	30.4	35.1	43.4	40.4	38.2	47.3	56.6	62.4	60.5	62.0	60.0	61.3	60.1	64.4	64.1	60.6	64.5	64.0	63.3	63.4	67.4	62.6	55.5	62.4	65.1	64.0	65.3	66.2	65.8	66.1	65.4	67.4	73.6	69.1
7:05 AM	65.2	59.0	39.3	42.4	18.7	30.0	38.0	45.1	38.7	36.2	45.1	56.8	62.3	59.9	61.6	59.1	60.9	59.4	63.5	63.4	60.5	63.9	63.9	63.1	63.1	67.1	63.4	56.3	62.5	65.2	64.2	65.1	66.5	65.9	66.3	65.9	67.7	73.9	69.1
7:10 AM	65.5	56.9	35.3	39.9	19.3	29.3	36.3	42.0	37.5	34.6	45.3	56.8	61.9	60.4	61.4	57.5	60.7	59.1	62.7	63.0	59.9	63.5	63.5	63.0	62.4	66.5	63.0	56.6	62.4	65.3	63.8	65.1	66.2	65.9	65.8	65.8	67.4	74.0	69.1
7:15 AM	65.1	45.5	32.1	43.0	18.7	29.5	35.1	40.7	35.5	32.6	43.5	55.7	62.2	59.8	59.9	57.1	59.0	55.4	62.0	62.5	59.4	63.3	62.1	62.1	60.3	64.6	59.6	55.5	61.8	65.0	63.5	64.8	66.2	65.6	65.6	65.3	67.0	73.9	69.1
7:20 AM	62.4	32.7	31.4	44.0	17.5	28.9	34.8	39.3	35.3	33.0	44.4	56.3	61.3	59.4	60.1	55.8	57.1	52.4	62.0	62.1	59.2	63.1	61.8	61.9	54.1	61.1	48.6	55.1	60.9	64.7	62.9	64.3	65.9	65.5	65.0	65.5	67.0	73.7	68.8
7:25 AM	61.8	27.8	30.7	46.5	18.2	27.7	33.2	40.4	35.8	32.9	42.8	56.0	61.4	59.0	56.7	56.5	56.7	49.3	61.3	61.9	58.4	62.6	61.0	60.8	52.3	54.0	46.4	53.5	60.5	64.5	62.8	64.1	65.5	65.6	64.6	65.7	66.8	73.5	68.8
7:30 AM	58.5	27.5	30.1	44.5	17.8	29.1	33.3	41.0	36.6	33.9	41.4	55.1	60.8	57.0	58.2	54.3	51.9	48.5	60.3	61.2	58.7	61.8	59.9	60.3	51.0	46.4	38.3	53.1	59.8	63.9	62.4	63.6	65.3	64.9	64.1	64.9	66.3	73.4	68.9
7:35 AM	59.5	25.4	31.8	47.4	18.4	27.9	32.0	41.3	34.0	32.5	41.5	55.4	58.1	54.3	53.2	53.1	50.0	46.3	60.5	61.1	57.8	61.3	59.0	58.4	40.0	39.0	33.7	52.4	59.6	63.8	62.0	63.6	65.1	64.9	63.5	64.7	65.8	72.9	68.6
7:40 AM	54.9	23.8	33.0	43.8	18.3	28.3	33.4	42.6	34.3	34.7	42.2	54.9	58.2	54.7	53.6	54.2	49.0	45.4	60.3	60.8	56.9	60.4	54.4	53.0	31.8	36.5	31.6	52.5	59.3	63.9	61.9	63.8	65.1	64.6	63.1	64.5	66.0	72.5	68.2
7:45 AM	51.0	26.4	33.2	49.5	18.8	28.5	32.9	41.3	35.0	32.9	41.1	55.0	59.8	57.5	57.0	55.2	49.2	45.5	58.5	61.0	55.2	59.1	46.6	48.0	28.8	32.9	30.3	51.7	59.0	63.4	61.8	63.3	65.0	64.5	63.4	64.6	65.8	72.4	68.0
7:50 AM	48.5	26.1	36.9	46.8	20.4	28.8	30.8	39.6	31.1	31.2	41.9	55.8	60.9	58.4	54.0	55.5	49.9	44.4	58.0	60.8	48.6	51.9	42.3	45.2	26.4	32.5	30.3	51.3	58.5	62.8	61.6	63.2	64.5	64.2	63.1	64.5	65.6	72.4	67.9
7:55 AM	54.8	25.1	38.5	50.4	19.3	29.8	31.4	40.7	35.6	32.5	43.4	55.8	61.1	58.0	58.1	53.7	50.8	46.5	58.8	60.2	46.6	48.4	39.6	42.9	25.0	31.1	29.4	50.7	58.4	63.0	61.5	63.1	64.5	64.1	62.9	64.2	65.5	72.5	68.2
8:00 AM	57.4	27.4	44.8	46.0	18.5	28.3	33.1	41.9	36.3	33.7	44.3	55.8	60.8	58.2	57.8	53.9	54.0	48.6	59.7	59.2	46.6	53.9	39.3	41.0	24.3	30.9	28.2	50.3	58.4	63.1	61.3	63.2	64.2	63.6	62.9	63.7	65.6	72.5	68.1
8:05 AM	61.0	34.0	48.7	43.6	18.9	30.0	32.6	43.9	40.7	37.3	46.6	57.0	61.3	58.6	58.3	55.5	56.1	50.7	60.0	59.6	46.5	52.4	38.6	42.3	23.6	31.2	29.0	50.6	58.5	62.6	60.8	62.5	64.0	63.5	63.1	63.6	65.4	72.5	68.2
8:10 AM	62.9	47.4	53.0	50.4	22.3	29.3	35.0	46.0	41.8	37.5	45.6	57.3	62.1	58.9	59.5	57.8	58.5	54.3	60.7	60.1	47.1	53.4	41.5	43.3	23.7	31.2	28.5	50.3	58.1	62.4	61.0	62.7	64.2	63.6	63.6	63.7	65.5	72.9	68.2
8:15 AM	63.8	54.0	53.4	53.6	27.9	30.1	36.3	47.1	47.1	43.1	49.1	58.0	62.4	59.5	59.6	57.8	59.9	56.6	60.4	59.1	50.0	52.0	41.0	41.4	24.4	30.6	29.8	50.1	58.1	62.0	61.0	62.3	64.0	63.8	63.7	63.5	65.6	72.7	67.9
8:20 AM	64.7	58.1	54.9	53.2	25.4	29.4	40.9	51.8	45.3	42.0	48.8	58.4	62.8	61.0	62.2	59.1	61.1	56.6	62.1	59.9	50.0	50.9	38.6	42.5	24.9	30.9	29.6	50.3	58.5	62.2	61.0	62.7	63.9	64.0	63.8	63.5	65.4	72.6	68.0
8:25 AM	66.1	59.8	56.1	54.4	25.8	30.6	35.6	49.0	45.0	43.6	48.6	58.0	62.7	61.3	61.9	60.2	61.5	58.2	63.0	61.4	49.9	48.5	37.2	42.0	26.4	31.6	29.4	50.0	58.5	62.4	61.0	62.6	64.0	63.8	63.9	63.2	65.6	72.6	67.9
8:30 AM	66.9	61.7	59.3	57.1	26.3	31.6	42.3	52.1	48.4	45.1	50.6	57.9	63.0	61.5	62.6	60.6	62.3	59.1	62.4	61.9	48.2	50.0	37.9	42.6	26.0	32.0	32.5	49.8	58.5	62.6	61.3	62.5	64.1	63.6	64.2	63.2	65.9	72.9	67.7
8:35 AM	67.0	62.2	60.1	59.3	33.3	33.0	45.9	53.7	55.0	48.9	53.9	60.0	64.0	62.1	63.0	61.4	62.9	59.4	62.4	61.8	52.7	53.8	37.9	42.0	26.8	31.3	30.9	50.1	58.3	62.6	61.2	62.6	64.0	63.8	64.3	63.4	65.6	72.6	67.9
8:40 AM	67.5	63.0	60.9	60.4	36.5	37.3	48.4	56.4	57.7	55.6	56.1	61.2	64.3	62.4	62.5	61.3	63.2	59.8	61.9	62.0	54.9	54.4	41.9	45.4	26.4	31.0	30.6	50.6	58.4	62.7	61.2	62.0	64.3	64.0	64.1	63.6	65.7	72.5	67.9
8:45 AM	67.5	63.5	61.3	60.1	45.4	40.6	50.6	59.8	58.6	58.8	56.9	61.8	65.0	63.2	64.5	62.5	63.0	60.1	61.4	62.0	57.4	58.4	44.9	48.2	28.4	32.0	30.8	50.6	58.8	62.5	61.0	62.4	64.4	64.0	64.3	63.8	65.6	72.4	67.7
8:50 AM	67.7	63.6	61.6	62.2	49.3	53.0	54.5	62.5	61.3	60.1	57.6	62.0	65.0	63.6	64.9	62.7	64.1	61.5	62.4	62.8	57.8	60.4	51.4	50.1	29.0	31.9	30.5	49.8	58.6	62.8	61.4	61.8	64.6	64.0	64.3	63.8	65.9	72.5	67.6
8:55 AM	68.1	64.6	62.5	62.6	52.8	60.7	55.2	64.3	62.0	61.5	58.9	62.9	65.1	64.0	65.0	63.4	64.6	62.5	62.0	63.8	57.7	61.9	55.6	54.8	33.0	35.3	34.0	49.7	58.5	63.0	61.4	62.4	64.4	63.9	64.4	63.4	65.9	72.5	67.6
9:00 AM	67.9	64.3	62.4	62.6	54.3	64.3	57.5	64.1	62.1	62.5	60.0	64.0	66.5	64.8	66.0	64.9	64.8	61.9	62.8	64.3	59.4	62.2	59.7	58.3	43.0	39.3	35.0	50.0	58.9	63.3	61.8	63.0	65.0	64.2	65.0	63.8	66.2	72.4	67.9
9:05 AM	68.1	64.2	63.2	62.7	57.8	65.0	59.5	64.6	63.3	62.4	60.4	64.2	66.7	64.8	66.4	64.5	65.5	61.8	63.5	64.2	59.4	62.6	62.8	58.5	51.8	51.3	42.0	50.8	59.6	62.6	61.5	62.6	64.8	64.4	65.0	63.6	66.5	72.7	68.1
9:10 AM	67.8	63.9	63.0	63.5	60.8	66.4	60.1	65.0	63.5	62.8	60.5	64.3	66.3	65.1	66.4	64.8	65.9	62.3	62.9	65.1	60.3	62.9	63.1	59.2	56.8	59.4	51.3	52.0	59.7	62.9	61.5	63.0	65.0	64.0	65.4	63.5	66.4	72.9	68.2
9:15 AM	67.8	64.0	63.2	63.9	60.9	67.5	60.8	65.9	63.9	63.4	61.4	64.2	66.6	65.3	65.9	64.9	65.6	63.4	63.1	65.0	60.0	63.1	63.6	60.1	60.1	63.6	56.9	55.6	61.0	63.6	62.0	63.1	64.9	63.9	65.4	63.3	66.6	72.7	68.1
9:20 AM	67.9	64.0	62.8	63.9	61.1	67.8	60.8	66.0	64.1	63.5	61.4	64.9	66.5	64.9	65.8	65.0	65.8	63.4	64.0	65.3	60.5	63.9	64.0	61.1	60.9	66.1	58.7	58.6	61.7	63.5	62.1	62.8	64.9	64.1	65.4	63.6	66.6	73.1	68.2
9:25 AM	67.9	63.5	63.1	64.4	61.9	68.0	60.9	66.5	64.7	63.6	61.5	64.6	66.5	64.9	65.9	65.1	65.6	63.6	62.4	64.9	60.5	63.8	64.6	60.4	62.6	67.0	58.4	60.9	62.9	64.6	62.2	62.7	65.0	64.4	65.9	63.8	66.7	73.1	68.2
9:30 AM	67.8	63.5	62.7	64.0	61.6	68.0	60.9	66.2	64.8	63.9	61.6	65.1	66.6	65.2	66.0	65.0	66.0	64.1	62.6	65.1	60.5	63.6	64.8	60.8	63.5	68.0	61.1	61.6	63.9	64.6	62.8	63.9	65.0	64.2	66.0	63.5	66.8	73.2	68.4
9:35 AM	67.8	63.4	62.6	64.1	61.4	68.1	60.6	66.5	64.3	63.2	62.0	64.8	66.5	65.1	66.0	64.9	66.1	64.2	62.8	65.8	60.6	63.6	65.1	61.8	63.6	68.4	61.2	62.1	64.8	64.7	62.5	63.3	64.8	64.1	66.1	63.8	67.0	73.5	68.6
9:40 AM	67.7	63.8	62.7	63.8	61.4	68.3	60.9	66.6	64.7	64.0	61.8	64.9	66.4	64.9	66.0	64.7	65.8	64.2	62.9	65.8	61.1	63.8	65.3	61.7	63.5	69.0	61.3	63.4	65.0	65.8	63.1	63.3	65.0	64.2	66.3	64.1	67.0	73.5	68.6
9:45 AM	67.8	63.3	62.3	63.5	61.1	68.2	61.0	66.9	65.3	63.8	61.8	64.9	66.5	65.0	66.0	64.5	65.9	64.1	62.6	66.1	61.1	63.5	65.3	61.5	63.5	69.2	61.4	63.7	65.3	65.7	63.4	63.9	65.3	64.6	66.4	63.8	66.9	73.4	68.6
9:50 AM	68.0	64.0	62.5	64.3	61.9	68.5	60.9	66.9	64.5	63.5	61.6	64.6	66.4	64.8	66.0	64.5	65.9	64.2	62.7	65.8	61.0	63.6	65.5	61.8	63.9	69.7	63.0	63.7	65.5	65.8	63.4	64.0	65.4	64.5	66.4	63.8	67.0	73.1	68.6
9:55 AM	67.9	63.8	62.0	64.2	62.0	68.7	61.6	67.3	65.1	63.9	61.9	65.0	66.5	65.0	66.4	64.6	66.0	64.0	62.3	66.0	61.0	63.5	65.5	61.7	63.6	70.0	63.2	64.3	65.9	65.5	63.4	63.3	65.4	64.4	66.6	63.6	67.1	73.3	68.6
10:00 AM	67.9	63.8	62.4	64.0	61.8	68.7	61.5	67.4	65.2	64.1	62.0	65.1	66.6	65.0	66.1	65.1	66.3	64.3	62.1	65.7	61.1	63.6	65.3	61.3	64.0	70.1	63.3	63.7	66.1	65.9	63.1	62.8	65.2	64.3	66.8	63.5	67.4	73.6	68.9

Table 8-10: Southbound I-15 AM Modeled Speed Contours – Typical Day

Time	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06
5:05 AM	76.5	75.7	76.2	75.5	75.0	74.3	73.5	75.1	76.3	74.7	74.3	75.2	76.8	75.9	75.7	75.3	76.1	75.7	75.9	76.0	75.2	75.5	76.5	74.9	75.3	74.8	75.5	76.9	75.6	75.7	76.5	76.5	76.4	76.1	77.8	77.2	77.4	77.5	77.3
5:10 AM	76.0	74.8	76.0	73.7	73.6	74.0	74.7	74.9	75.2	73.6	73.8	74.8	76.4	76.0	76.0	73.3	76.1	75.9	75.7	76.1	75.6	76.0	76.7	76.2	76.4	75.8	76.1	76.2	75.5	76.0	76.3	75.9	75.9	75.8	76.5	76.5	76.4	76.4	76.5
5:15 AM	76.2	75.8	76.5	74.5	73.4	73.1	72.6	72.9	74.6	71.7	73.2	73.8	76.3	75.7	75.5	74.7	76.2	76.1	76.3	75.9	73.2	75.4	77.1	75.3	75.8	74.0	75.8	76.5	76.0	76.1	77.4	77.1	76.7	76.4	77.7	76.9	76.2	76.4	76.8
5:20 AM	74.7	72.4	74.8	68.5	71.8	72.0	72.5	74.4	75.3	72.4	72.9	74.5	76.1	75.8	75.4	74.3	75.1	74.5	74.6	74.7	72.8	74.3	76.2	74.9	76.0	74.7	75.7	77.5	75.4	76.4	77.2	76.8	77.1	76.7	78.7	76.8	77.2	77.0	76.8
5:25 AM	74.9	72.2	74.4	65.9	69.2	70.2	66.3	70.1	73.2	70.3	69.7	71.8	74.8	74.7	74.1	72.4	75.8	75.0	75.5	75.7	75.3	74.6	76.8	74.0	75.1	74.3	75.0	75.4	73.7	73.7	75.8	75.9	75.6	75.6	77.3	76.0	76.4	76.5	77.2
5:30 AM	74.9	72.2	74.1	69.2	68.4	68.2	59.4	68.6	74.0	71.6	69.2	70.0	73.2	74.8	74.8	70.9	74.9	74.1	74.5	73.8	73.6	74.1	76.2	74.2	75.3	74.4	75.0	76.1	74.7	75.5	76.4	75.8	75.8	75.4	77.4	75.9	76.0	75.3	75.8
5:35 AM	74.3	70.2	70.6	65.5	67.5	66.0	63.1	69.1	72.9	69.9	68.2	71.2	73.1	73.8	73.3	71.9	73.9	73.2	74.7	74.9	72.9	73.8	76.3	72.6	73.8	73.6	73.9	74.8	72.9	74.3	75.4	75.9	76.0	76.0	77.6	76.4	76.6	76.4	76.5
5:40 AM	74.5	70.2	72.6	52.2	64.5	63.8	57.2	66.1	70.9	65.5	66.2	71.0	74.7	73.7	73.4	71.0	74.5	72.5	73.2	71.5	68.7	73.7	75.8	71.7	74.7	74.2	74.5	75.3	72.4	73.8	75.9	75.4	75.3	74.7	75.7	75.5	75.5	74.8	75.8
5:45 AM	72.6	69.6	71.6	49.9	60.6	60.3	51.6	63.0	71.8	71.2	66.1	70.5	72.5	72.3	72.2	66.4	73.0	72.3	72.7	72.2	70.8	72.6	75.8	72.2	73.1	72.7	73.7	75.3	70.8	74.0	75.3	75.7	75.3	74.5	75.8	75.1	74.7	75.5	75.1
5:50 AM	73.2	68.6	71.2	45.0	49.0	53.6	53.7	59.5	71.9	70.7	65.5	68.2	71.0	72.8	72.1	62.6	73.9	72.7	73.8	73.0	71.4	70.4	74.2	70.7	73.0	72.9	73.4	75.7	69.7	71.8	75.0	75.0	75.1	75.3	76.3	75.2	75.2	74.8	75.6
5:55 AM	72.9	66.9	70.6	44.6	52.8	51.8	48.7	60.7	70.7	67.5	64.9	71.0	74.3	72.9	71.2	66.6	73.1	72.2	73.6	74.0	73.5	72.3	75.5	71.7	73.4	72.4	73.7	74.5	67.8	71.4	75.0	74.8	74.5	74.7	76.4	75.9	76.4	75.2	75.7
6:00 AM	73.6	69.5	70.6	45.6	58.6	57.1	38.0	55.0	71.0	70.0	65.3	70.4	73.5	72.7	72.1	61.4	73.1	72.3	72.8	73.3	73.0	71.1	75.1	70.2	73.5	71.8	72.6	75.4	66.0	73.3	74.4	75.8	75.5	75.2	76.0	75.1	74.8	75.3	74.6
6:05 AM	73.1	64.2	70.0	49.1	59.5	61.0	37.7	55.4	70.1	68.0	63.5	70.0	74.0	73.1	72.2	63.3	73.2	71.0	72.7	71.1	68.2	69.7	74.6	68.6	71.7	68.5	71.3	74.5	67.1	70.4	74.1	75.2	74.4	74.3	72.9	75.4	75.6	74.9	75.2
6:10 AM	73.6	59.5	66.6	49.3	44.2	49.5	37.1	53.9	69.0	64.8	63.2	69.6	73.2	72.6	72.7	60.2	72.7	70.9	72.9	71.5	70.3	70.2	74.8	69.2	71.0	69.8	69.5	74.4	61.3	71.2	74.3	74.3	74.4	74.0	71.2	74.8	75.0	74.6	74.5
6:15 AM	72.6	58.5	60.5	40.6	35.0	40.6	39.2	51.8	70.0	65.4	57.7	66.5	72.4	72.4	71.5	66.8	71.2	70.1	72.3	71.0	69.5	69.4	74.3	65.3	70.6	67.2	65.8	73.8	65.9	70.7	72.4	73.9	73.3	72.9	70.6	72.6	73.2	74.3	74.7
6:20 AM	73.1	59.7	59.5	29.8	31.9	37.4	34.5	52.8	64.6	53.2	57.9	61.3	71.3	72.1	72.0	66.6	73.3	70.9	72.5	69.1	59.7	68.6	74.1	64.5	70.5	69.4	67.2	74.1	58.2	67.6	68.8	73.6	73.5	73.0	61.4	73.2	72.9	73.8	74.0
6:25 AM	73.7	61.6	53.4	26.2	29.5	33.6	32.7	53.5	59.9	47.1	54.2	61.8	68.9	71.4	71.6	62.7	72.9	70.3	72.5	70.9	68.8	66.4	74.2	64.4	71.5	68.2	63.2	73.7	58.0	68.8	71.6	73.5	73.2	72.6	69.3	72.8	73.5	73.4	73.2
6:30 AM	73.7	60.2	27.8	26.5	27.1	30.1	38.3	53.5	63.1	52.7	54.5	63.7	71.2	70.2	70.4	62.9	72.4	69.8	73.1	72.5	71.2	68.7	74.3	64.6	70.7	68.2	64.5	73.6	58.1	65.6	73.4	74.4	73.6	73.1	66.1	72.6	73.5	72.9	73.7
6:35 AM	72.6	58.9	21.5	26.1	24.1	25.1	38.8	54.0	65.5	56.6	54.6	61.5	69.8	69.9	69.5	62.4	71.5	69.1	71.3	67.7	64.1	64.9	73.9	65.9	71.1	68.0	62.3	74.2	56.7	68.6	72.0	73.7	73.3	72.6	62.8	72.8	73.6	72.8	74.2
6:40 AM	73.4	61.6	22.3	32.1	23.3	26.9	34.0	54.6	58.4	44.1	54.6	65.0	72.8	72.0	71.0	58.9	70.9	66.7	71.6	71.1	67.5	63.9	74.2	64.0	70.1	64.6	60.9	73.5	56.3	67.2	64.6	73.0	72.3	71.7	50.8	71.8	73.9	73.8	73.1
6:45 AM	72.8	60.3	26.5	36.8	23.7	27.1	38.0	51.9	49.0	38.5	53.1	64.9	72.7	71.3	70.9	52.6	71.0	67.3	71.8	68.5	68.9	62.8	73.4	59.3	70.1	63.5	54.1	74.1	53.5	63.2	66.2	71.5	72.1	71.6	55.2	71.4	73.4	71.8	72.2
6:50 AM	72.4	63.1	26.9	40.5	22.7	25.8	44.0	52.2	41.2	36.5	49.8	61.7	72.2	69.1	67.9	61.0	71.3	64.0	71.5	65.1	64.7	54.0	73.3	61.9	70.8	61.5	43.3	73.7	53.5	54.4	66.0	73.7	72.4	70.8	60.1	68.5	72.1	71.6	73.3
6:55 AM	72.8	68.5	22.1	42.5	22.7	26.4	48.3	57.8	42.3	36.6	50.0	60.4	71.3	70.6	68.8	50.3	70.9	68.2	72.6	70.9	66.7	61.5	70.9	59.9	66.2	48.5	40.5	73.4	54.4	68.6	68.7	72.7	71.4	70.2	53.4	70.2	73.2	72.5	72.9
7:00 AM	72.1	68.1	24.7	46.8	22.6	27.2	47.6	60.1	49.7	39.7	52.6	61.9	71.1	69.4	69.5	47.8	71.0	62.4	71.5	70.0	66.5	66.4	74.0	62.9	61.5	43.3	39.4	73.1	54.8	58.2	63.5	71.1	72.9	71.1	53.2	69.8	72.6	73.1	73.3
7:05 AM	72.0	65.4	24.7	43.3	37.2	27.1	37.5	56.6	50.4	41.1	52.0	56.1	70.4	69.4	69.4	50.1	70.4	64.8	69.8	64.2	59.6	61.5	69.0	61.2	57.7	39.9	38.7	73.3	54.6	66.1	65.5	72.4	71.8	70.3	48.9	71.3	72.7	71.0	72.5
7:10 AM	72.8	64.4	35.8	46.2	47.2	37.5	35.4	52.5	47.0	39.1	49.3	58.7	71.3	69.6	68.8	45.3	70.3	63.6	71.4	67.6	66.2	58.8	60.0	59.9	52.3	39.1	37.0	71.5	51.4	54.8	62.3	70.2	71.3	70.5	58.8	68.7	72.5	72.7	73.4
7:15 AM	71.9	66.1	50.0	47.9	35.4	37.0	40.5	55.4	46.9	39.2	48.0	55.3	69.2	68.7	70.2	53.7	69.5	59.8	68.6	61.9	58.8	65.2	51.9	61.5	45.3	39.2	38.0	67.3	53.9	65.2	61.4	66.3	70.2	68.3	42.2	68.8	69.7	72.4	71.9
7:20 AM	71.8	65.8	51.3	50.7	30.3	32.7	41.6	59.7	52.0	44.5	50.1	57.8	70.5	70.4	68.6	48.4	70.0	61.5	70.1	47.9	40.7	61.6	56.6	59.2	36.3	35.0	37.4	69.8	51.7	60.7	55.6	67.1	71.2	69.4	47.4	66.7	72.2	70.5	70.9
7:25 AM	72.2	67.5	32.0	50.9	43.2	26.0	41.3	61.5	54.1	41.6	57.3	59.9	70.0	68.6	68.3	56.9	69.6	57.7	70.3	40.4	42.1	60.3	40.9	59.9	34.3	37.3	37.7	72.2	52.5	63.2	66.2	68.7	70.8	68.5	50.1	60.8	64.7	71.8	71.9
7:30 AM	72.6	61.8	25.6	47.4	30.5	20.3	46.3	63.9	53.4	40.8	54.9	58.0	71.6	70.3	70.4	54.9	70.3	59.2	68.0	38.6	40.2	59.4	24.8	59.8	31.3	36.5	36.3	73.2	54.9	68.5	61.0	66.6	69.8	67.9	47.0	64.5	71.3	70.7	70.6
7:35 AM	72.0	59.0	17.7	47.7	22.8	13.8	49.5	67.3	63.3	46.4	65.2	66.1	72.0	70.5	69.2	55.9	70.9	58.0	69.9	36.2	39.5	47.5	25.5	58.4	30.5	36.6	38.1	73.2	56.2	66.7	59.7	66.9	71.6	70.0	52.1	62.1	69.2	70.7	70.8
7:40 AM	74.0	67.2	29.0	50.4	8.5	11.6	48.4	65.1	66.6	55.2	66.2	64.7	68.1	70.1	71.4	64.2	71.2	63.3	70.7	42.6	39.7	43.4	24.5	60.1	30.7	33.9	35.8	72.4	50.4	67.4	59.5	61.8	70.7	68.1	41.1	61.9	69.5	71.8	71.5
7:45 AM	72.0	63.0	31.3	46.5	9.2	13.6	44.3	62.3	63.7	47.7	63.5	64.1	71.0	70.4	69.3	53.1	71.4	64.6	72.2	48.4	38.6	40.8	25.8	51.7	30.1	35.9	37.9	70.9	54.3	67.2	56.3	64.0	71.1	68.6	35.8	60.4	60.7	71.1	71.1
7:50 AM	72.3	62.3	27.9	25.8	13.1	17.9	38.7	62.6	52.4	39.0	59.3	60.3	71.1	71.4	70.5	58.6	71.5	65.8	70.2	58.3	57.2	51.3	25.4	27.9	27.9	36.0	37.2	72.1	53.5	61.6	58.6	67.4	67.2	66.0	44.6	53.6	62.0	71.6	70.4
7:55 AM	72.7	61.3	47.3	15.0	15.1	19.7	31.8	54.0	44.0	37.4	52.0	59.1	70.4	70.7	70.3	51.0	71.5	60.7	71.5	63.9	56.4	61.0	21.5	24.8	30.4	33.3	33.2	70.9	53.9	62.2	56.9	62.7	70.2	67.5	43.5	54.6	58.5	70.2	71.6
8:00 AM	71.3	59.2	64.9	19.2	16.3	20.7	38.2	57.7	35.3	34.1	48.3	48.7	67.9	68.7	69.3	48.6	72.0	65.4	71.6	65.4	54.1	57.5	24.1	23.1	27.8	31.4	26.7	70.3	56.9	67.8	59.7	67.3	68.2	66.2	37.1	57.6	60.3	70.0	70.1
8:05 AM	72.4	63.0	65.0	23.8	15.4	19.5	36.5	55.5	37.9	35.1	43.8	54.3	69.3	69.8	65.3	50.4	71.6	63.3	72.7	69.5	63.6	66.5	34.1	20.6	24.9	27.8	27.2	50.0	52.8	68.5	58.4	69.0	71.3	69.9	38.1	61.0	64.4	69.0	70.7
8:10 AM	74.6	64.9	62.6	20.1	17.2	21.4	33.7	53.6	36.0	33.5	43.4	56.1	70.6	70.7	71.1	51.3	71.3	65.0	71.4	63.3	63.0	62.1	49.4	21.4	25.8	30.8	31.0	29.1	54.2	65.0	62.6	70.7	72.0	70.6	43.1	67.2	67.1	69.1	71.5
8:15 AM	73.2	62.5	62.5	14.6	17.6	19.9	37.9	53.7	35.9	35.3	44.4	55.8	69.1	69.1	70.2	42.0	71.7	63.5	72.6	69.3	68.5	63.3	31.5	19.6	27.4	31.4	32.0	23.6	52.3	61.1	63.9	72.5	72.8	71.3	48.4	68.6	67.8	70.0	73.3
8:20 AM	75.5	68.7	61.7	15.6	17.3	20.7	29.0	54.1	37.2	34.5	45.2	55.4	70.2	70.2	67.7	53.0	70.7	62.0	71.6	67.1	63.9	67.2	59.5	21.2	28.4	31.9	32.3	23.4	50.8	64.2	59.8	70.6	71.6	69.4	49.7	66.8	70.4	70.3	73.5
8:25 AM	75.8	74.1	73.1	19.7	17.6	20.0	30.2	49.5	35.0	34.6	46.9	60.7	70.8	70.7	68.1	43.6	72.1	62.7	72.4	67.1	65.3	62.3	41.2	21.1	27.6	32.7	33.8	24.8	53.3	63.6	58.8	71.2	72.1	71.2	57.1	68.5	65.6	68.5	72.9
8:30 AM	75.9	73.6	70.3	58.2	16.9	19.8	38.1	50.9	32.8	32.6	44.9	58.1	70.0	68.7	66.7	47.2	71.1	61.3	72.2	67.2	65.5	68.8	63.6	19.3	27.1	31.5	33.2	24.8	55.4	66.1	55.9	69.7	71.7	70.7	42.3	69.8	68.8	69.7	73.6
8:35 AM	75.4	73.3	69.4	61.1	18.9	21.6	38.5	56.8	34.8	35.4	45.3	58.3	72.0	70.2	66.2	42.4	72.3	64.7	72.6	63.6	60.2	68.3	65.9	19.3	28.2	32.9	33.5	26.4	54.1	67.8	61.8	71.6	71.3	69.9	45.9	66.9	70.5	71.9	73.4
8:40 AM	75.1	73.7	73.1	63.7	56.7	42.8	35.9	54.7	34.6	36.0	46.1	54.8	68.9	70.5	64.4	40.2	71.4	63.9	72.3	64.7	62.3	66.8	72.5	24.7	27.2	32.2	33.2	23.9	53.0	65.1	67.3	72.5	71.0	69.9	51.2	67.3	69.1	70.9	72.2
8:45 AM	75.0	73.3	73.0	62.8	69.6	67.0	42.8	56.7	38.5	36.6	44.3	46.3	66.1	67.9	66.3	43.5	70.6	64.6	72.2	66.0	63.3	64.9	74.2	44.1	28.4	32.6	32.9	23.9	54.1	64.1	62.6	72.4	71.8	70.2	54.8	69.3	70.7	70.8	72.4
8:50 AM	74.1	72.0	73.9	65.0	65.9	63.7	52.9	62.1	57.0	47.0	41.1	45.0	65.5	67.9	65.3	46.8	71.5	62.0	71.3	66.3	63.2	65.4	73.9	60.2	27.9	33.0	31.6	23.3	55.2	68.3	54.8	72.9	72.9	72.0	56.9	70.5	71.8	72.3	73.0
8:55 AM	75.5	73.0	73.3	60.2	67.6	64.8	57.7	65.8	69.3	65.0	66.8	66.3	71.5	71.2	70.1	42.8	71.4	60.6	71.0	67.3	67.5	65.0	74.1	64.0	28.6	33.0	33.8	24.6	52.1	67.0	58.6	71.9	72.1	71.1	63.1	70.3	71.7	71.2	73.4
9:00 AM	74.4	72.9	72.7	65.1	69.4	66.2	59.8	68.6	70.5	64.3	67.9	67.6	70.8	72.9	72.4	59.6	73.8	68.7	73.3	66.5	63.2	65.4	74.4	66.0	28.8	33.7	31.0	22.8	52.9	62.8	54.2	72.3	73.3	72.4	61.7	69.5	72.3	72.5	73.4
9:05 AM	74.7	72.3	73.3	60.0	66.5	62.8	60.2	68.6	71.9	67.6	68.8	65.9	69.7	72.6	73.1	55.0	74.1	70.8	74.3	72.1	71.8	70.1	75.7	68.7	32.7	34.5	33.6	23.1	54.2	67.7	60.0	71.8	71.9	71.0	59.5	67.2	70.1	71.9	72.8
9:10 AM	75.1	71.9	72.4	60.4	66.6	63.1	59.4	64.4	68.1	65.8	68.9	69.4	72.4	72.4	72.6	66.5	73.6	69.7	73.7	70.3	68.8	67.2	75.3	69.3	48.3	38.5	36.8	22.7	55.3	63.4	59.5	73.2	73.5	72.6	62.3	70.0	71.7	71.6	73.2
9:15 AM	75.4	72.9	71.8	62.2	67.1	61.8	63.7	68.1	67.3	63.8	67.5	68.6	71.9	72.5	71.8	66.0	73.1	70.7	73.4	72.2	68.5	70.3	75.0	70.2	67.0	47.4	38.8	23.3	55.1	67.1	64.6	73.3	73.2	72.3	73.9	70.8	72.6	72.9	73.4
9:20 AM	74.8	73.3	74.5	62.1	65.0	61.6	60.7	67.1	68.8	64.5	67.0	69.8	73.7	72.9	72.4	67.7	73.2	69.2	73.8	71.3	68.6	68.4	74.2	70.8	72.2	64.0	46.1	25.0	53.8	67.0	60.6	71.8	71.5	71.4	65.9	71.6	72.5	73.3	73.8
9:25 AM	75.3	73.7	73.5	58.9	64.9	62.1	62.8	66.2	66.1	62.6	67.5	68.1	70.8	72.1	72.7	68.0	73.3	72.1	73.3	71.3	63.8	67.9	74.6	69.9	72.8	72.2	64.7	61.5	53.9	65.2	57.8	71.8	72.2	71.3	62.4	71.7	72.4	73.6	73.0
9:30 AM	74.4	72.4	74.8	66.0	64.9	60.3	58.7	67.1	67.5	63.1	68.8	69.6	70.9	72.1	72.5	63.0	73.5	70.6	72.2	70.0	68.8	68.4	74.4	68.3	71.9	68.3	70.6	73.7	54.3	68.1	60.8	71.4	71.2	70.0	59.5	69.2	70.4	71.9	72.7
9:35 AM	75.5	73.5	74.2	62.9	64.3	62.1	59.8	64.0	65.6	61.1	66.3	68.1	71.8	73.0	72.6	68.9	73.8	70.9	72.9	71.6	66.5	66.4	74.3	67.4	71.5	68.9	68.5	73.7	58.2	71.8	64.9	73.5	74.0	73.1	70.0	72.8	71.7	72.1	73.8
9:40 AM	75.5	73.7	75.0	64.7	67.2	60.8	58.4	66.3	68.3	65.8	69.9	69.1	72.1	73.5	73.6	67.5	74.1	71.0	73.2	71.5	69.4	65.9	74.6	68.9	72.7	70.5	68.3	72.7	55.7	66.4	64.1	73.5	72.5	72.6	72.5	72.1	71.3	73.6	73.1
6:45 AM	75.1	72.5	73.8	60.7	64.1	60.9	61.2	66.6	66.8	63.3	68.6	67.5	70.6	72.4	72.9	66.9	74.4	73.1	74.4	73.6	71.3	68.9	75.4	67.7	72.8	69.2	67.1	73.3	57.5	65.4	66.2	73.3	72.9	72.0	64.9	71.3	71.7	72.1	74.2
6:40 AM	75.8	73.8	74.5	63.0	63.8	57.1	61.8	64.7	66.9	63.3	68.6	68.7	71.5	72.5	72.3	67.2	73.9	71.3	73.2	72.8	69.6	69.2	75.1	67.9	73.8	71.5	71.1	74.4	57.5	72.2	70.5	73.7	73.3	73.1	66.5	70.8	72.0	73.5	73.5
6:45 AM	76.0	75.0	76.2	67.5	70.1	65.9	62.0	67.7	67.4	63.9	69.1	68.9	72.4	72.9	72.8	69.4	73.2	70.7	73.4	71.6	72.2	68.6	75.0	71.1	74.0	71.7	71.9	74.6	65.7	72.2	70.9	74.3	73.8	73.4	74.9	73.8	73.0	74.1	74.2
6:50 AM	76.0	73.3	75.1	66.5	68.5	66.0	69.4	70.3	68.9	63.9	70.0	70.3	73.9	74.2	74.6	71.6	74.5	72.2	73.9	73.4	71.5	67.5	75.4	71.7	73.9	70.7	72.2	74.2	64.5	63.4	72.5	74.6	74.5	73.7	70.4	73.4	73.7	74.4	74.5

Table 8-11: Northbound I-15 AM Observed Speed Contours – Typical Day

Time	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06
5:05 AM	73.4	70.0	68.1	70.2	67.7	70.0	67.5	68.3	68.3	68.4	69.7	70.0	70.1	70.5	69.6	67.3	70.4	67.8	70.1	68.4	67.4	68.8	70.0	67.6	70.3	70.1	70.5	66.1	69.8	70.6	70.7	70.8	67.7	66.0	65.6	67.9	67.9
5:10 AM	73.1	70.5	68.1	70.3	67.4	70.0	67.2	67.6	68.0	68.0	69.6	68.6	69.0	70.8	68.8	66.8	69.5	66.7	69.7	67.8	67.1	69.0	69.9	67.7	70.0	70.2	69.8	66.2	68.4	70.6	70.2	70.4	66.9	65.2	66.0	68.0	68.0
5:15 AM	73.0	70.5	68.2	70.5	67.8	70.1	67.3	67.8	68.0	68.0	69.8	68.7	68.4	70.6	68.1	66.1	69.0	66.1	69.2	67.9	67.1	68.6	70.0	67.9	70.6	70.4	70.0	66.0	69.3	70.8	69.4	70.4	66.8	65.3	65.5	67.9	68.2
5:20 AM	73.0	70.5	68.3	70.8	68.0	70.2	68.0	68.8	68.9	68.5	69.9	69.1	69.0	70.8	68.5	66.5	69.1	65.9	69.5	68.1	67.1	68.7	70.4	67.9	70.5	70.2	69.9	66.3	68.4	70.8	69.8	70.5	67.3	66.0	65.5	68.1	68.2
5:25 AM	72.8	70.5	68.3	71.0	68.1	69.8	68.1	68.8	68.9	69.1	70.2	70.0	70.2	70.9	69.4	66.6	69.0	66.0	69.8	68.6	68.0	69.5	70.9	68.5	71.0	71.0	70.5	66.5	67.9	70.9	69.5	70.5	67.1	65.3	65.3	68.3	68.2
5:30 AM	72.5	70.4	68.2	71.3	68.8	69.8	68.6	69.2	69.4	69.7	70.0	70.1	70.4	71.0	69.8	66.7	69.3	66.2	70.1	69.2	68.1	69.7	71.4	68.3	71.0	71.1	70.7	66.7	69.5	71.0	70.6	70.7	67.7	65.4	65.6	68.5	68.5
5:35 AM	72.0	69.7	67.8	71.3	69.1	69.5	69.0	69.8	69.6	69.8	69.9	70.6	71.2	71.0	70.4	67.8	70.5	67.3	70.5	69.2	68.1	69.8	71.3	69.1	71.4	71.3	70.7	67.2	70.4	71.0	70.5	70.5	68.5	66.3	65.4	68.4	68.4
5:40 AM	71.7	69.3	67.7	71.3	69.0	69.5	69.1	69.8	69.1	69.8	69.7	71.0	71.7	70.9	71.2	68.2	70.8	67.7	71.1	69.9	69.0	70.5	72.3	69.7	71.9	71.9	71.9	68.0	71.0	70.9	71.4	70.7	68.6	66.7	65.2	68.6	68.5
5:45 AM	71.1	69.3	67.2	71.5	69.3	69.2	69.6	70.5	69.9	71.0	69.4	71.0	71.5	70.9	71.1	68.0	71.2	67.6	71.4	70.3	69.1	71.2	73.1	70.4	72.5	72.4	72.4	68.5	72.3	71.2	72.2	70.9	70.0	67.8	66.5	68.3	68.4
5:50 AM	70.7	68.8	67.3	71.7	69.5	69.3	70.6	70.8	70.0	71.1	69.6	71.4	71.9	70.9	71.5	68.3	71.9	69.4	71.6	70.1	69.0	70.9	72.5	69.8	72.4	72.3	72.6	68.5	72.2	71.2	73.0	71.0	71.1	68.7	66.4	68.5	68.6
5:55 AM	70.7	68.8	67.2	71.9	69.4	69.5	70.6	71.0	70.0	71.4	70.2	71.9	72.0	70.9	72.4	68.0	72.0	69.9	71.8	70.5	68.6	71.5	72.7	69.5	72.3	72.5	72.2	68.4	71.9	71.3	73.0	70.9	70.5	69.1	66.2	68.3	68.4
6:00 AM	70.9	68.5	67.1	71.4	69.0	69.8	69.9	70.4	69.3	70.8	70.3	72.1	72.2	71.2	72.5	68.7	72.1	69.8	72.1	70.3	68.6	71.3	72.1	69.5	72.0	72.1	72.2	68.5	71.6	71.2	72.0	71.1	71.2	69.2	67.0	68.4	68.6
6:05 AM	70.4	67.5	67.0	71.7	67.1	69.5	67.6	68.1	67.3	68.6	70.1	69.4	69.1	71.1	69.5	67.1	69.8	67.2	69.7	67.9	67.2	68.4	69.8	66.8	69.8	70.0	69.4	66.1	68.0	71.0	70.3	71.0	68.1	67.0	66.5	68.6	68.5
6:10 AM	69.9	66.6	66.6	71.8	66.1	69.3	66.6	67.1	66.6	67.5	70.0	68.4	67.9	71.0	68.2	66.2	68.4	65.0	68.1	66.4	66.0	67.1	68.4	65.8	68.5	68.6	68.0	65.0	66.7	71.0	69.2	71.1	67.0	65.7	66.0	68.5	68.5
6:15 AM	69.1	65.5	65.9	71.8	65.9	68.9	66.7	67.0	66.3	67.2	69.5	67.7	66.9	70.5	67.2	65.3	67.5	64.2	67.8	65.5	66.1	66.8	68.3	65.5	68.0	68.1	67.4	64.4	65.8	70.9	68.7	71.1	66.4	65.4	66.4	68.5	68.4
6:20 AM	68.3	64.8	65.8	71.9	66.0	68.6	67.3	67.1	66.1	67.5	69.3	67.5	67.0	70.1	67.0	65.3	67.3	64.2	67.4	65.2	65.6	65.8	67.1	64.9	67.8	67.8	67.3	64.5	65.5	70.9	68.5	71.1	66.3	65.8	65.5	68.5	68.5
6:25 AM	67.5	64.1	65.0	72.2	65.8	68.6	67.0	67.2	65.6	67.7	69.2	67.9	67.4	70.1	67.7	65.5	67.5	64.1	67.5	65.2	66.0	66.2	67.7	64.9	67.2	67.6	66.8	63.6	64.4	70.7	67.8	70.9	65.3	64.8	66.1	69.0	68.8
6:30 AM	66.3	63.3	65.0	72.0	65.3	68.3	66.7	66.5	65.5	67.5	69.0	67.6	67.3	69.9	67.8	65.8	67.9	64.6	68.0	65.9	66.4	66.5	68.3	65.5	67.9	68.2	67.6	64.5	64.5	70.7	68.4	70.9	65.3	64.5	65.8	69.0	68.8
6:35 AM	66.0	62.7	64.6	71.6	65.2	68.0	66.3	66.2	65.3	67.0	68.9	67.5	67.4	69.4	67.4	65.5	67.9	64.3	68.0	66.0	66.5	67.3	68.7	66.0	68.5	68.5	68.1	65.0	65.7	70.7	68.7	71.0	66.3	64.9	66.5	69.0	68.9
6:40 AM	65.4	62.7	64.3	71.8	65.1	67.9	66.5	66.3	64.8	66.8	68.7	67.8	67.4	69.4	67.3	65.3	68.1	63.8	68.5	66.3	66.9	67.2	68.8	65.9	68.5	68.6	68.1	65.2	65.8	70.8	69.3	70.9	66.9	65.5	67.7	69.2	69.2
6:45 AM	64.9	62.5	64.2	71.5	65.5	67.8	66.4	66.8	65.1	67.4	68.5	68.0	67.5	69.5	67.5	64.9	68.1	64.5	68.3	66.4	67.0	67.6	68.9	66.4	69.0	69.3	68.6	65.9	66.7	70.8	69.5	70.8	66.6	65.4	67.9	69.4	69.3
6:50 AM	64.8	62.3	64.5	71.8	65.5	67.9	66.7	66.9	65.5	67.4	68.5	68.0	68.2	69.2	67.3	65.2	68.0	65.0	68.3	66.1	66.9	67.6	69.1	66.3	69.4	69.7	69.3	66.2	67.2	70.8	70.4	70.6	66.1	64.3	67.9	69.4	69.1
6:55 AM	61.7	62.6	64.3	71.6	65.2	68.2	67.0	67.0	65.5	67.4	68.6	68.4	68.3	69.4	68.1	65.4	68.4	64.9	68.3	66.0	67.0	67.5	69.3	66.6	69.0	69.5	69.3	66.3	67.9	70.8	70.5	70.6	66.0	64.8	67.8	69.4	69.5
7:00 AM	62.7	63.1	64.5	71.8	65.4	68.1	66.5	67.2	65.7	67.6	68.8	68.3	68.1	69.5	68.0	65.0	68.6	65.2	68.6	66.4	67.1	67.9	69.3	66.5	69.1	69.5	69.2	65.8	66.9	71.0	70.3	70.8	65.4	64.6	67.9	69.5	69.3
7:05 AM	65.1	64.1	65.0	71.8	65.5	68.2	66.8	67.0	65.5	67.8	68.9	68.1	68.0	69.4	68.0	64.8	68.4	64.9	68.5	66.0	67.0	67.5	69.2	66.6	69.3	69.5	69.2	66.3	67.1	71.3	69.8	71.0	65.6	65.3	66.6	69.5	69.5
7:10 AM	66.1	64.2	64.8	71.5	65.5	68.0	67.0	67.0	65.7	67.8	68.5	68.0	67.8	69.3	67.8	64.9	68.1	65.0	68.3	66.5	67.2	67.7	69.1	66.6	69.0	69.3	69.0	65.9	66.3	71.1	69.5	70.9	66.1	65.3	65.8	69.5	69.4
7:15 AM	66.4	63.6	64.5	71.4	65.4	68.1	67.0	66.7	65.5	67.6	68.4	67.8	67.8	69.0	68.0	65.2	68.1	64.4	68.4	66.0	66.8	67.6	69.1	66.6	68.8	69.1	68.9	66.1	66.3	70.9	69.2	70.8	65.5	64.2	65.8	69.5	69.3
7:20 AM	66.2	63.4	64.5	71.1	65.4	67.9	67.3	67.0	65.5	67.7	68.1	68.0	68.2	69.1	68.2	65.0	68.1	64.9	68.4	66.1	66.9	67.9	69.0	66.4	69.0	69.3	69.0	66.0	66.4	70.6	69.2	70.1	65.0	62.9	64.4	69.4	69.3
7:25 AM	64.1	63.1	64.3	71.3	65.2	67.9	67.2	67.3	65.5	67.6	67.7	68.1	68.1	68.7	68.0	64.9	68.3	65.1	68.5	66.6	66.8	67.7	69.1	66.9	69.0	69.6	69.4	66.4	67.1	70.5	68.9	69.4	64.2	59.0	63.9	69.3	69.3
7:30 AM	62.3	63.5	64.5	71.0	65.3	68.0	66.8	66.9	65.5	67.5	67.7	67.8	67.9	68.8	68.1	64.8	68.3	65.2	68.5	66.1	66.9	67.6	68.9	66.5	68.9	69.4	69.3	65.8	66.7	70.6	69.3	69.5	63.7	53.7	64.0	69.4	69.4
7:35 AM	62.6	63.7	64.5	70.8	65.3	67.8	66.7	67.0	64.8	67.3	67.5	67.8	67.9	68.7	67.7	64.6	68.3	65.0	68.2	66.1	66.3	67.3	68.6	66.4	68.8	69.0	69.1	65.8	66.2	70.5	69.3	69.3	63.0	52.5	64.1	69.3	69.4
7:40 AM	62.3	63.8	64.5	70.5	65.1	67.5	66.7	66.8	64.8	67.4	67.4	67.5	67.8	68.5	68.0	64.2	68.1	65.0	68.1	66.1	66.3	67.3	68.5	66.4	68.6	69.0	68.6	65.5	66.0	70.3	69.0	69.3	63.1	49.8	63.8	69.4	69.3
7:45 AM	62.7	63.6	64.3	70.2	65.1	67.4	66.6	67.0	64.8	67.4	67.1	67.4	67.6	68.3	67.4	64.3	67.7	64.9	68.1	65.8	66.3	67.3	68.5	66.3	68.5	68.7	68.5	65.5	66.3	70.3	68.7	69.0	61.9	48.1	62.2	69.3	69.3
7:50 AM	60.8	62.6	64.1	69.9	65.0	67.4	66.7	67.3	64.6	67.4	67.1	68.1	68.2	68.6	67.8	64.5	68.0	65.0	68.0	65.8	66.1	66.9	68.3	66.2	68.3	68.9	68.3	65.0	65.3	70.2	68.6	68.6	60.9	45.0	62.0	69.3	69.1
7:55 AM	57.5	62.7	64.0	69.6	65.0	67.5	66.7	67.4	65.0	67.6	67.4	67.9	68.2	68.3	67.9	64.0	67.9	64.7	68.3	65.9	65.9	66.6	68.2	65.9	68.3	68.6	68.3	65.0	64.9	70.2	68.5	68.5	60.6	44.1	62.2	69.0	69.1
8:00 AM	57.3	63.3	64.1	69.9	65.3	67.3	66.4	67.0	64.8	67.5	67.8	68.0	68.1	68.5	68.1	64.1	68.1	65.5	68.2	65.8	65.9	66.8	68.3	65.6	68.0	68.5	68.3	65.2	65.1	70.3	68.5	68.6	61.3	45.4	61.0	69.1	69.1
8:05 AM	57.6	63.8	64.3	69.3	64.8	67.4	66.1	66.3	64.3	67.0	67.5	67.5	67.9	68.5	67.8	64.2	68.0	65.3	68.4	65.8	66.0	66.7	68.3	65.9	68.5	68.8	68.4	65.1	65.8	70.4	69.2	68.3	62.1	45.1	61.9	69.1	69.1
8:10 AM	62.5	63.9	64.3	69.0	64.6	67.1	66.0	66.3	64.4	66.5	67.5	67.0	67.4	68.3	67.4	63.7	67.3	64.4	67.9	65.5	65.6	66.5	67.9	65.5	68.2	68.8	68.3	65.2	64.8	70.4	68.5	67.8	62.3	45.3	61.7	69.4	69.3
8:15 AM	64.0	64.4	64.5	68.9	64.5	67.0	65.7	65.9	63.8	66.1	67.3	66.6	67.2	67.9	66.9	63.4	66.9	63.8	67.3	65.0	65.0	65.7	67.4	65.1	67.5	68.1	67.5	64.4	64.6	70.1	67.9	67.9	62.1	47.3	61.7	69.2	69.0
8:20 AM	64.3	64.0	64.1	68.7	64.3	67.0	65.1	65.5	63.5	65.6	67.1	66.5	66.8	68.0	66.3	63.5	66.9	63.5	67.1	65.1	64.8	65.3	67.0	64.8	67.3	67.6	67.1	63.5	64.2	69.8	67.7	67.7	61.4	47.0	60.9	69.1	69.0
8:25 AM	64.2	63.5	64.0	68.4	64.1	66.9	65.3	65.3	63.7	65.6	67.0	66.3	66.7	67.6	66.5	63.4	66.4	63.6	66.9	64.6	64.6	65.3	67.0	64.8	67.1	67.5	66.8	63.0	64.1	69.8	66.8	67.9	61.1	44.4	60.5	69.0	68.6
8:30 AM	63.5	62.0	63.6	68.1	63.9	67.0	65.2	64.8	63.2	65.3	67.0	65.9	66.6	67.9	65.9	62.8	66.2	63.3	66.5	64.1	64.2	64.5	66.6	64.7	66.9	67.3	66.5	62.9	63.5	69.8	67.0	67.7	60.9	45.1	60.0	69.0	68.8
8:35 AM	62.0	62.3	63.6	68.1	63.8	67.0	64.9	64.9	63.0	65.0	66.8	65.8	66.3	67.5	65.5	63.1	65.8	63.1	66.5	64.0	64.2	64.5	66.2	63.9	66.1	66.7	66.1	62.0	62.0	69.5	66.3	67.7	60.8	44.6	59.6	69.0	68.8
8:40 AM	59.6	63.2	63.6	68.1	63.8	66.9	65.0	65.1	62.8	65.3	67.0	65.8	66.1	67.7	65.4	62.7	65.6	62.8	66.3	64.1	64.0	64.0	65.9	63.8	65.8	66.4	65.3	61.9	61.8	69.2	66.0	67.8	60.4	43.0	59.2	68.8	68.4
8:45 AM	61.3	62.3	63.9	68.0	63.6	66.6	64.5	64.9	62.9	65.0	66.7	65.8	66.2	67.4	65.9	63.1	65.6	62.8	66.1	63.7	64.0	64.2	65.9	63.6	65.8	66.3	65.5	61.7	61.4	68.9	65.5	67.6	60.5	43.5	58.6	68.7	68.4
8:50 AM	62.4	62.7	63.7	68.1	63.6	66.6	64.9	64.6	63.0	65.2	66.9	65.5	65.8	67.2	65.5	62.8	65.4	63.1	66.0	63.7	64.0	64.6	66.1	63.9	65.9	66.2	65.7	62.0	61.9	68.9	65.7	67.4	59.6	42.5	58.8	68.7	68.4
8:55 AM	61.5	62.3	63.5	68.0	63.3	66.8	64.8	64.5	62.8	65.0	67.0	65.3	65.8	67.4	65.4	62.6	65.4	62.4	65.8	63.6	63.7	64.1	66.0	63.5	65.9	66.5	65.5	62.3	61.4	69.1	65.8	67.6	60.5	41.0	59.4	68.5	68.5
9:00 AM	63.7	62.6	63.9	68.0	63.0	66.9	64.2	64.2	62.9	64.9	67.1	65.6	65.9	67.7	65.3	62.8	65.5	62.5	65.5	63.5	63.2	63.8	65.5	63.1	65.4	66.1	65.3	61.7	60.8	69.1	65.4	67.7	60.5	43.6	58.5	68.4	68.4
9:05 AM	65.3	63.0	64.3	67.5	62.9	66.9	63.6	63.4	62.0	64.1	67.0	65.0	65.1	67.6	65.0	62.6	65.0	62.6	65.5	63.1	63.1	63.3	65.1	63.0	65.3	65.9	64.6	61.3	60.2	69.0	65.4	67.9	60.5	48.1	58.1	68.2	68.0
9:10 AM	64.2	63.3	64.8	67.3	62.3	66.6	63.1	63.0	61.6	63.6	66.9	64.1	64.7	68.0	63.7	62.3	64.6	61.2	65.0	62.6	62.7	62.7	64.6	62.9	64.8	65.3	64.0	60.9	59.5	69.1	65.1	68.0	60.8	51.7	57.5	68.3	68.1
9:15 AM	65.2	64.3	65.0	67.0	62.1	66.7	62.8	62.8	61.4	63.3	67.0	64.0	64.4	67.9	63.7	62.0	64.0	60.6	64.5	62.0	62.1	62.1	64.0	62.5	64.3	64.7	63.6	60.3	58.7	68.7	64.8	67.6	60.5	53.0	58.1	68.3	68.1
9:20 AM	66.7	65.1	65.5	67.5	62.5	67.2	63.6	63.4	61.5	63.6	67.0	64.0	64.6	68.0	63.2	62.0	63.9	60.7	64.3	61.7	62.4	62.2	63.8	62.2	64.2	64.8	62.9	60.2	57.9	68.7	64.4	67.6	60.2	55.9	57.4	68.0	68.1
9:25 AM	68.3	65.6	65.6	67.7	62.9	67.2	63.8	63.5	62.1	63.9	67.1	64.2	64.7	68.1	63.8	61.6	64.0	60.5	64.4	62.1	62.2	62.0	64.0	62.5	64.2	64.5	62.9	60.0	58.3	68.5	64.2	67.6	60.5	57.4	58.5	68.4	68.0
9:30 AM	69.1	66.1	66.0	67.7	62.8	67.6	64.0	63.8	62.1	64.0	67.4	64.3	64.8	68.4	64.2	62.1	64.0	61.2	64.5	61.8	62.9	62.5	64.3	62.3	64.4	64.6	62.8	59.8	58.0	68.5	64.0	67.5	60.1	58.6	58.5	68.1	68.1
9:35 AM	69.4	66.5	66.1	67.6	63.0	67.8	63.9	63.8	62.4	63.9	67.5	64.6	65.1	68.3	63.8	62.5	64.1	61.1	64.2	61.5	62.7	62.6	64.5	62.1	64.7	64.9	63.0	60.4	58.3	68.5	64.5	67.6	60.5	59.5	59.0	68.4	68.1
9:40 AM	69.3	66.4	66.0	68.0	63.2	67.9	64.0	63.9	62.5	64.1	67.5	64.9	64.9	68.4	64.2	62.0	64.4	61.4	64.9	62.0	63.3	63.0	64.9	62.4	64.5	64.8	63.0	60.1	58.3	68.6	64.6	67.4	60.6	59.8	58.6	68.4	68.3
9:45 AM	69.6	66.6	66.3	68.2	63.1	68.0	64.4	64.5	62.7	64.2	67.7	64.8	65.3	68.6	64.6	62.2	64.4	61.5	65.0	62.0	63.5	63.4	65.0	62.8	64.6	65.2	63.5	60.7	59.5	68.7	64.6	67.3	60.4	60.0	58.8	68.4	68.3
9:50 AM	69.6	66.8	66.4	68.3	63.3	68.0	64.0	64.0	62.7	64.5	67.9	64.7	65.0	68.6	64.5	62.1	64.4	61.3	64.9	62.1	63.2	62.9	64.6	62.8	64.9	65.2	63.8	60.6	59.9	68.9	65.2	67.6	61.0	60.8	59.3	68.4	68.1
9:55 AM	69.8	66.6	66.4	68.5	63.0	68.1	63.8	64.2	62.6	64.1	67.8	65.0	65.2	68.9	64.0	61.6	64.4	60.8	64.5	61.7	63.1	62.8	64.9	62.9	65.0	65.6	63.5	60.1	59.9	68.8	64.6	67.5	61.0	60.5	59.5	68.4	68.2
10:00 AM	70.2	67.0	66.5	68.5	62.9	68.3	64.0	63.4	62.5	63.8	67.8	64.4	65.0	69.1	63.8	61.6	64.3	60.5	64.8	61.1	63.0	63.1	64.8	62.4	64.8	65.0	63.1	60.4	58.6	68.9	64.7	67.7	61.0	60.4	59.8	68.5	68.3

Table 8-12: Northbound I-15 AM Modeled Speed Contours – Typical Day

Time	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06
5:05 AM	76.2	76.7	75.3	73.4	73.1	74.1	75.5	75.3	74.1	76.0	76.2	76.1	76.5	76.9	76.5	77.1	76.7	76.0	75.3	75.5	77.7	76.9	75.8	76.8	76.0	75.3	75.1	76.2	75.4	75.4	75.0	75.0	75.5	74.7	75.3	76.0	75.6
5:10 AM	76.0	76.7	75.8	73.6	74.6	75.1	75.6	75.7	75.4	75.8	75.9	75.8	77.1	77.4	76.8	77.4	77.8	77.0	78.2	77.4	78.5	76.5	76.2	77.7	76.6	76.0	75.8	76.7	75.3	76.0	75.9	76.1	75.0	74.9	74.8	74.6	74.8
5:15 AM	75.8	76.4	75.2	72.9	74.4	73.5	75.2	74.1	75.0	75.6	76.4	75.5	75.2	75.7	75.9	77.0	76.9	76.4	76.7	76.2	77.2	75.8	76.0	77.8	77.7	76.8	76.8	77.8	75.8	77.0	76.4	77.0	76.5	76.2	75.9	75.5	74.0
5:20 AM	75.3	74.7	75.1	70.4	73.0	71.6	75.7	75.8	75.7	75.3	75.6	75.0	75.5	76.5	75.4	75.8	75.2	75.3	75.1	75.2	76.4	75.1	75.1	76.1	75.8	74.8	75.2	76.5	75.4	75.8	75.9	76.0	75.3	75.6	76.5	76.3	76.5
5:25 AM	75.5	75.2	74.4	69.2	72.7	72.1	75.3	75.1	74.8	75.6	76.6	75.6	75.7	76.3	75.9	76.6	76.5	75.3	75.9	75.8	77.1	75.7	74.6	76.3	75.5	75.1	74.7	75.8	74.2	75.3	75.3	75.1	75.0	75.2	76.8	76.2	75.4
5:30 AM	75.3	74.0	74.2	65.7	71.3	71.0	75.4	74.9	74.8	75.2	77.2	76.6	76.6	77.0	76.4	77.4	76.3	75.5	75.7	76.1	76.6	75.4	75.3	76.7	76.1	75.5	75.7	76.6	74.7	75.6	74.7	75.0	75.0	75.3	75.7	75.5	76.3
5:35 AM	73.4	71.8	72.0	66.5	68.4	70.1	75.3	74.5	74.4	75.0	76.6	75.6	75.6	76.5	76.2	77.3	76.3	75.8	76.6	77.0	77.4	74.1	76.1	77.8	77.3	75.7	75.6	77.2	75.7	76.0	75.3	75.9	75.1	73.5	76.9	77.0	75.9
5:40 AM	73.5	72.2	72.3	60.4	68.7	69.1	75.1	73.9	73.9	74.6	74.9	74.9	75.2	75.4	75.4	76.5	76.3	75.3	76.0	75.9	76.4	74.4	75.1	76.8	76.8	75.3	75.3	77.1	76.1	76.9	76.5	76.2	76.1	74.0	76.6	76.0	75.9
5:45 AM	73.2	70.5	72.0	61.9	68.9	66.5	73.5	73.9	73.6	74.0	75.3	75.6	75.8	76.6	76.1	76.9	76.0	72.5	76.1	75.4	76.0	74.3	75.1	76.8	75.7	75.0	74.6	76.1	74.9	75.5	75.1	75.0	75.2	74.0	77.3	77.6	76.7
5:50 AM	71.7	67.9	70.0	56.5	67.4	65.6	73.8	72.0	72.1	73.5	75.0	74.6	75.3	76.3	75.8	76.8	76.0	74.4	75.5	75.6	76.3	75.6	74.9	76.5	76.4	75.2	75.7	77.3	75.7	76.0	75.9	75.5	75.4	72.3	75.2	74.8	73.9
5:55 AM	72.2	69.3	69.6	55.2	66.0	65.1	72.8	74.4	72.1	74.3	74.5	73.9	74.8	75.5	75.3	76.5	76.2	74.0	75.9	74.9	76.0	71.5	75.0	76.5	75.8	75.3	75.0	76.3	75.2	75.9	75.7	76.2	76.0	74.5	76.2	76.2	75.6
6:00 AM	71.2	65.8	68.5	55.2	66.8	66.5	73.0	72.6	72.7	73.9	75.6	74.7	75.1	75.4	75.3	76.4	75.5	70.9	75.3	74.5	75.8	74.7	74.6	76.3	76.4	75.1	75.6	76.8	75.0	75.9	75.1	75.3	74.7	73.1	76.6	76.5	77.1
6:05 AM	72.2	66.7	67.7	56.7	67.5	66.1	73.1	72.5	71.1	73.2	73.7	73.5	74.5	74.4	74.9	75.9	75.8	72.0	75.1	73.6	75.4	74.0	75.0	76.7	76.0	75.3	74.9	76.9	75.3	75.6	75.5	75.0	75.3	74.3	76.3	76.3	76.1
6:10 AM	72.1	70.8	70.5	63.2	69.1	68.1	73.3	72.5	71.4	74.1	75.8	74.9	74.6	75.4	74.8	76.1	75.4	71.8	75.9	75.5	75.8	73.0	74.5	76.3	75.7	74.8	74.9	75.8	74.5	75.2	74.9	75.1	74.5	72.4	76.8	76.9	75.3
6:15 AM	70.8	65.8	67.5	61.0	67.9	67.9	71.8	72.6	73.2	74.1	75.8	74.1	75.1	75.7	75.2	76.4	75.8	72.6	75.4	74.1	75.5	73.5	74.8	76.2	75.6	75.0	74.8	76.7	74.9	75.1	75.1	74.7	75.3	72.6	75.9	76.4	76.4
6:20 AM	66.0	60.6	65.0	62.8	68.9	64.8	72.2	70.8	71.1	72.0	73.9	74.3	74.4	74.9	75.2	76.3	75.5	73.6	74.4	72.7	74.6	72.0	73.2	75.3	75.3	74.4	74.6	75.8	74.6	75.3	75.1	75.3	73.8	73.5	75.8	75.6	74.1
6:25 AM	59.9	58.1	60.2	54.3	65.8	65.2	70.9	70.7	69.0	73.0	74.4	73.2	73.5	74.7	74.1	75.1	74.6	68.9	74.3	74.1	74.9	70.5	73.8	75.5	75.9	74.9	73.8	76.3	73.6	75.1	74.2	74.3	73.3	71.7	76.0	75.5	76.5
6:30 AM	60.5	56.3	60.5	55.3	66.2	60.5	69.8	71.0	69.7	71.0	73.6	72.7	73.6	73.7	75.0	76.4	75.8	65.9	73.9	72.0	74.2	68.6	73.1	75.4	74.8	73.0	73.9	76.0	74.7	75.1	75.0	75.1	73.8	70.4	75.9	76.1	75.2
6:35 AM	66.7	56.4	60.8	56.6	65.6	56.8	69.5	69.1	68.9	71.8	73.9	73.6	72.9	73.9	74.9	75.7	74.8	66.2	73.7	68.9	73.4	63.8	73.7	75.5	75.8	74.6	74.1	75.4	73.8	74.5	73.8	73.6	73.3	66.4	75.9	76.4	76.0
6:40 AM	67.8	58.0	58.8	55.4	62.6	60.7	66.9	68.3	67.5	70.7	74.2	73.0	73.8	74.3	74.5	75.8	74.7	67.7	73.3	69.4	72.6	65.3	71.8	74.8	74.4	72.2	72.9	75.6	74.1	74.2	74.4	75.0	70.9	69.2	75.8	75.5	75.0
6:45 AM	66.7	58.5	59.4	50.9	63.7	57.3	67.7	66.0	64.8	70.8	72.4	72.4	73.1	72.7	74.4	75.5	75.1	67.7	74.6	72.9	73.3	64.4	73.4	75.7	75.2	73.5	73.0	75.7	72.9	73.6	74.1	74.3	70.8	67.9	76.6	76.9	76.6
6:50 AM	67.3	59.0	57.5	53.5	62.2	50.2	65.7	65.5	67.1	71.8	74.1	73.1	74.2	74.5	74.7	75.7	74.7	61.8	72.6	67.3	71.4	65.7	72.8	75.1	75.5	73.5	73.3	76.2	74.4	74.9	73.6	74.5	71.0	66.7	75.6	75.5	75.9
6:55 AM	65.9	59.4	59.1	52.5	66.2	40.7	56.5	66.5	67.7	72.4	73.2	73.7	73.2	72.0	75.3	76.1	75.1	67.8	73.3	67.2	71.6	61.2	71.7	73.7	74.1	73.8	73.2	75.1	72.6	74.2	74.6	75.0	73.7	70.9	76.7	77.1	76.2
7:00 AM	62.2	57.6	59.0	50.3	63.2	56.1	64.1	61.9	66.2	69.8	71.1	71.2	72.6	72.5	74.6	75.9	75.0	67.9	74.2	71.6	73.2	60.9	73.2	75.6	75.4	73.5	72.3	75.8	73.1	74.8	74.3	74.1	71.5	70.5	75.8	75.6	75.4
7:05 AM	68.5	58.7	59.6	50.4	62.4	48.2	60.7	61.8	65.7	70.9	72.7	71.2	72.5	72.2	74.4	74.3	74.7	62.2	73.1	67.6	71.1	57.5	72.1	75.0	75.2	73.0	72.8	75.0	74.4	73.8	74.1	73.7	70.8	69.8	75.5	76.0	75.0
7:10 AM	70.1	61.8	58.7	51.3	61.3	54.3	65.1	61.3	62.2	67.7	71.7	71.8	72.3	71.5	73.7	74.8	74.5	65.9	72.7	65.0	70.9	58.5	71.8	74.5	74.8	73.1	71.8	75.4	72.3	72.5	73.2	73.8	70.5	70.3	76.8	76.8	76.3
7:15 AM	69.6	66.1	64.8	48.9	62.9	58.5	66.9	61.6	63.6	71.7	73.2	73.0	72.0	72.6	73.2	75.0	74.1	62.5	72.3	63.7	71.5	61.1	72.6	75.2	75.0	73.5	72.7	74.4	72.7	73.8	73.7	73.3	70.8	68.7	75.2	75.6	75.4
7:20 AM	62.5	61.5	60.5	48.7	63.2	50.5	66.9	64.5	64.0	71.2	73.0	71.7	71.5	72.3	74.4	75.4	73.9	65.4	71.9	63.7	66.7	50.2	68.5	74.6	73.9	72.3	71.5	74.8	72.8	74.5	73.9	75.2	70.2	70.7	75.4	75.5	75.6
7:25 AM	65.1	59.4	57.1	49.0	59.3	48.7	61.8	61.2	64.1	68.0	71.5	70.4	71.4	70.7	74.2	75.4	74.1	58.5	72.2	64.3	69.4	57.4	69.7	73.8	74.4	69.8	70.3	75.5	71.9	72.3	73.2	72.7	66.5	67.0	75.7	75.9	75.1
7:30 AM	57.6	59.7	57.1	49.6	57.8	50.2	58.2	53.6	62.7	68.0	71.9	71.5	71.5	69.4	73.9	75.3	74.4	66.1	72.4	62.1	71.6	58.2	71.3	74.2	73.7	70.6	70.4	74.2	70.8	72.2	73.8	74.5	66.8	68.0	76.7	77.0	76.2
7:35 AM	67.2	58.8	57.7	47.0	58.0	58.5	64.8	57.4	59.6	68.0	70.4	69.3	70.8	69.7	73.4	74.3	73.9	64.3	72.6	65.6	71.5	56.1	70.6	74.2	74.7	73.6	73.0	75.1	70.8	73.5	72.7	73.7	69.6	68.5	74.6	74.6	75.2
7:40 AM	66.1	59.3	52.2	48.5	52.7	54.8	56.8	54.7	59.8	63.7	70.6	70.1	72.1	72.4	73.8	74.0	73.9	54.6	70.3	59.2	65.7	46.2	71.8	74.4	74.6	73.1	72.8	75.8	71.5	73.8	74.9	73.8	70.8	69.8	75.9	76.4	75.9
7:45 AM	66.5	59.6	52.7	50.3	50.2	50.3	56.8	47.7	57.9	67.1	68.5	69.5	71.7	68.7	73.8	74.4	74.5	60.3	73.2	65.1	67.9	52.7	70.3	73.9	73.5	71.3	71.9	74.4	68.4	72.2	74.1	74.2	71.0	70.6	76.2	76.2	75.6
7:50 AM	68.7	59.7	48.9	48.7	51.4	47.3	55.4	46.8	58.6	67.0	65.9	71.7	71.8	68.7	72.8	73.2	72.5	57.2	71.7	59.4	68.1	56.5	72.0	74.8	73.7	72.4	71.4	75.4	69.8	74.4	73.4	74.3	64.3	67.7	75.4	76.3	76.0
7:55 AM	68.0	59.0	48.7	49.9	45.9	45.9	51.5	47.5	58.1	65.4	65.1	67.9	69.7	68.5	73.3	72.3	73.4	56.4	69.3	51.4	67.8	48.7	70.7	73.5	74.4	71.7	72.1	74.9	71.3	74.4	74.1	74.1	71.0	71.7	75.9	75.7	75.1
8:00 AM	68.5	59.4	45.0	48.4	44.5	48.0	48.2	47.0	59.0	67.2	69.2	69.2	69.4	69.8	73.0	71.7	72.7	50.2	69.4	52.0	64.3	48.3	70.9	75.2	74.5	71.2	71.5	74.9	70.9	72.8	71.8	72.1	66.6	71.8	75.1	75.4	75.2
8:05 AM	70.2	63.5	45.0	47.5	43.7	47.2	47.0	45.4	59.4	68.8	66.2	68.6	70.2	66.1	73.6	71.4	72.5	51.6	68.5	56.6	70.0	61.3	71.2	74.0	74.4	72.4	71.3	74.9	67.9	71.9	73.1	73.5	66.3	69.1	74.9	75.7	75.8
8:10 AM	71.7	67.9	54.9	54.2	52.6	49.9	53.2	47.4	58.4	62.7	69.8	69.0	69.8	68.1	73.8	73.4	73.9	58.9	70.5	53.5	65.0	50.3	70.4	74.7	74.6	72.4	72.6	76.1	72.9	73.4	73.6	73.6	66.2	70.7	75.8	75.7	74.7
8:15 AM	69.0	69.1	64.9	53.1	63.9	53.1	59.2	53.6	61.5	67.4	67.3	69.6	67.9	67.0	73.3	71.9	73.3	55.0	70.6	56.3	66.6	58.0	72.1	75.4	74.5	70.2	71.8	74.0	67.9	72.3	72.4	72.8	67.4	69.1	76.3	76.9	75.4
8:20 AM	69.5	66.7	64.8	53.8	62.1	47.5	64.7	48.4	59.0	63.6	69.9	67.5	71.5	70.0	73.2	69.5	72.1	54.7	67.1	55.0	60.6	54.3	69.1	73.5	73.2	70.1	70.8	74.4	71.0	73.9	74.0	74.2	71.0	68.0	75.4	76.0	75.4
8:25 AM	69.2	65.5	61.9	53.5	59.7	52.7	65.0	57.4	61.4	67.1	70.6	66.7	70.3	67.3	72.8	71.8	73.3	54.7	68.3	49.6	67.5	47.1	69.6	73.2	73.4	70.7	70.2	73.8	70.0	71.5	73.0	73.2	64.9	70.1	75.5	75.7	75.6
8:30 AM	69.2	65.2	60.0	48.6	60.5	54.1	64.6	56.3	65.7	69.6	70.1	67.9	70.1	71.2	72.9	71.1	73.5	62.4	70.1	54.8	68.0	59.1	69.7	73.2	73.9	70.9	70.4	75.0	70.1	73.6	73.2	74.1	69.3	69.4	76.3	75.9	74.7
8:35 AM	71.4	65.8	57.6	52.3	57.7	50.6	63.6	50.6	58.7	68.4	71.0	65.5	71.8	66.1	73.0	73.2	72.9	52.3	71.2	58.8	68.4	51.6	71.5	74.7	72.8	72.3	69.9	73.3	69.1	72.3	72.5	72.3	68.6	70.5	76.0	75.8	75.3
8:40 AM	71.7	70.0	68.2	54.3	65.3	49.0	64.8	52.1	61.2	69.1	70.6	71.3	70.6	70.8	73.9	75.0	73.6	57.8	69.9	50.6	68.2	53.8	70.3	74.5	74.9	72.6	72.2	74.3	70.0	74.2	74.3	74.3	65.6	67.8	74.7	74.6	74.3
8:45 AM	72.0	71.3	70.2	54.9	65.1	59.6	67.6	60.0	62.4	71.7	72.7	70.7	71.7	71.7	73.8	74.2	73.4	61.7	72.0	58.0	66.3	52.7	70.0	74.1	74.4	72.4	71.0	74.9	71.2	73.5	73.4	73.3	68.9	66.0	74.2	75.4	74.5
8:50 AM	70.1	68.2	67.8	57.4	67.2	58.8	68.0	61.6	62.0	70.0	72.6	71.8	71.9	72.2	74.5	74.2	74.4	63.3	73.0	65.0	71.2	60.9	72.0	73.9	74.2	71.2	71.4	74.6	70.3	72.8	71.6	72.7	68.2	66.9	74.8	74.7	74.7
8:55 AM	68.3	66.6	65.5	49.8	62.4	61.3	69.9	67.2	66.1	69.2	72.7	68.8	71.7	71.1	73.9	75.8	75.1	64.3	72.4	63.1	70.6	58.6	71.2	74.9	75.0	73.6	69.9	75.7	70.3	73.6	73.4	73.4	71.7	70.2	75.4	75.2	74.7
9:00 AM	68.8	63.1	63.3	52.3	61.6	52.4	65.1	64.3	64.6	67.4	71.2	71.4	72.7	71.2	73.6	74.4	72.9	57.4	72.6	64.2	69.7	62.9	73.3	74.6	74.2	72.8	72.7	74.7	70.0	73.7	74.1	74.4	69.8	69.9	74.4	74.5	73.7
9:05 AM	72.3	65.6	64.6	51.6	60.5	57.3	64.4	59.0	63.1	68.0	70.8	66.7	71.0	71.3	73.3	74.2	73.8	54.0	72.5	61.8	73.0	65.9	71.7	74.5	74.2	71.9	72.6	74.6	71.7	74.3	74.6	75.0	71.5	71.0	76.0	75.8	74.8
9:10 AM	72.6	71.5	71.3	53.9	66.4	60.7	68.1	64.3	64.1	68.7	73.0	69.0	72.8	71.8	73.4	74.1	73.3	62.2	69.3	53.2	68.2	54.4	71.0	74.8	74.8	72.7	72.9	75.4	71.9	74.3	74.4	73.6	69.6	70.1	74.0	74.8	75.5
9:15 AM	70.7	67.9	69.4	54.0	68.1	60.3	70.5	69.2	68.4	71.1	74.3	71.7	73.2	74.2	74.4	75.2	74.6	64.7	71.4	58.1	71.0	57.9	69.8	72.8	73.2	70.9	69.5	73.6	68.6	72.6	73.3	73.2	71.2	71.2	76.0	75.4	74.1
9:20 AM	71.5	70.9	70.5	54.4	65.6	63.7	69.1	64.6	64.9	70.5	74.1	71.3	72.9	72.5	74.9	75.6	74.7	69.3	73.4	65.0	70.0	57.0	69.6	74.5	74.1	72.4	70.7	74.5	70.8	72.7	72.6	73.0	67.3	66.6	74.8	75.0	74.9
9:25 AM	73.6	69.5	70.2	54.8	64.8	62.8	70.1	67.0	68.2	70.2	73.7	72.9	72.3	72.1	74.5	75.6	74.4	63.5	71.8	63.6	71.1	65.6	71.7	74.6	73.7	72.1	69.8	74.8	71.4	74.5	73.5	73.9	69.6	69.3	75.1	75.2	74.8
9:30 AM	73.2	71.4	70.5	53.6	67.0	63.2	70.3	68.3	67.8	68.8	73.4	72.3	73.0	73.9	73.7	74.3	74.2	62.1	71.6	58.2	70.0	59.1	70.3	74.6	74.4	71.3	72.3	75.4	72.7	74.1	73.6	73.7	71.8	69.4	75.7	76.5	76.1
9:35 AM	73.9	72.3	71.1	53.9	65.2	63.8	70.8	70.6	67.2	71.7	74.0	70.3	71.5	72.6	74.2	74.4	73.6	62.0	71.6	64.9	71.0	61.2	71.9	74.5	73.8	71.6	71.5	74.6	70.7	73.7	73.4	73.5	70.7	67.8	74.6	75.5	75.1
9:40 AM	72.8	72.4	71.3	55.2	68.2	64.7	71.7	70.5	68.8	71.2	74.0	71.5	74.1	74.1	74.6	75.5	74.4	63.8	71.0	58.6	71.5	61.6	69.0	73.1	74.2	71.5	72.3	75.0	72.5	73.4	73.3	73.9	69.3	67.2	75.2	75.4	75.2
9:45 AM	73.2	71.1	71.6	59.4	65.8	64.8	72.6	66.6	68.2	70.7	72.7	71.5	71.8	72.0	75.1	75.2	75.0	65.2	73.0	63.1	70.3	57.2	69.8	74.0	71.8	69.0	70.6	74.5	70.7	73.2	72.5	73.0	70.9	64.9	74.2	74.9	74.2
9:50 AM	73.0	72.3	71.7	58.1	67.8	63.2	71.9	67.4	67.3	72.3	74.4	71.4	71.3	73.4	73.2	73.3	73.8	60.7	72.9	65.6	71.0	55.5	71.6	74.2	71.9	69.8	70.4	74.8	71.6	71.0	73.2	72.2	69.9	65.6	75.1	75.6	75.3
9:55 AM	73.5	71.8	71.4	59.7	68.4	64.2	72.3	71.4	71.7	71.1	74.0	73.5	72.8	71.6	74.3	74.5	74.3	63.8	72.8	60.0	69.4	55.8	70.5	73.8	74.0	69.8	72.4	74.9	72.5	73.8	73.5	73.1	67.2	65.0	73.7	75.2	74.4
10:00 AM	73.3	72.6	72.7	62.4	69.1	69.5	72.8	70.4	70.7	72.0	73.8	72.9	73.9	74.2	75.1	75.3	74.9	69.3	73.1	67.4	71.8	58.8	70.0	74.6	74.3	70.5	69.7	74.3	71.0	72.3	72.7	72.7	69.6	67.2	75.5	75.8	74.7

Table 8-13: Southbound I-15 PM Observed Speed Contours – Typical Day

Time	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######
2:05:00 PM	68.4	64.2	63.4	64.8	62.2	69.1	62.5	67.7	64.8	65.1	62.9	65.2	66.5	64.7	65.3	64.5	66.3	63.9	60.3
2:10:00 PM	68.5	64.6	63.2	64.6	62.5	69.3	62.4	67.8	64.6	65.3	63.3	65.4	67.0	65.0	65.7	64.7	66.5	64.3	58.7
2:15:00 PM	68.4	64.9	63.9	64.8	63.3	69.0	62.8	67.7	65.0	66.0	63.6	65.5	67.2	65.3	65.9	65.0	66.5	64.3	59.2
2:20:00 PM	68.4	64.6	64.5	65.5	63.5	69.0	62.8	67.6	65.3	66.2	64.3	65.8	67.8	65.7	66.2	65.4	66.8	64.9	59.2
2:25:00 PM	68.3	64.9	64.4	65.8	63.6	69.0	63.1	67.7	65.3	66.3	64.1	66.3	67.8	65.9	66.8	65.6	67.7	65.2	60.3
2:30:00 PM	68.5	65.5	64.5	65.9	63.5	69.2	63.2	67.5	65.1	66.3	64.4	65.9	67.8	66.0	66.6	65.7	67.5	65.0	60.5
2:35:00 PM	68.4	65.0	64.4	66.0	64.2	69.3	63.6	67.6	65.5	66.5	64.7	66.5	68.1	66.0	66.6	65.8	67.8	65.4	60.7
2:40:00 PM	68.6	65.6	64.5	66.0	63.9	69.1	63.6	67.5	65.9	66.6	64.7	66.7	68.1	66.6	66.9	66.1	68.0	65.4	60.8
2:45:00 PM	68.5	65.2	64.4	66.4	64.2	69.0	63.7	67.6	65.5	66.7	65.0	67.1	68.6	66.9	67.4	66.4	67.9	65.9	60.9
2:50:00 PM	68.7	65.1	64.6	66.7	64.1	69.2	63.5	67.7	65.9	66.8	64.9	66.9	68.4	66.9	67.4	66.5	68.5	65.8	60.7
2:55:00 PM	68.5	65.5	64.3	66.5	64.3	69.2	63.8	67.8	65.5	66.9	65.0	67.0	68.7	66.8	67.5	66.4	68.3	65.9	60.8
3:00:00 PM	68.7	65.6	64.5	66.2	64.0	69.4	63.4	67.8	65.3	66.8	64.8	66.9	68.5	66.7	67.5	66.5	68.0	66.4	61.1
3:05:00 PM	68.6	65.1	64.7	66.7	64.3	69.3	63.9	67.6	65.5	66.8	65.1	66.9	68.5	66.8	67.1	66.5	68.0	66.3	61.4
3:10:00 PM	68.4	65.5	64.9	67.0	64.4	69.4	63.9	67.7	65.3	66.9	64.8	66.9	68.5	66.8	67.3	66.5	68.1	66.0	61.0
3:15:00 PM	68.6	65.6	64.7	66.8	64.4	69.4	63.7	67.6	64.7	66.9	64.7	67.0	68.5	66.9	67.6	66.4	68.0	66.1	62.2
3:20:00 PM	68.4	65.7	64.6	67.0	64.5	69.3	63.8	67.6	64.7	67.1	64.9	67.1	68.3	67.3	67.4	66.7	68.0	66.5	60.9
3:25:00 PM	68.5	65.6	64.3	66.2	64.1	69.1	63.6	67.5	64.5	67.1	64.9	67.0	68.5	67.1	67.6	66.9	68.1	66.4	61.0
3:30:00 PM	68.6	66.1	65.1	66.5	64.3	69.2	63.8	67.4	64.3	66.8	64.8	66.6	68.3	67.0	67.5	66.7	68.2	66.5	61.6
3:35:00 PM	68.5	66.0	65.1	66.3	64.5	69.0	63.6	67.5	64.3	66.8	64.8	67.1	68.7	67.4	67.7	66.8	68.1	66.4	61.1
3:40:00 PM	68.7	66.5	65.1	66.5	64.5	69.1	64.3	67.5	64.3	67.2	65.0	67.4	69.0	67.6	67.9	67.0	68.5	66.8	60.9
3:45:00 PM	68.5	66.0	64.9	66.8	64.7	68.9	64.1	67.4	63.9	67.3	65.3	67.5	68.9	67.5	68.0	67.1	68.7	66.5	61.5
3:50:00 PM	68.6	66.9	65.3	66.9	64.9	68.9	63.9	67.4	63.5	67.2	64.8	67.3	68.9	67.6	68.0	67.0	68.8	66.9	60.9
3:55:00 PM	68.7	67.2	65.5	67.2	65.4	69.0	64.9	67.4	64.0	67.4	65.4	67.6	69.1	67.6	68.1	67.1	68.9	66.8	60.9
4:00:00 PM	68.6	67.3	65.6	67.7	65.3	69.1	64.7	67.6	64.2	67.5	65.2	67.7	69.4	68.0	68.5	67.6	69.1	67.5	61.6
4:05:00 PM	68.7	67.3	65.7	67.7	65.3	69.2	64.8	67.6	64.3	67.7	65.8	67.9	69.3	68.1	68.3	67.8	69.5	67.7	61.8
4:10:00 PM	68.7	67.5	66.5	67.5	65.3	69.1	65.2	67.7	64.4	67.8	65.9	67.9	69.3	68.1	68.5	67.9	69.1	67.6	62.0
4:15:00 PM	68.6	67.0	65.7	67.7	65.6	69.3	64.7	67.5	64.8	68.2	65.8	67.9	69.7	68.4	68.9	67.9	69.4	67.5	61.3
4:20:00 PM	68.5	67.0	66.3	67.7	65.4	69.3	64.7	67.6	64.6	67.7	65.3	67.9	69.4	68.3	69.1	68.2	69.5	67.4	61.6
4:25:00 PM	68.6	67.6	66.7	67.6	65.4	69.1	65.1	67.5	64.4	68.0	65.6	68.2	69.8	68.5	68.4	67.9	69.3	67.4	60.2
4:30:00 PM	68.4	67.6	66.3	67.7	66.0	69.1	65.6	67.7	64.7	68.3	65.6	68.4	70.1	69.0	69.3	68.3	69.6	68.0	62.2
4:35:00 PM	68.5	67.6	66.5	67.9	65.7	69.2	65.5	67.7	64.9	68.3	65.8	68.6	70.1	69.1	69.5	68.6	70.0	68.2	62.2
4:40:00 PM	68.6	67.9	66.9	68.4	66.2	69.3	65.3	67.7	65.0	68.4	66.3	68.6	70.2	69.0	69.4	68.6	70.4	68.1	61.8
4:45:00 PM	68.8	68.2	66.8	68.3	66.2	69.1	65.9	67.6	65.0	68.5	66.2	68.9	70.2	69.3	69.6	68.9	70.4	68.4	62.3
4:50:00 PM	68.7	68.5	67.0	68.8	66.4	69.3	65.8	67.6	65.0	68.5	66.4	69.0	70.7	69.6	69.7	68.8	70.3	68.4	63.1
4:55:00 PM	68.8	68.6	67.5	68.8	66.5	69.1	66.1	67.9	65.3	68.8	66.8	69.2	70.5	69.7	69.9	69.0	70.7	68.3	61.7
5:00:00 PM	68.9	68.4	67.3	68.9	66.8	69.3	66.3	67.9	65.5	69.1	66.7	69.3	70.9	70.0	70.2	69.3	71.2	68.9	62.4
5:05:00 PM	69.0	68.5	67.5	68.9	66.7	69.6	66.5	68.0	65.4	69.0	66.8	69.4	70.5	69.8	70.2	69.4	70.9	68.8	62.4
5:10:00 PM	69.0	68.7	67.7	69.3	67.1	69.4	66.3	67.9	65.0	69.1	66.9	69.4	70.8	70.0	70.4	69.4	70.7	68.9	63.4
5:15:00 PM	68.8	69.1	68.3	69.9	67.3	69.3	66.3	67.9	65.4	69.0	67.1	69.5	70.8	70.0	70.2	69.5	70.7	68.9	63.3
5:20:00 PM	68.7	69.2	68.1	69.2	67.0	69.0	66.4	67.6	64.8	68.9	66.8	69.6	71.1	70.2	70.4	69.5	70.8	69.1	62.9
5:25:00 PM	68.8	69.2	68.3	69.6	67.3	69.0	66.0	67.4	65.1	68.9	66.8	69.6	71.0	70.3	70.1	69.5	70.9	69.0	63.1
5:30:00 PM	68.8	69.6	68.5	70.1	67.5	69.3	66.5	67.6	65.0	69.1	66.5	69.8	71.0	70.3	70.3	69.8	70.7	68.7	63.2
5:35:00 PM	68.9	69.7	68.0	69.5	67.5	69.3	67.0	67.7	65.4	69.6	67.2	70.0	71.5	70.8	70.8	70.3	71.2	69.0	63.8
5:40:00 PM	69.0	69.6	68.0	70.2	67.7	69.6	67.6	67.9	65.4	69.8	67.3	70.1	71.5	70.5	70.9	70.3	71.2	69.5	63.0
5:45:00 PM	69.2	69.5	67.9	69.3	67.2	69.8	67.5	68.1	65.5	69.4	67.2	69.9	71.4	70.8	70.9	70.3	70.9	69.0	62.0
5:50:00 PM	69.2	69.5	67.9	70.0	67.6	69.6	67.3	68.1	65.5	69.4	67.4	70.0	71.6	71.0	70.9	70.3	71.3	69.4	62.5
5:55:00 PM	69.0	69.4	68.3	69.8	67.5	69.8	67.3	68.0	65.6	69.3	67.3	69.7	71.5	71.0	70.9	70.5	71.2	69.6	63.4
6:00:00 PM	69.0	69.3	68.2	69.9	67.8	70.0	67.3	68.4	65.6	69.5	67.5	69.7	71.4	70.5	70.4	70.0	71.1	69.4	61.8
6:05:00 PM	69.0	69.2	68.1	69.3	67.2	69.8	67.6	68.4	65.6	69.8	67.0	69.9	71.0	70.4	70.7	70.4	71.3	69.7	63.0
6:10:00 PM	68.7	69.1	67.8	69.0	67.1	69.7	66.9	68.0	65.4	69.3	66.9	69.6	70.6	70.1	70.5	70.3	71.1	69.8	62.4
6:15:00 PM	68.8	69.0	68.1	69.0	66.9	69.5	66.8	68.0	65.5	69.4	66.8	69.4	70.7	70.0	70.1	69.6	70.4	68.9	62.0
6:20:00 PM	68.8	68.6	68.1	69.2	67.1	69.6	66.7	67.8	66.3	70.0	66.8	69.6	70.8	70.1	70.0	69.9	70.2	68.7	62.7
6:25:00 PM	68.9	68.6	67.8	69.1	67.3	70.0	67.0	68.2	66.3	69.8	66.8	69.6	70.7	70.3	70.3	70.0	70.7	68.9	63.4
6:30:00 PM	68.7	67.7	67.5	69.3	67.2	69.8	67.2	68.1	65.5	70.0	66.6	69.6	70.4	70.2	70.1	69.5	70.5	69.8	63.4
6:35:00 PM	68.9	68.6	67.0	68.4	66.8	70.0	67.1	68.3	65.1	69.2	66.8	69.6	71.0	70.2	70.2	69.5	70.4	69.0	64.6
6:40:00 PM	68.8	68.7	66.9	69.4	67.4	70.1	66.8	68.5	65.9	69.9	67.2	70.1	70.9	70.2	69.9	69.5	70.0	68.6	64.0
6:45:00 PM	68.8	68.2	67.0	69.9	67.3	70.3	67.8	68.6	65.9	70.1	67.4	70.3	70.8	70.1	70.2	69.5	70.9	69.0	64.1
6:50:00 PM	69.0	68.7	67.2	69.6	67.5	70.5	68.1	68.7	65.9	70.2	67.5	70.4	70.8	70.5	70.3	69.3	70.6	69.0	64.8
6:55:00 PM	68.9	68.5	67.7	70.0	67.6	70.6	68.2	68.9	66.3	70.7	67.5	70.3	71.0	70.4	70.7	70.0	70.6	69.0	64.3
7:00:00 PM	69.0	69.0	67.6	70.0	67.8	70.8	68.6	69.0	66.8	71.2	68.3	70.8	71.7	71.0	70.8	70.6	71.3	69.7	65.0

Time	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######
2:05:00 PM	66.4	61.8	63.9	65.2	60.2	64.8	70.3	62.9	63.9	66.8	65.2	62.6	63.5	65.2	64.4	67.2	63.9	67.3	73.0	68.3
2:10:00 PM	66.4	61.7	63.8	65.1	59.9	65.1	70.3	63.4	64.2	67.0	65.8	63.0	62.9	65.5	64.3	67.3	64.1	67.4	73.1	68.3
2:15:00 PM	66.5	62.1	64.5	65.6	60.1	65.3	70.4	64.3	64.4	66.6	65.5	62.9	63.3	65.6	64.6	67.1	64.6	67.2	73.0	67.9
2:20:00 PM	66.9	62.3	64.7	65.8	61.0	65.1	70.4	63.3	64.9	66.9	66.1	63.8	63.7	65.8	64.7	67.1	64.6	67.2	72.9	68.0
2:25:00 PM	66.7	62.5	64.8	66.0	61.1	65.0	70.3	63.4	65.0	67.0	66.4	63.5	64.2	65.9	64.9	67.3	64.7	67.3	72.8	68.0
2:30:00 PM	67.4	62.8	64.9	66.3	61.4	65.8	70.4	64.8	64.9	66.9	66.5	63.6	63.2	65.9	64.8	67.3	64.6	67.4	72.9	68.0
2:35:00 PM	67.0	62.7	65.4	66.3	61.0	65.4	70.3	64.5	65.4	67.1	67.0	64.2	63.9	66.0	64.9	67.4	65.1	67.5	72.9	67.8
2:40:00 PM	67.4	62.8	65.5	66.8	61.6	66.0	70.5	64.6	65.2	66.6	67.1	64.3	63.4	66.0	65.1	67.1	65.1	67.5	72.9	68.0
2:45:00 PM	67.6	62.7	65.7	67.1	61.9	66.2	70.1	65.0	65.3	66.1	66.9	64.0	63.9	66.0	65.3	66.5	64.9	67.0	72.5	67.8
2:50:00 PM	67.8	62.9	66.0	67.1	62.2	66.0	69.8	64.5	65.3	65.8	66.7	64.3	63.6	66.1	65.3	65.8	64.8	66.4	71.8	67.3
2:55:00 PM	67.9	63.2	65.8	67.1	61.6	66.0	70.0	64.0	65.0	65.9	66.6	64.3	63.0	66.2	65.2	65.6	64.8	66.3	70.9	66.7
3:00:00 PM	68.1	63.3	65.8	67.1	61.8	66.1	70.0	64.5	65.1	66.1	67.0	64.3	63.4	66.4	65.3	65.8	64.6	66.5	70.6	66.5
3:05:00 PM	68.2	63.3	65.5	67.1	61.5	66.4	70.3	64.3	65.8	66.3	67.1	64.2	63.7	66.3	65.1	66.0	64.9	66.7	71.1	66.8
3:10:00 PM	67.7	63.0	65.7	67.4	62.6	66.3	69.9	64.8	65.5	66.4	67.2	64.6	64.7	66.5	65.3	66.0	65.0	66.8	71.4	67.0
3:15:00 PM	68.1	62.9	66.0	67.3	62.8	66.0	69.7	64.8	65.4	66.1	67.0	64.6	64.7	66.4	65.4	66.0	64.8	66.5	71.6	66.9
3:20:00 PM	68.1	63.2	66.0	67.3	62.8	66.2	69.6	65.1	65.4	66.0	66.8	64.8	64.9	66.3	65.3	65.3	64.3	66.3	71.8	67.0
3:25:00 PM	68.5	63.5	66.4	67.3	62.1	66.1	69.6	65.5	65.2	66.0	67.0	64.8	65.3	66.4	65.1	65.0	64.6	66.1	71.3	66.3
3:30:00 PM	68.3	63.6	65.9	67.5	62.2	66.5	69.6	65.8	65.0	65.9	67.1	65.1	65.1	66.4	65.1	65.0	64.7	66.0	71.1	65.7
3:35:00 PM	68.3	63.2	66.1	67.5	62.1	66.3	69.8	66.3	65.6	66.1	66.6	64.8	64.5	66.5	65.1	65.1	64.8	66.2	71.3	65.6
3:40:00 PM	68.5	63.4	66.6	67.8	63.0	66.7	69.7	66.4	65.8	65.8	67.0	64.9	64.2	66.3	65.0	64.8	64.8	66.0	71.5	65.6
3:45:00 PM	68.7	63.6	66.4	67.8	62.9	66.5	69.6	66.9	65.7	65.6	67.3	65.2	64.4	66.5	65.3	64.6	65.0	65.9	71.4	65.1
3:50:00 PM	68.7	63.4	66.6	67.6	63.4	66.5	69.4	66.1	65.6	65.3	67.0	64.7	62.3	66.5	65.0	64.5	65.0	65.6	71.0	62.4
3:55:00 PM	68.7	63.5	66.6	67.8	62.8	66.8	69.3	66.4	65.1	65.3	66.6	64.9	64.3	66.2	65.0	64.0	64.8	65.1	70.7	56.6
4:00:00 PM	68.8	63.9	66.3	67.7	62.9	66.7	69.5	66.3	65.3	65.3	67.1	64.9	66.3	66.1	65.1	63.8	64.5	65.1	70.7	50.0
4:05:00 PM	69.0	64.3	67.0	68.4	62.9	67.2	69.3	66.9	65.9	65.8	67.8	65.0	65.7	66.4	65.5	64.5	64.6	65.3	70.5	41.5
4:10:00 PM	68.9	64.0	66.9	68.2	64.2	67.5	69.8	67.3	66.2	66.1	68.6	65.6	65.8	66.7	65.9	64.6	65.4	65.4	71.1	34.4
4:15:00 PM	69.2	64.1	67.3	68.3	64.6	67.6	69.5	67.7	66.4	65.9	68.7	65.4	66.5	67.0	66.1	64.9	65.4	65.5	71.2	29.6
4:20:00 PM	69.5	64.3	67.8	68.4	64.8	67.9	69.5	67.6	66.4	65.7	68.2	65.5	66.9	67.1	65.9	64.6	65.3	65.3	71.2	25.9
4:25:00 PM	69.1	64.4	67.3	68.6	64.1	67.6	69.5	67.4	66.4	65.8	68.2	65.9	65.3	67.1	66.6	64.5	65.9	65.3	71.3	22.8
4:30:00 PM	69.0	64.5	67.2	68.4	64.4	67.5	69.5	67.5	66.2	65.8	68.6	66.3	66.2	67.2	66.5	64.3	65.7	65.2	71.4	20.2
4:35:00 PM	69.6	64.7	67.8	68.8	64.1	67.9	69.9	67.7	66.9	66.0	68.6	66.0	66.5	67.3	66.7	64.7	65.6	65.3	71.0	19.4
4:40:00 PM	69.6	64.9	68.1	69.0	64.6	68.4	70.0	68.3	67.4	66.4	69.3	66.4	66.6	67.8	66.4	64.7	65.6	65.3	71.2	19.6
4:45:00 PM	69.2	64.6	68.1	69.0	63.9	68.1	69.6	68.4	67.2	66.2	69.9	66.7	67.1	67.9	66.8	64.6	65.8	65.2	72.0	20.8
4:50:00 PM	69.5	65.0	68.4	69.1	64.1	67.8	69.2	68.7	66.9	66.0	68.7	67.0	67.3	68.0	67.0	64.6	65.9	64.8	71.7	20.7
4:55:00 PM	69.7	65.0	68.3	69.0	64.3	68.1	69.2	68.2	66.9	66.0	68.9	67.1	67.6	67.9	67.0	64.1	66.1	65.2	71.3	18.7
5:00:00 PM	69.9	65.1	68.8	69.6	64.6	68.5	69.4	68.4	67.4	66.2	68.4	66.6	67.8	68.0	67.0	64.6	65.9	65.1	71.7	19.0
5:05:00 PM	70.0	65.3	69.1	69.8	65.1	68.9	69.9	69.3	68.1	66.3	69.2	67.2	67.6	68.1	67.1	64.9	66.2	65.3	71.8	17.9
5:10:00 PM	69.9	65.5	68.7	69.6	65.5	69.1	70.0	69.5	68.2	66.5	69.7	67.7	67.3	68.2	67.3	64.7	66.3	65.4	71.9	17.1
5:15:00 PM	70.0	64.9	68.8	69.5	64.5	69.0	69.5	69.6	68.2	66.2	70.4	67.8	65.5	68.3	67.6	64.2	66.3	65.3	72.2	17.3
5:20:00 PM	69.6	64.5	68.6	69.5	65.3	68.9	69.0	69.1	68.0	65.8	70.7	67.9	67.4	68.6	67.5	63.6	66.2	64.9	71.1	17.7
5:25:00 PM	70.2	65.1	69.0	69.8	65.5	68.9	68.9	69.5	67.3	65.6	70.1	67.9	67.6	68.1	67.5	63.6	66.0	64.5	71.4	17.1
5:30:00 PM	69.9	64.6	68.7	69.2	65.2	68.6	68.9	69.5	67.5	65.9	70.0	67.9	68.1	68.0	67.4	63.6	65.5	63.8	71.0	17.3
5:35:00 PM	70.1	65.1	68.9	69.1	65.4	68.7	69.0	69.8	67.2	65.6	69.7	67.4	67.5	68.0	67.1	63.3	65.7	63.9	70.8	16.3
5:40:00 PM	70.4	65.1	69.1	69.3	65.8	68.9	69.5	69.9	68.0	65.8	70.3	67.7	67.5	68.3	67.3	64.2	65.7	64.4	70.3	16.1
5:45:00 PM	70.3	65.1	69.0	69.3	65.2	69.2	69.4	69.8	68.5	65.9	70.4	68.1	66.6	68.5	67.7	64.6	66.4	64.2	70.8	14.8
5:50:00 PM	70.3	65.0	68.9	69.3	65.5	69.1	69.1	69.5	68.5	65.9	70.7	67.9	68.3	68.9	68.0	64.7	66.5	65.0	71.8	15.8
5:55:00 PM	70.7	65.1	69.7	69.3	65.4	69.4	69.3	70.2	68.8	66.2	71.3	68.1	69.0	69.0	68.5	65.6	67.0	65.9	71.7	15.3
6:00:00 PM	70.6	64.9	69.7	69.4	65.6	69.6	69.3	70.0	68.8	66.5	71.5	68.3	68.9	69.3	68.4	66.4	67.1	66.1	72.7	16.2
6:05:00 PM	70.4	64.8	69.3	69.7	66.0	69.5	69.5	69.8	68.9	66.0	71.3	68.5	69.1	69.4	68.5	66.9	67.6	66.3	72.5	17.1
6:10:00 PM	70.5	65.0	69.6	69.7	65.6	70.0	69.6	70.2	69.0	66.5	71.4	68.1	68.3	69.2	68.7	66.4	67.6	66.4	72.8	23.4
6:15:00 PM	70.0	64.9	69.5	69.6	65.4	70.1	69.8	69.8	69.2	66.5	71.8	68.6	68.9	69.3	68.8	66.7	67.5	65.9	72.3	33.4
6:20:00 PM	69.9	64.5	69.6	69.7	64.5	69.6	69.4	69.4	69.0	66.5	71.5	68.5	68.9	69.3	69.0	66.5	67.7	66.0	72.4	40.4
6:25:00 PM	70.1	64.3	69.4	69.6	65.7	69.3	69.0	69.5	68.7	66.3	70.6	68.4	68.5	69.2	69.1	66.6	67.8	66.3	72.3	44.8
6:30:00 PM	70.5	65.4	69.4	69.8	65.5	70.0	70.2	69.9	68.5	66.3	70.6	68.0	67.8	69.2	68.8	66.6	67.9	67.1	72.4	52.4
6:35:00 PM	70.1	65.1	69.5	69.9	66.6	70.2	69.5	69.9	69.4	66.3	70.4	68.4	68.6	69.4	69.0	67.2	68.1	67.0	72.8	59.8
6:40:00 PM	70.4	65.3	70.1	70.1	66.2	70.1	70.9	70.1	69.3	67.1	70.7	68.2	68.3	69.4	69.2	67.3	68.2	67.3	73.4	63.1
6:45:00 PM	70.3	65.3	70.1	70.1	67.0	70.0	70.7	70.3	69.8	67.4	70.6	68.6	68.5	69.4	69.4	67.6	68.5	67.1	73.4	65.0
6:50:00 PM	70.5	64.8	69.9	70.3	67.6	70.1	70.7	70.3	69.6	67.8	70.7	68.8	69.0	69.5	69.1	67.6	68.4	67.3	73.5	66.3
6:55:00 PM	70.5	65.6	70.0	70.3	67.6	70.3	71.6	70.9	69.8	67.8	71.2	68.8	69.0	69.7	69.3	67.9	68.6	67.5	73.8	67.6
7:00:00 PM	70.5	65.7	70.0	70.4	67.0	70.1	71.1	70.6	70.3	67.9	70.7	69.1	69.5	70.4	69.6	68.6	69.5	68.4	74.0	67.8

Table 8-14: Southbound I-15 PM Modeled Speed Contours – Typical Day

Time	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######	######
2:05:00 PM	74.9	73.6	74.5	56.3	65.1	60.3	61.5	66.6	65.2	61.3	70.0	70.4	73.7	73.8	73.9	72.1	74.7	72.2	74.3	73.5	70.7	66.9	74.3	68.9	73.8	71.8	72.4	74.9	66.6	73.2	73.2	75.1	74.3	74.3	75.0	73.9	73.8	74.2	74.6
2:10:00 PM	75.8	74.6	74.7	51.3	62.5	57.2	66.3	67.4	65.7	60.7	69.4	67.0	71.9	73.4	73.5	71.3	74.4	72.7	73.8	74.0	71.7	71.4	75.4	69.9	72.1	67.3	70.9	75.3	64.3	69.3	72.5	74.9	73.3	73.5	76.9	73.4	74.1	74.2	73.5
2:15:00 PM	75.3	73.9	75.4	42.7	58.3	54.2	64.9	66.8	64.2	59.8	69.5	70.4	72.3	73.0	72.8	70.9	74.2	72.9	74.4	74.2	72.4	69.5	74.7	68.5	72.6	68.6	71.9	75.4	70.0	69.6	72.2	74.5	73.8	73.9	75.1	72.6	73.5	72.0	73.1
2:20:00 PM	75.3	74.7	74.8	52.7	60.5	57.2	59.5	66.5	60.4	54.7	68.3	68.3	74.0	74.1	74.0	71.8	74.0	72.1	74.2	74.4	66.4	67.8	75.2	70.0	73.3	69.4	72.0	75.3	69.6	73.0	74.2	75.0	72.3	73.2	75.7	73.2	74.0	73.8	73.9
2:25:00 PM	75.2	74.1	74.7	57.5	65.1	57.8	64.1	67.0	61.8	58.4	69.4	69.6	73.1	73.6	73.6	72.6	74.2	71.1	73.7	73.9	70.7	67.8	75.2	69.3	71.9	66.6	71.9	75.8	63.5	73.0	73.5	74.5	73.7	73.3	74.5	72.2	73.4	74.0	73.8
2:30:00 PM	75.4	74.1	74.2	50.1	63.0	60.5	61.6	65.6	62.8	58.3	71.2	71.4	74.0	74.1	73.8	72.5	74.7	72.3	73.9	73.9	70.3	69.8	74.7	69.1	73.5	69.2	71.4	75.0	62.3	71.7	72.0	73.9	72.7	73.0	76.0	72.0	73.2	73.0	73.7
2:35:00 PM	75.8	74.7	74.1	53.7	62.4	56.3	66.4	67.6	58.3	54.1	71.2	70.4	73.2	73.7	73.5	72.1	73.4	72.3	73.7	73.9	71.6	66.4	74.1	69.0	73.0	69.3	71.4	75.1	67.2	73.6	71.8	75.0	73.3	73.4	72.5	72.4	74.4	74.3	73.1
2:40:00 PM	74.4	73.9	74.8	52.8	60.2	54.0	64.0	68.2	61.0	56.1	71.3	70.8	70.8	73.5	73.5	72.3	74.4	71.6	73.9	73.7	69.3	69.5	74.5	68.4	71.2	67.2	71.7	75.5	60.0	72.7	71.7	74.9	73.1	73.0	73.1	72.5	72.3	73.4	73.9
2:45:00 PM	75.0	74.8	75.0	61.1	61.0	57.8	63.8	68.5	64.7	60.8	71.6	71.5	74.4	74.0	73.1	71.7	74.3	72.0	74.4	74.6	71.3	66.8	74.5	68.5	71.3	65.0	68.4	75.4	59.6	68.1	71.3	74.3	72.2	72.5	76.5	71.0	73.1	72.9	72.6
2:50:00 PM	75.1	74.5	74.7	60.2	63.4	58.3	65.1	66.5	62.7	58.3	69.9	70.0	72.2	73.7	74.6	71.6	75.2	72.6	74.3	73.5	68.2	69.7	73.6	68.0	72.7	66.3	68.4	75.4	61.5	69.1	65.4	73.7	72.2	72.3	71.8	66.9	71.0	72.9	71.3
2:55:00 PM	75.2	73.6	73.1	61.1	66.4	63.2	64.7	67.7	65.6	62.4	70.2	69.2	72.0	74.0	73.5	71.3	74.7	70.7	74.1	74.0	69.9	68.7	74.3	67.9	71.8	66.7	70.8	74.9	61.7	70.7	66.4	74.6	72.6	71.7	66.2	70.0	70.6	72.1	72.0
3:00:00 PM	74.6	73.8	74.7	58.2	61.7	58.5	63.8	66.5	66.1	64.4	69.9	67.3	71.3	73.4	73.5	71.0	73.6	71.6	73.4	73.3	70.1	68.3	74.5	67.8	70.5	64.5	69.8	74.6	61.2	72.0	70.8	73.9	72.1	71.8	65.4	72.7	73.1	71.6	72.4
3:05:00 PM	75.2	74.9	74.7	61.2	64.3	61.2	60.0	64.7	62.3	56.3	69.7	67.8	71.5	71.8	71.7	69.6	73.5	71.0	73.4	72.9	68.3	66.2	73.6	67.0	72.1	66.2	71.1	74.8	61.0	57.9	63.7	71.9	71.2	71.4	74.9	67.3	71.2	71.8	72.9
3:10:00 PM	76.0	75.3	74.5	63.9	65.9	60.6	64.9	68.5	63.7	59.3	67.7	65.5	71.4	73.6	73.5	71.6	74.0	70.8	72.9	72.6	67.3	65.2	73.2	66.0	68.6	64.1	68.9	74.2	57.6	70.6	65.9	73.2	71.9	71.6	72.8	69.7	71.2	71.4	71.7
3:15:00 PM	75.3	74.5	74.1	64.6	61.7	55.7	58.5	67.2	66.7	60.8	69.6	68.5	72.2	73.5	73.8	72.1	75.0	71.3	74.3	73.6	62.6	64.4	73.8	64.1	70.8	64.1	61.9	74.4	59.1	63.8	69.1	73.5	71.3	71.3	74.0	68.5	71.6	72.4	72.7
3:20:00 PM	76.7	75.0	74.2	64.5	64.4	61.8	63.0	66.9	65.0	60.6	68.8	68.3	71.2	73.5	73.6	69.7	74.2	72.1	73.7	73.4	63.2	69.2	74.8	68.8	72.7	68.3	65.1	74.9	56.1	61.9	72.7	74.1	71.4	71.4	65.8	70.4	71.7	72.4	71.8
3:25:00 PM	74.9	73.7	73.4	58.8	65.4	59.8	65.3	68.4	65.7	60.2	69.1	69.8	72.0	73.7	73.8	70.6	74.1	71.5	73.1	72.4	65.7	65.8	74.5	66.3	71.9	67.3	70.2	75.7	59.6	65.5	71.8	73.4	71.0	71.6	70.7	68.4	72.8	69.5	71.8
3:30:00 PM	75.0	74.8	73.9	60.3	65.9	60.7	65.1	68.0	65.3	63.1	70.2	70.1	73.5	74.0	73.7	70.9	74.5	72.1	74.3	74.3	69.6	68.0	74.6	66.2	73.1	64.3	67.1	74.9	59.7	67.1	72.6	74.1	71.1	71.4	69.4	68.9	73.9	72.2	71.6
3:35:00 PM	75.0	73.6	73.7	62.4	60.9	56.4	64.0	70.2	66.1	61.6	70.4	70.1	72.9	74.4	74.4	72.0	74.9	72.6	74.1	72.8	67.7	66.1	74.4	68.7	71.2	68.4	68.8	75.2	60.9	71.7	68.0	74.4	71.7	71.5	75.9	71.9	70.6	72.8	71.9
3:40:00 PM	75.3	72.3	72.3	62.7	59.8	54.8	55.8	65.4	65.6	62.7	70.2	69.9	74.4	73.6	73.3	71.6	73.7	70.9	74.1	73.3	65.0	68.8	74.4	68.3	71.8	64.3	67.9	75.1	62.2	71.0	71.1	73.4	72.4	72.0	57.9	70.0	74.0	72.1	72.0
3:45:00 PM	75.3	74.2	74.8	55.1	57.7	52.8	56.2	65.5	66.3	63.6	68.6	67.9	71.4	73.5	73.5	71.2	74.2	72.1	74.3	73.8	65.1	67.6	74.4	67.6	72.5	70.1	70.1	75.4	59.9	68.6	69.5	73.3	71.4	71.3	75.7	69.0	72.4	70.9	71.6
3:50:00 PM	75.4	74.0	75.2	57.5	60.1	54.4	54.5	66.5	63.3	61.0	69.8	69.7	73.8	73.6	73.2	71.0	74.0	71.5	73.6	72.8	64.6	64.3	74.4	64.8	70.6	66.8	67.7	75.3	58.0	69.3	72.7	74.9	71.9	72.2	74.1	71.1	71.3	71.8	72.4
3:55:00 PM	74.0	73.8	74.7	61.0	61.8	56.3	60.5	66.0	63.7	60.3	68.6	68.8	71.1	73.8	73.7	72.5	75.0	71.8	73.7	73.5	69.7	69.3	74.9	64.0	70.9	65.8	63.1	75.0	61.9	64.7	67.4	73.6	71.3	71.9	71.0	71.7	73.4	73.5	73.5
4:00:00 PM	74.7	72.7	73.2	52.9	62.0	58.4	62.4	69.3	68.7	64.4	69.7	70.3	73.5	73.0	72.7	70.6	73.8	70.3	73.8	73.5	68.2	64.8	73.9	66.2	71.9	68.3	66.7	74.4	53.0	70.7	69.5	73.4	71.7	71.8	71.3	69.8	71.0	71.9	72.3
4:05:00 PM	75.6	75.7	73.7	53.7	56.2	52.1	57.1	65.5	63.3	59.7	67.8	68.1	72.0	73.0	73.2	70.4	73.9	69.1	72.7	72.3	68.1	70.1	74.3	67.9	71.5	67.7	67.6	74.9	60.3	70.3	69.8	72.4	70.9	71.1	75.8	71.9	72.5	71.5	73.2
4:10:00 PM	76.2	74.9	75.1	63.5	65.9	59.9	60.6	65.4	64.5	60.2	70.4	69.5	69.0	72.9	74.0	72.5	73.8	69.9	74.1	72.1	64.9	68.0	73.7	67.5	71.0	66.9	67.0	74.6	58.5	69.0	71.3	74.4	71.7	71.4	66.4	71.6	71.0	71.6	73.4
4:15:00 PM	74.5	74.0	74.3	63.8	68.2	63.2	70.6	72.0	69.2	66.1	71.7	70.6	70.7	73.3	73.6	72.3	74.3	70.2	74.2	74.8	69.0	68.4	72.9	66.6	71.2	68.8	66.6	74.2	61.3	70.4	70.4	74.1	72.0	71.5	75.8	71.9	71.2	70.9	74.5
4:20:00 PM	75.1	73.1	72.7	52.5	62.7	60.0	64.4	69.2	68.8	64.1	71.3	70.2	71.9	73.6	74.1	72.6	75.3	73.3	74.6	74.3	70.2	69.0	74.2	67.9	71.7	66.7	69.2	74.9	61.3	71.1	71.1	74.4	72.2	72.9	76.3	72.8	70.9	71.8	73.9
4:25:00 PM	76.5	75.3	73.2	61.5	65.8	58.5	65.6	69.2	66.2	61.3	69.8	69.0	73.4	73.3	72.6	70.3	73.8	70.5	72.8	73.9	70.1	69.3	74.5	70.2	72.8	70.7	70.4	75.9	63.4	72.6	72.6	74.2	72.7	73.2	74.4	72.2	71.8	72.2	74.4
4:30:00 PM	75.4	74.0	74.4	66.5	65.9	62.6	67.2	69.6	68.9	65.3	71.5	70.9	71.9	73.6	74.3	72.9	74.5	72.3	74.3	73.3	68.4	67.1	73.6	67.0	71.0	64.8	67.5	74.7	59.9	68.7	71.4	74.8	72.0	72.6	74.3	74.1	72.5	70.4	76.0
4:35:00 PM	74.3	73.4	74.7	61.0	61.1	55.4	60.1	67.8	68.0	63.8	71.0	69.1	73.8	74.0	74.6	73.0	74.8	72.5	74.4	73.0	67.4	68.6	74.9	69.7	72.4	66.1	68.4	74.3	62.6	70.7	69.1	73.7	72.0	72.1	73.8	72.7	72.0	70.7	75.1
4:40:00 PM	75.1	73.8	74.5	63.1	62.7	57.2	60.2	68.3	64.3	59.4	69.5	68.8	73.9	72.8	72.5	70.5	74.8	72.1	73.9	73.5	67.9	67.5	73.6	66.6	71.1	69.2	67.4	75.5	63.2	67.7	67.1	74.5	73.6	72.8	72.5	73.2	72.7	70.9	74.5
4:45:00 PM	74.5	75.2	74.8	54.5	56.3	55.0	61.0	67.1	65.1	62.4	70.3	70.4	72.5	74.1	73.7	69.4	74.0	71.3	74.1	73.2	66.4	63.6	74.2	66.5	72.2	68.5	68.3	75.0	59.7	70.5	68.6	74.2	73.0	73.2	73.5	74.0	69.8	71.6	75.1
4:50:00 PM	76.1	74.2	74.4	52.4	57.6	52.0	56.9	64.8	67.0	62.6	69.4	68.7	73.0	74.0	74.0	70.6	75.0	72.8	74.6	72.6	59.1	69.9	74.2	65.9	71.9	68.8	71.2	74.8	61.5	71.9	68.2	73.8	72.2	72.5	74.4	72.6	68.9	70.1	75.3
4:55:00 PM	76.4	75.3	74.7	58.1	60.5	57.2	58.1	64.0	63.0	57.7	68.5	69.7	73.6	73.2	73.3	70.5	74.2	72.2	73.8	71.9	62.1	64.7	74.5	69.4	72.3	67.7	69.3	75.6	58.9	72.9	70.4	74.3	72.2	71.8	70.6	72.6	72.9	70.6	75.9
5:00:00 PM	74.8	74.0	73.6	54.2	63.0	59.7	61.5	67.8	65.2	62.1	68.6	68.1	73.3	73.4	72.9	69.0	74.2	71.7	73.9	73.1	66.9	66.6	73.9	66.7	71.4	65.1	70.0	75.6	58.9	72.2	73.4	74.4	72.7	72.7	75.3	72.1	64.2	69.7	75.5
5:05:00 PM	76.2	75.0	75.0	58.0	61.5	55.0	59.2	65.7	65.2	64.3	70.1	70.0	72.2	74.0	72.7	70.8	73.0	71.2	73.5	73.2	63.8	69.0	74.6	68.4	72.1	65.0	66.9	74.9	58.3	70.9	70.0	74.6	73.2	73.3	76.0	73.0	65.2	72.0	76.1
5:10:00 PM	75.8	74.4	73.9	62.1	61.3	53.2	63.7	69.4	65.1	62.3	70.6	70.9	73.2	73.3	73.0	71.2	73.9	69.1	73.0	73.6	66.1	67.3	74.0	65.9	70.3	64.0	68.1	75.0	58.2	71.3	68.9	73.9	72.2	72.2	75.1	74.1	68.9	70.6	75.7
5:15:00 PM	75.9	74.6	74.8	56.5	62.3	61.1	60.9	67.5	67.6	64.3	71.6	71.5	74.3	74.5	74.3	73.2	75.0	72.4	73.7	73.1	66.6	64.5	74.1	66.3	71.2	66.2	67.6	74.6	56.8	67.2	69.6	74.4	72.4	72.5	73.7	73.5	71.5	71.0	74.9
5:20:00 PM	74.7	73.7	74.2	62.9	58.1	51.7	60.6	67.9	69.4	65.9	69.9	71.1	74.1	74.5	74.6	70.7	74.9	71.6	73.2	73.8	69.5	66.1	74.7	66.2	71.5	65.1	68.0	74.9	61.4	71.7	70.6	74.3	72.3	72.9	70.9	73.7	68.6	70.7	75.8
5:25:00 PM	74.8	73.9	72.7	56.8	57.8	53.6	58.7	66.8	63.3	60.3	69.5	70.5	72.7	73.3	73.5	70.8	74.2	72.3	74.1	74.0	66.6	64.0	73.2	63.7	71.8	63.0	68.5	74.8	58.0	70.5	71.4	74.6	73.1	73.0	72.2	73.4	71.1	70.2	76.1
5:30:00 PM	75.9	74.1	73.9	55.6	53.6	54.2	53.7	62.1	63.4	58.3	68.0	69.6	72.6	73.0	72.8	70.3	73.6	69.0	72.6	71.5	60.1	67.1	74.0	68.5	72.4	67.3	66.4	75.4	61.2	71.4	70.9	73.4	71.5	71.8	73.0	74.1	72.9	70.8	75.3
5:35:00 PM	75.6	74.9	74.0	60.4	55.8	52.1	60.3	64.5	61.6	57.0	66.1	66.6	69.4	72.8	73.3	71.5	73.5	71.6	73.6	71.4	55.7	65.2	72.1	63.7	69.2	61.5	64.3	75.0	52.0	71.7	73.3	75.0	72.9	73.2	76.8	71.4	61.7	69.6	75.4
5:40:00 PM	75.6	75.1	75.4	58.3	64.6	58.6	60.0	65.8	65.3	64.0	70.2	65.2	68.7	72.4	72.5	65.8	73.9	69.3	72.2	72.1	61.5	63.6	73.9	64.1	70.7	60.1	59.2	74.1	54.1	69.5	66.5	73.1	72.1	72.4	74.4	73.6	70.0	70.6	75.8
5:45:00 PM	74.8	74.4	74.1	59.9	66.1	61.6	59.9	67.0	63.1	60.6	70.0	69.6	72.0	74.2	74.0	73.1	74.1	71.7	73.9	72.9	67.2	66.4	73.6	65.0	70.0	64.6	59.5	74.7	55.5	71.0	67.5	73.8	72.2	72.4	62.5	73.2	69.1	70.0	75.3
5:50:00 PM	75.2	74.3	73.1	60.2	58.8	52.8	62.4	67.1	65.2	62.7	69.0	68.4	72.0	73.1	73.4	72.0	73.9	73.0	74.6	73.3	64.6	66.5	74.8	69.7	72.6	68.4	63.9	74.4	56.3	67.7	68.3	74.3	72.7	72.8	74.4	72.9	72.4	70.9	75.9
5:55:00 PM	75.6	75.4	73.2	60.2	63.5	58.0	60.0	66.6	66.5	61.8	70.5	70.2	74.1	74.4	74.8	71.0	74.1	70.0	72.7	73.0	68.5	67.0	74.3	67.0	71.4	65.1	69.4	74.9	61.8	65.9	69.0	73.7	72.8	72.6	72.5	73.1	73.5	71.1	75.4
6:00:00 PM	76.1	75.2	75.0	62.6	63.6	60.2	63.7	69.5	66.4	62.9	70.0	67.7	71.2	72.8	73.0	71.4	74.0	70.1	73.2	73.4	68.7	66.3	74.9	69.3	73.0	66.7	70.7	75.0	60.4	72.9	72.2	74.9	73.5	73.9	75.6	74.1	73.4	73.2	75.2
6:05:00 PM	75.3	74.6	73.7	58.7	63.4	58.5	59.0	66.9	65.1	60.4	71.2	71.8	73.5	74.9	74.6	71.6	74.7	71.6	74.3	73.7	68.2	66.3	74.6	69.0	71.9	65.7	72.1	75.2	61.2	73.4	72.1	75.3	72.6	72.9	73.6	74.0	73.6	73.3	76.0
6:10:00 PM	75.1	74.9	75.5	52.7	61.1	58.6	65.3	67.7	67.0	65.3	71.5	70.6	69.0	73.5	73.3	70.2	74.8	71.9	75.2	74.4	67.1	68.0	75.0	69.1	72.2	68.3	71.5	75.1	64.9	70.4	68.3	74.3	73.0	73.2	75.4	74.4	74.2	73.9	74.8
6:15:00 PM	74.9	73.9	73.6	64.6	65.0	59.2	63.2	67.5	66.1	63.2	71.8	71.4	71.7	73.6	74.2	72.1	75.0	72.6	74.1	74.5	70.8	65.8	74.9	67.5	72.9	64.1	71.9	75.8	64.8	71.7	71.8	75.0	73.8	73.8	73.7	71.6	73.4	73.1	74.7
6:20:00 PM	75.9	74.9	74.7	59.3	64.2	60.3	62.4	67.0	65.3	62.0	71.1	70.8	72.4	73.7	73.4	72.2	74.5	72.5	74.2	73.5	68.7	68.8	74.7	69.9	73.0	68.3	69.9	75.4	65.2	72.0	71.9	74.8	73.1	73.2	76.6	73.1	74.4	74.3	75.2
6:25:00 PM	76.3	75.1	74.4	63.9	63.7	59.2	65.1	68.7	65.0	63.6	70.0	68.7	73.6	74.0	73.8	73.3	74.4	72.8	74.2	74.0	66.5	67.3	73.3	66.4	72.7	71.1	71.9	75.1	63.3	72.2	71.1	73.7	71.8	72.0	76.1	74.1	74.1	73.9	74.3
6:30:00 PM	75.1	75.5	76.1	60.0	68.9	63.1	66.4	68.4	65.8	62.4	70.6	70.8	74.1	74.3	74.1	71.9	75.2	72.9	74.4	74.8	70.8	66.7	75.8	70.4	72.1	65.0	69.9	74.9	57.8	72.6	71.1	74.7	72.7	72.2	75.8	72.4	73.1	72.8	74.6
6:35:00 PM	76.5	75.5	75.4	65.7	69.1	65.9	68.7	70.4	67.8	64.5	71.4	71.3	74.7	74.1	73.7	71.0	75.0	73.2	74.2	74.4	71.7	67.9	74.9	69.0	73.2	70.4	72.6	76.1	65.8	72.2	71.7	75.0	72.6	72.8	71.1	71.6	73.4	73.6	74.0
6:40:00 PM	76.1	75.8	76.6	64.8	70.7	66.8	71.7	71.8	70.8	65.7	72.2	71.4	74.4	75.2	75.2	73.9	75.1	73.6	74.8	75.0	73.0	70.3	74.9	68.9	73.0	70.8	71.9	75.2	65.7	72.0	73.3	75.3	74.0	74.0	76.3	73.5	74.1	73.8	74.7
6:45:00 PM	75.8	75.4	75.2	69.9	72.6	68.5	70.7	71.4	72.2	68.9	73.3	71.7	75.2	75.2	74.5	74.2	75.9	73.7	74.8	75.1	72.5	73.0	76.4	72.7	74.3	71.3	73.0	75.7	65.6	72.3	71.0	74.8	73.6	73.7	74.6	73.4	73.8	75.1	74.9
6:50:00 PM	75.4	74.8	74.5	63.7	71.4	67.2	72.0	71.7	71.1	67.3	74.2	73.0	74.9	74.7	74.8	73.3	75.0	73.1	75.0	74.7	71.3	69.9	74.6	71.6	74.5	70.8	72.6	75.9	69.9	73.4	73.9	75.9	74.9	74.5	75.1	72.9	73.8	73.6	74.1
6:55:00 PM	76.7	76.3	77.0	72.2	73.9	71.2	72.1	72.7	72.2	68.2	72.5	72.2	75.0	75.4	74.9	74.4	75.5	73.8	75.1	74.8	73.6	72.3	75.3	72.7	74.3	70.8	72.4	75.1	65.9	73.1	72.9	74.9	74.1	73.9	76.8	73.5	73.8	74.9	75.0
7:00:00 PM	76.1	75.4	76.0	70.7	72.8	69.7	72.9	74.2	73.3	68.0	74.5	74.5	76.4	76.2	76.0	74.5	76.1	73.4	74.3	74.3	71.5	71.8	75.6	73.4	74.8	73.3	74.3	76.2	69.5	74.6	72.7	75.2	74.6	74.6	76.7	73.9	74.9	74.8	74.6

Table 8-15: Northbound I-15 PM Observed Speed Contours – Typical Day

Time	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
2:05 PM	69.5	67.3	65.3	66.3	62.5	67.0	63.7	64.2	62.4	63.9	66.7	64.7	65.9	68.4	64.3	61.8	64.5	60.8	64.2	61.6	63.5	63.0	64.4	62.7	64.5	64.9	63.4	58.8	60.0	67.5	63.3	66.8	60.3	59.6	60.1	68.2	67.8
2:10 PM	69.5	67.2	65.3	66.5	62.6	67.0	64.0	64.1	62.7	63.9	66.5	64.8	66.2	68.1	64.6	61.8	64.7	61.1	64.7	62.0	63.3	62.9	64.3	62.5	64.3	64.9	63.0	59.0	59.6	67.1	63.3	66.8	60.0	59.6	60.3	68.0	67.8
2:15 PM	69.6	67.2	65.2	66.8	63.0	67.0	64.0	64.4	62.6	63.9	66.5	64.8	66.2	68.2	64.8	61.9	64.8	61.3	64.9	62.0	63.5	63.1	64.5	62.6	64.4	65.0	63.0	59.2	60.0	67.0	62.9	66.5	60.0	59.8	59.8	68.0	67.9
2:20 PM	69.4	67.1	65.1	66.6	63.1	67.0	63.9	64.5	62.6	63.8	66.2	64.5	66.1	67.9	64.8	62.3	64.9	61.5	64.9	62.3	63.8	63.9	64.5	62.7	64.3	64.9	63.3	59.0	60.0	67.1	63.3	66.3	60.0	59.2	60.2	67.9	67.8
2:25 PM	69.0	67.1	65.0	66.5	62.9	66.8	63.9	64.4	62.3	63.5	65.9	64.3	66.2	67.8	65.2	62.1	65.0	61.8	64.8	62.5	63.5	63.9	64.5	62.8	64.5	64.9	63.1	58.9	60.5	66.8	63.2	66.2	60.1	59.5	60.5	68.0	67.9
2:30 PM	69.1	67.0	65.2	66.7	62.9	67.0	64.0	64.2	62.4	63.7	65.6	64.5	66.3	67.6	64.4	62.3	65.2	61.6	65.0	62.6	63.7	63.7	64.6	63.0	64.7	65.1	63.5	59.4	61.2	66.9	63.5	66.0	60.3	59.7	60.5	68.2	68.0
2:35 PM	69.0	67.0	65.0	66.2	63.0	66.9	63.8	64.3	62.1	63.5	65.5	64.5	66.2	67.6	64.6	61.8	65.0	61.4	64.8	62.1	63.4	63.6	64.4	62.8	64.5	65.0	63.5	59.4	60.8	67.0	63.6	65.8	60.5	59.8	60.6	68.1	68.1
2:40 PM	69.0	67.2	65.0	66.3	63.1	67.0	64.2	64.0	61.5	63.4	65.5	64.3	66.2	67.4	64.3	62.2	65.0	61.5	64.9	61.9	63.0	63.2	63.8	62.4	64.0	64.7	62.9	59.5	60.7	66.6	63.2	65.5	60.5	60.3	60.8	68.3	68.0
2:45 PM	68.6	66.3	64.6	66.5	62.9	66.8	64.1	64.2	61.3	63.5	65.0	64.0	66.4	66.9	64.1	62.3	64.9	61.8	64.6	61.8	62.6	63.2	63.8	62.5	64.0	64.6	63.1	58.9	60.8	65.9	63.0	65.3	60.3	60.0	60.9	68.1	68.0
2:50 PM	68.1	65.9	64.3	66.1	62.9	66.5	64.1	64.0	60.9	63.1	64.6	64.1	66.0	66.3	64.3	62.4	65.2	61.9	64.9	61.8	62.4	63.0	63.3	62.3	63.6	64.1	62.6	58.6	61.7	65.8	62.8	65.0	60.1	59.8	60.5	67.9	68.0
2:55 PM	68.0	66.0	64.5	66.1	63.0	66.4	64.0	63.7	60.6	63.0	64.7	63.5	65.6	66.0	63.5	62.3	64.9	61.7	64.8	61.3	61.1	61.5	63.4	62.3	63.4	64.0	62.5	57.7	61.8	65.5	63.2	64.8	60.6	60.1	60.8	67.8	67.8
3:00 PM	67.9	66.3	64.8	66.0	63.1	66.5	64.1	64.3	61.0	63.4	64.5	63.8	65.7	66.0	63.1	62.0	64.9	61.6	64.5	61.0	60.4	61.3	62.9	62.3	63.3	64.0	62.9	58.2	62.0	65.0	63.0	64.8	60.7	59.8	60.7	67.8	67.8
3:05 PM	68.0	66.3	65.0	66.4	63.5	66.7	64.3	64.3	61.5	63.6	64.6	63.8	65.7	66.0	63.2	61.9	64.7	61.6	64.5	60.5	60.0	61.0	62.2	62.0	63.2	63.4	62.5	57.6	60.7	64.5	62.9	64.5	60.1	59.5	60.9	67.4	67.4
3:10 PM	68.0	66.5	65.0	66.9	63.5	66.8	64.3	64.0	61.6	63.5	64.6	63.7	65.5	66.3	63.1	61.7	64.2	61.3	64.0	60.3	59.6	60.0	60.1	61.3	63.0	63.3	62.3	57.4	60.8	64.0	63.0	64.4	59.6	59.2	60.4	67.3	67.2
3:15 PM	68.0	66.4	64.7	67.0	63.7	66.7	64.4	64.4	61.6	63.6	64.6	63.5	65.8	66.1	62.3	61.9	65.0	61.8	64.2	60.4	60.0	58.5	59.9	61.0	63.0	63.1	61.9	57.3	60.0	63.8	62.5	64.0	59.5	59.4	60.8	67.2	66.9
3:20 PM	67.6	65.8	64.3	66.6	63.5	66.5	64.2	63.6	61.3	63.0	63.5	62.4	65.5	65.4	61.1	61.9	64.6	61.9	64.0	60.2	59.8	59.1	60.5	61.8	62.6	62.5	61.8	57.6	60.2	63.6	62.4	64.0	59.6	59.0	60.5	67.0	66.9
3:25 PM	67.1	65.3	64.0	66.3	63.3	66.1	64.0	63.6	61.1	62.4	62.5	61.8	64.9	62.0	60.0	62.0	64.9	61.5	63.5	59.1	57.4	53.8	57.3	61.2	62.3	62.5	61.1	57.9	60.7	63.7	63.0	64.2	59.5	59.4	60.3	67.0	66.8
3:30 PM	66.8	65.8	63.9	66.3	63.1	65.9	63.8	62.8	59.8	61.6	61.1	61.3	63.8	62.0	58.7	61.6	64.5	61.6	63.2	59.0	53.4	49.9	49.0	60.6	62.2	62.5	61.4	58.1	61.0	63.8	63.3	64.4	59.4	59.2	59.9	66.9	67.1
3:35 PM	66.4	65.6	63.9	66.4	63.1	65.9	63.6	62.4	58.7	61.4	61.6	61.5	62.0	58.1	58.5	61.5	64.3	61.1	62.7	58.0	46.3	47.8	48.4	60.7	62.8	62.2	61.9	57.6	60.9	63.3	63.0	64.3	58.5	57.1	59.7	66.9	66.9
3:40 PM	66.4	65.7	63.8	66.3	63.1	65.5	63.2	62.0	58.4	59.0	60.3	59.9	61.8	61.2	58.3	61.1	63.9	60.2	62.7	53.1	43.4	45.4	48.9	60.3	61.0	61.6	61.1	56.5	61.7	63.3	63.1	63.9	57.8	54.5	59.6	66.5	66.5
3:45 PM	67.0	65.3	63.0	65.8	62.8	65.2	62.2	56.6	52.9	55.3	55.9	58.5	62.2	61.6	58.3	60.7	63.8	58.1	55.8	47.3	37.5	38.1	48.9	60.4	60.9	61.7	61.3	56.4	62.0	63.0	62.8	63.5	57.3	52.5	59.0	66.5	66.7
3:50 PM	65.2	64.1	62.0	65.3	62.3	64.0	56.2	47.6	46.6	52.7	57.1	58.9	61.9	61.3	57.7	61.1	63.5	56.5	56.2	45.3	32.3	33.9	48.0	59.1	59.9	61.1	60.6	56.5	61.4	63.0	62.9	63.3	56.8	49.7	59.0	66.3	66.5
3:55 PM	62.3	63.2	61.6	64.8	62.0	61.4	50.6	42.1	42.5	52.3	52.6	57.8	62.0	59.3	57.5	60.6	63.4	53.9	50.9	39.6	28.6	30.5	48.7	58.6	59.6	60.6	59.9	55.8	61.7	62.5	62.1	62.9	54.6	50.0	58.5	66.1	66.5
4:00 PM	57.1	62.8	61.9	64.3	62.1	60.2	47.3	39.2	43.1	51.5	50.9	57.9	62.6	59.3	57.4	59.9	63.0	52.7	38.4	35.6	26.6	30.8	48.0	58.4	59.2	59.4	60.1	55.2	61.7	62.0	62.0	62.6	53.6	47.5	59.0	66.4	66.4
4:05 PM	56.4	62.5	62.0	64.4	61.8	58.6	47.0	37.7	39.4	50.6	54.7	58.3	63.3	59.2	56.5	60.0	62.8	49.3	36.4	34.7	27.2	31.1	47.2	59.5	56.0	59.2	58.6	54.6	61.7	62.3	61.8	63.0	53.9	44.8	58.4	66.3	66.5
4:10 PM	57.2	63.9	62.5	64.4	62.3	57.0	47.1	34.9	38.6	51.1	53.1	58.7	64.0	60.9	55.3	60.0	61.5	46.6	35.2	33.6	24.9	29.3	48.6	59.9	57.6	59.5	59.5	54.9	62.0	61.8	62.5	62.8	49.2	40.5	58.0	66.1	66.6
4:15 PM	59.8	63.6	61.1	64.6	60.6	51.4	38.5	32.6	38.7	52.7	54.6	59.0	65.0	57.5	55.2	59.8	60.3	42.9	30.0	31.4	24.8	29.3	47.6	58.3	55.7	59.3	59.1	54.8	61.8	61.3	62.2	61.9	47.9	39.0	57.6	66.3	66.4
4:20 PM	60.5	62.8	59.6	62.6	45.0	45.9	36.2	33.0	39.1	53.2	55.9	59.9	65.3	59.0	55.9	59.0	53.8	39.2	28.5	30.8	23.7	28.3	47.4	57.5	53.4	55.9	56.7	52.9	62.0	61.4	62.5	61.4	47.5	39.2	57.8	66.0	66.2
4:25 PM	59.2	61.5	57.3	53.0	38.2	39.9	33.5	35.2	40.7	54.8	56.6	59.8	65.3	59.1	56.3	57.4	52.1	37.5	28.9	30.2	23.3	28.5	47.7	55.2	49.9	50.5	53.4	53.7	61.9	61.4	62.5	61.6	47.7	38.5	57.7	66.1	66.1
4:30 PM	55.2	61.1	46.7	49.3	38.5	38.5	36.0	37.5	41.7	53.6	56.6	59.5	64.8	57.9	53.3	58.4	51.3	40.7	30.3	29.9	23.4	28.0	46.8	53.8	47.4	50.3	53.9	54.4	61.9	61.1	61.7	61.3	45.8	38.8	57.9	65.9	66.4
4:35 PM	57.6	59.2	46.4	43.3	39.1	40.4	34.7	36.5	42.0	54.4	57.1	59.3	61.5	51.6	55.3	58.3	52.7	36.0	30.3	30.7	22.5	26.6	47.6	55.3	48.9	53.7	56.5	54.5	62.3	61.3	62.2	60.0	45.1	37.0	57.6	66.0	66.4
4:40 PM	50.3	58.2	50.8	44.6	37.8	40.6	37.2	34.0	40.7	53.2	55.9	59.9	62.3	54.1	56.7	58.9	52.9	38.9	27.5	31.3	23.0	28.6	48.2	55.4	50.9	54.7	57.3	55.8	63.0	61.3	61.7	60.7	40.8	36.1	57.0	65.7	66.6
4:45 PM	44.1	58.2	50.4	44.0	41.3	39.4	35.3	36.1	40.2	53.2	56.2	59.5	62.9	56.8	57.9	59.3	51.5	39.5	28.2	30.8	24.0	28.8	46.4	56.7	50.2	56.0	57.4	55.3	62.9	61.5	61.8	60.4	39.9	35.3	57.3	65.8	66.4
4:50 PM	43.0	54.8	51.5	44.5	36.4	40.9	35.3	35.4	41.2	55.2	56.5	58.5	64.1	59.1	58.3	57.4	49.6	39.5	28.9	30.1	22.9	28.9	46.6	57.8	51.0	52.3	52.9	56.4	63.3	61.5	63.0	60.7	41.1	35.4	57.5	65.9	66.2
4:55 PM	41.6	53.1	43.8	46.2	39.3	38.4	33.8	34.6	40.8	55.0	55.8	59.9	64.7	60.9	56.8	59.4	55.1	38.7	27.0	29.8	23.8	28.6	48.0	55.8	48.2	49.1	50.4	56.0	63.4	61.7	63.1	59.8	38.2	35.3	57.3	65.7	66.2
5:00 PM	45.0	52.9	46.2	47.2	36.0	37.3	34.2	36.0	43.2	52.7	54.9	60.3	65.5	61.5	59.0	60.6	57.5	38.2	29.6	30.5	23.7	28.6	48.9	54.5	47.0	50.2	52.0	56.2	63.3	61.9	63.0	58.2	41.2	33.8	56.9	65.8	66.2
5:05 PM	54.5	56.0	43.5	45.0	36.2	39.3	37.0	35.7	40.1	54.2	55.1	60.3	65.7	62.8	59.9	60.8	61.4	41.3	30.6	32.1	24.3	29.2	47.8	54.6	48.0	49.3	53.3	56.1	63.4	62.8	63.2	60.5	39.9	33.6	57.0	66.1	66.1
5:10 PM	61.0	55.8	49.7	42.0	38.5	38.2	37.3	35.2	40.8	54.0	55.9	60.8	66.8	62.4	62.0	61.8	64.5	44.4	34.3	33.1	24.2	28.6	47.9	53.1	53.1	54.2	56.5	56.2	63.4	62.8	63.0	61.2	40.6	34.9	57.6	65.8	66.6
5:15 PM	62.5	58.0	51.4	46.7	37.8	38.3	37.6	36.2	41.6	56.0	55.5	60.4	66.2	62.6	62.5	61.9	64.5	47.7	36.4	33.5	23.5	28.0	46.8	55.6	53.6	56.4	57.2	57.6	63.6	62.7	63.4	61.5	38.1	34.9	57.8	65.1	66.3
5:20 PM	64.0	58.3	49.8	46.9	36.3	39.0	36.6	36.4	41.9	55.1	56.4	60.4	66.3	62.5	63.5	61.9	65.1	50.6	36.9	33.3	23.2	28.1	47.1	55.4	53.5	56.7	56.4	56.6	64.6	63.2	63.6	61.4	40.2	35.7	57.6	64.8	66.4
5:25 PM	62.1	55.9	45.1	47.0	36.7	38.1	37.9	34.1	41.8	55.6	54.8	60.7	66.9	62.2	63.0	62.0	65.2	51.1	35.2	32.2	23.4	29.0	47.6	57.1	50.8	49.5	52.3	56.3	63.5	63.0	63.8	59.7	40.4	35.3	56.9	64.9	66.3
5:30 PM	55.7	50.4	43.6	44.8	33.7	37.9	35.8	34.0	41.4	55.8	54.4	61.0	67.5	62.7	64.3	62.0	65.2	50.7	38.6	36.1	25.6	31.2	48.3	55.1	46.8	46.0	50.5	55.8	63.7	63.3	64.0	59.7	41.8	35.5	56.6	64.6	66.6
5:35 PM	57.1	47.5	39.5	42.6	33.4	36.6	35.5	33.6	41.7	55.8	55.4	61.3	67.7	63.2	64.5	62.3	65.7	51.7	52.8	38.7	29.0	31.6	48.7	49.4	46.5	44.8	49.7	56.2	64.5	63.1	64.6	60.3	43.9	36.6	56.9	64.1	66.8
5:40 PM	62.9	46.6	40.9	43.8	37.3	38.2	37.3	34.1	41.2	54.4	56.0	61.6	67.8	63.6	65.0	63.0	66.0	52.5	53.6	44.4	29.4	34.1	47.3	51.5	45.4	46.0	50.4	56.5	64.5	63.3	64.6	61.6	47.6	38.2	56.9	64.5	66.6
5:45 PM	65.0	49.0	44.7	42.2	38.7	38.8	36.7	33.5	41.4	55.3	55.0	61.5	67.6	63.7	65.1	62.3	66.1	57.9	60.7	54.5	38.7	37.7	49.2	54.3	50.5	52.4	53.5	57.2	64.1	63.4	64.9	62.3	51.9	39.0	58.3	63.9	66.7
5:50 PM	64.8	55.8	47.0	46.3	35.7	38.3	36.0	34.8	41.4	55.3	55.2	61.1	67.6	63.3	64.6	62.7	66.2	61.0	63.0	56.7	46.6	45.3	51.4	57.0	56.1	55.6	57.5	58.6	65.0	63.2	65.0	62.9	51.8	41.4	58.2	64.9	66.1
5:55 PM	65.3	59.4	54.0	46.3	38.4	38.9	36.5	33.5	41.2	54.6	55.9	61.1	67.8	63.8	65.3	62.3	66.3	63.5	64.0	59.4	55.9	51.6	57.9	60.0	58.0	57.9	59.4	58.3	65.5	63.8	65.9	63.3	52.6	39.3	59.1	65.7	66.8
6:00 PM	65.3	63.3	58.9	42.2	44.5	42.3	36.4	35.6	40.9	55.8	57.0	61.3	67.1	63.9	65.0	62.1	66.4	64.3	64.2	60.1	59.2	54.6	62.4	61.2	60.9	62.1	60.9	59.3	66.0	64.1	65.1	63.2	55.8	41.5	59.9	67.0	67.2
6:05 PM	66.8	65.0	61.7	49.6	54.3	48.8	42.1	35.0	41.4	55.7	56.9	60.8	67.5	64.1	65.0	62.3	66.2	64.4	64.7	61.3	60.3	60.6	62.9	62.1	62.1	63.0	62.2	60.8	66.0	64.7	65.8	64.2	56.8	44.3	60.3	66.7	67.3
6:10 PM	67.4	65.5	62.0	58.6	59.5	55.9	48.0	38.4	43.0	57.2	56.8	60.9	67.0	64.1	64.9	62.4	66.1	64.3	64.8	61.1	61.3	62.5	64.1	63.0	62.8	63.4	63.7	60.9	66.5	65.2	65.9	64.6	58.9	53.2	60.6	67.1	67.4
6:15 PM	67.1	65.8	62.5	64.3	61.9	59.7	57.0	45.9	46.3	57.5	58.9	59.9	66.8	63.4	64.1	61.2	65.1	64.1	65.7	61.2	61.6	63.5	64.4	63.8	63.4	64.1	64.4	61.5	66.9	65.8	66.7	64.5	59.7	56.5	60.8	67.5	67.3
6:20 PM	67.9	66.3	63.2	66.5	62.9	62.2	60.4	52.4	49.7	59.8	60.1	61.8	67.2	63.7	64.0	61.3	65.2	64.4	65.2	61.7	61.8	63.7	65.1	63.7	63.8	64.2	63.9	61.0	66.5	65.7	66.3	65.2	59.1	58.4	61.4	67.6	67.1
6:25 PM	67.3	67.3	63.5	67.3	63.9	63.9	63.0	58.1	55.9	62.5	61.3	62.7	67.2	63.8	64.5	62.2	65.8	64.8	66.1	62.5	62.5	64.7	65.7	64.6	64.6	65.3	64.5	60.9	66.4	65.4	66.5	64.9	60.3	59.4	62.6	66.8	67.2
6:30 PM	68.1	66.7	64.0	68.4	64.8	65.0	64.1	61.2	58.7	63.9	62.3	63.6	67.3	64.4	65.4	62.7	66.4	65.4	67.0	64.0	63.9	65.6	66.4	65.2	65.5	66.2	65.4	61.4	66.6	66.4	66.5	65.6	60.8	60.2	62.5	67.0	67.1
6:35 PM	68.4	67.2	64.8	68.7	65.0	65.6	64.8	63.2	60.4	64.7	63.5	64.8	68.0	64.7	66.4	63.0	66.5	65.5	67.5	65.0	64.5	66.7	66.9	65.8	66.3	67.0	66.8	62.4	68.0	66.3	67.4	66.2	61.3	61.4	63.0	67.1	67.0
6:40 PM	68.9	67.5	64.9	69.2	65.5	66.5	65.4	64.4	61.7	65.7	63.9	65.4	68.3	65.5	67.1	64.1	67.0	65.8	68.0	64.3	65.2	67.1	67.5	66.2	66.9	67.3	66.8	62.4	67.5	66.9	67.4	66.9	61.9	62.6	63.3	67.3	67.1
6:45 PM	69.2	68.1	65.6	69.7	65.7	66.7	66.1	65.4	63.5	66.0	64.0	66.1	69.0	66.2	67.4	64.0	68.1	66.4	68.4	64.6	65.6	67.8	68.3	66.8	67.8	67.9	67.3	63.1	68.3	67.7	67.6	67.1	63.0	62.5	64.4	67.4	67.3
6:50 PM	69.7	68.2	65.9	69.8	66.0	66.8	67.1	65.9	63.6	67.7	65.4	67.1	69.0	67.4	67.8	64.0	68.2	66.3	68.5	65.1	66.0	67.9	68.9	67.2	68.3	68.3	68.1	63.7	68.4	68.0	68.7	67.0	64.3	63.6	64.4	67.9	67.8
6:55 PM	69.8	68.8	66.3	69.9	66.3	67.4	67.5	66.3	64.5	68.2	65.8	67.4	69.8	67.8	68.7	64.9	68.9	66.9	68.9	65.1	66.4	68.3	69.2	67.3	68.6	68.5	68.5	64.1	69.0	68.3	69.2	67.8	65.3	64.0	64.4	68.2	67.8
7:00 PM	70.3	69.0	66.9	70.5	66.9	68.3	67.9	67.3	65.4	68.6	66.5	67.8	70.3	68.3	69.0	64.7	69.8	67.8	69.6	66.5	66.7	68.5	69.0	67.9	68.9	69.0	68.7	64.4	68.8	68.7	68.9	68.4	65.0	64.5	64.8	68.1	67.8

Table 8-16: Northbound I-15 PM Model Speed Contours – Typical Day

Time	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
2:05 PM	73.3	70.8	71.4	51.5	65.4	59.6	67.1	59.2	62.9	70.0	71.1	70.1	72.3	73.9	73.5	74.4	73.9	62.1	70.5	57.2	66.4	51.8	67.5	73.3	72.0	68.0	70.2	74.4	69.4	73.4	73.4	72.9	69.7	63.1	75.0	75.7	74.5
2:10 PM	71.7	71.9	71.0	49.5	64.3	63.7	71.0	70.0	67.8	72.0	73.3	70.9	72.1	73.2	73.4	74.5	74.7	64.5	70.9	59.6	66.8	53.2	67.8	73.3	73.3	68.5	70.1	75.3	68.9	71.5	71.7	72.5	66.4	60.5	75.2	75.8	74.3
2:15 PM	71.2	70.1	70.9	52.3	61.0	61.9	70.3	61.8	67.9	73.0	73.9	71.6	72.4	74.8	74.5	74.5	73.9	67.8	71.0	64.4	67.5	58.6	66.2	74.1	74.5	69.0	69.0	75.3	68.5	73.8	72.9	73.8	63.2	64.1	75.5	76.5	75.9
2:20 PM	70.3	68.1	67.5	52.5	60.4	59.6	68.6	66.4	67.0	70.5	73.6	71.5	73.3	73.9	74.2	75.1	74.9	60.2	70.7	60.7	69.5	52.9	68.0	73.0	69.4	65.1	68.3	75.1	67.4	70.4	72.6	72.9	70.5	54.0	75.4	75.4	75.3
2:25 PM	69.2	67.7	63.1	46.9	58.6	58.9	65.8	63.4	64.4	65.4	70.2	69.7	72.7	74.3	74.3	74.5	73.9	64.4	72.5	67.1	71.5	58.1	69.2	74.3	67.7	66.9	66.8	75.8	71.1	70.8	72.6	73.0	65.2	57.3	74.6	75.7	74.5
2:30 PM	71.0	67.7	59.8	47.5	59.3	57.6	65.9	57.6	61.7	66.7	70.9	65.7	70.5	74.2	72.3	72.8	72.5	65.9	69.8	60.2	69.8	52.7	66.7	73.7	73.0	67.1	68.4	75.5	69.5	73.2	73.0	73.2	66.0	60.9	74.7	75.6	75.4
2:35 PM	70.1	68.7	59.4	48.3	57.5	55.6	65.6	60.1	59.6	61.8	69.2	66.4	69.9	71.7	73.2	73.7	72.8	59.4	65.6	52.3	61.5	49.5	64.7	74.2	72.3	66.1	67.9	73.5	67.8	72.1	71.7	71.5	66.0	60.8	74.2	75.5	74.9
2:40 PM	71.1	67.9	61.4	49.0	61.8	55.1	61.8	47.6	56.3	64.1	69.5	69.1	71.2	71.2	73.4	72.8	73.9	53.5	61.3	50.9	62.3	39.6	59.5	73.0	72.3	65.0	67.9	75.0	66.6	68.5	71.3	71.9	64.6	58.1	73.5	74.1	73.8
2:45 PM	68.8	66.5	62.6	45.5	61.9	55.3	63.8	46.4	56.0	63.1	67.6	65.5	71.0	73.0	73.4	72.4	72.4	62.4	62.4	47.9	59.6	45.4	60.1	72.7	71.5	64.1	67.1	75.4	67.3	68.5	72.5	73.1	57.1	45.4	72.7	74.4	73.8
2:50 PM	50.8	61.3	54.9	44.2	61.5	59.6	64.0	40.1	54.9	60.1	65.7	66.9	70.6	72.8	72.4	69.2	73.4	56.7	65.8	57.5	58.0	32.1	55.1	72.6	72.4	60.1	67.6	74.2	67.7	69.4	71.7	71.6	62.4	50.4	75.7	75.6	74.2
2:55 PM	44.6	57.7	45.1	49.1	63.7	49.8	58.3	35.7	51.6	65.2	68.1	67.0	67.2	70.8	71.6	72.0	72.7	58.4	56.0	51.4	62.9	50.1	55.6	72.3	71.0	61.4	67.4	74.0	67.1	68.9	71.0	71.6	56.5	51.1	73.4	74.6	74.4
3:00 PM	24.8	56.4	43.5	49.2	63.5	54.2	49.3	28.8	53.8	61.8	64.0	61.3	69.1	73.5	72.7	71.1	72.1	57.7	64.0	57.2	59.8	49.6	62.4	72.2	70.9	60.7	68.8	74.5	64.5	69.8	70.6	71.0	55.4	51.9	73.8	74.7	74.2
3:05 PM	34.5	58.7	43.7	51.1	61.1	49.6	40.1	28.6	51.0	63.2	66.1	62.0	70.7	73.5	71.4	67.1	72.3	61.7	55.7	50.2	61.5	49.7	63.5	70.8	66.3	63.3	65.1	73.5	62.8	66.5	70.8	70.5	63.6	50.9	73.5	74.0	73.7
3:10 PM	72.7	57.0	35.5	47.7	47.7	42.8	18.2	31.8	49.3	57.0	59.4	60.0	68.9	70.3	71.0	71.7	71.7	56.2	42.3	37.4	51.2	37.8	55.5	72.0	67.1	62.4	65.5	73.9	63.1	65.9	66.6	69.3	55.1	37.1	73.1	74.8	74.0
3:15 PM	74.0	70.0	40.9	40.9	38.8	34.8	17.7	29.2	48.1	52.5	52.4	58.9	69.3	69.4	71.3	70.3	69.3	50.6	30.8	31.4	36.0	30.9	47.8	70.5	60.9	59.8	62.3	73.3	62.0	65.6	69.2	66.3	54.5	33.2	72.0	73.4	72.2
3:20 PM	70.5	68.8	60.5	49.8	45.7	30.2	18.4	32.6	50.0	62.9	42.7	51.2	67.5	65.6	71.9	65.3	71.6	38.9	24.6	33.0	28.1	28.6	41.2	68.2	66.4	60.5	61.6	73.7	61.5	64.3	69.5	69.1	47.0	31.1	72.6	73.7	73.6
3:25 PM	71.5	69.1	56.3	49.6	48.2	24.7	19.4	32.1	51.5	58.9	44.3	55.3	69.3	70.8	73.2	70.1	72.0	36.8	21.3	31.3	23.8	26.0	40.2	63.4	58.7	59.7	57.4	73.6	61.9	58.5	68.2	68.7	47.9	36.0	72.9	74.4	72.4
3:30 PM	70.4	66.4	51.2	41.0	44.7	23.7	18.9	35.2	51.5	60.8	42.9	58.3	65.4	64.9	70.7	70.2	72.5	43.8	28.6	23.4	22.2	26.3	39.0	67.6	63.8	59.8	60.1	71.4	53.9	62.1	65.8	67.2	50.0	37.9	72.7	73.7	73.9
3:35 PM	70.6	68.0	47.7	38.5	40.2	21.3	18.3	32.5	49.3	59.0	50.0	57.8	68.6	68.5	72.8	66.7	70.9	47.6	29.3	24.5	23.7	24.3	38.1	62.4	62.2	59.4	61.5	73.8	60.9	64.8	70.1	71.0	38.4	45.6	73.0	74.1	73.6
3:40 PM	71.2	68.4	48.7	46.4	29.6	18.7	16.4	32.5	50.7	60.7	55.6	60.5	64.9	65.7	71.6	70.5	71.8	46.8	29.8	26.7	21.6	25.0	38.7	67.4	64.7	56.3	59.6	74.2	52.6	67.6	71.0	71.0	33.5	37.8	71.2	72.9	72.0
3:45 PM	70.2	68.2	47.4	41.9	25.0	17.3	17.9	31.5	49.2	62.5	63.7	65.3	65.3	63.6	72.4	69.3	71.3	48.6	32.5	24.4	23.6	26.1	37.2	62.7	60.2	56.7	56.7	73.2	55.4	61.3	69.4	70.3	35.3	45.8	70.6	73.2	71.7
3:50 PM	71.2	70.0	40.9	33.9	21.0	20.0	20.5	29.8	49.3	61.5	62.9	62.6	67.0	55.1	72.4	72.7	73.6	49.1	30.1	24.8	22.1	25.2	35.7	60.4	62.6	55.2	53.7	73.4	63.1	60.4	72.0	71.4	29.0	43.7	71.7	73.3	71.5
3:55 PM	70.8	65.4	36.3	24.9	23.5	22.4	19.1	33.1	49.0	55.1	68.9	66.3	70.4	66.5	72.7	72.3	71.5	52.5	42.8	29.2	19.1	25.1	34.8	55.6	67.2	56.7	56.0	73.3	56.7	65.2	69.9	69.7	31.3	31.9	72.3	73.5	73.0
4:00 PM	68.9	66.6	27.1	25.7	25.9	21.4	20.2	32.6	50.3	59.0	65.1	63.0	68.9	67.2	72.7	74.0	72.6	45.3	49.3	26.2	20.5	26.0	34.4	53.7	67.5	56.6	51.6	72.9	58.3	63.2	70.3	70.3	54.0	29.0	70.5	73.3	73.2
4:05 PM	72.9	64.9	21.8	25.7	24.3	22.7	20.8	30.6	50.5	59.8	55.7	62.7	67.1	66.3	72.1	72.5	71.9	58.7	57.1	39.3	22.2	24.7	34.7	63.8	62.6	49.8	59.2	73.8	56.9	55.4	68.4	68.5	57.8	39.4	72.5	72.8	72.4
4:10 PM	72.7	71.0	27.5	24.7	27.2	24.4	23.9	29.1	47.8	59.8	43.0	56.1	68.3	58.7	72.4	68.6	72.2	52.9	50.3	45.1	22.0	22.7	34.8	59.9	67.1	48.8	55.6	73.5	55.4	66.2	68.6	69.6	46.7	40.6	71.1	73.0	73.3
4:15 PM	70.8	71.6	39.7	27.8	29.1	28.6	21.1	29.2	46.7	58.0	54.0	56.8	66.7	69.1	73.0	69.3	72.8	55.5	42.2	40.9	25.1	23.1	34.6	50.7	64.4	47.1	54.6	73.9	51.4	68.5	69.3	69.1	53.2	41.8	71.8	72.0	72.1
4:20 PM	73.0	70.0	48.0	35.1	31.3	23.4	19.8	30.0	48.7	61.9	58.8	54.4	65.4	48.2	71.8	69.4	71.6	56.3	42.2	41.6	34.2	26.7	35.4	50.9	52.6	46.8	56.0	75.1	60.5	65.0	70.6	70.9	52.6	39.2	71.3	72.5	72.1
4:25 PM	72.2	72.5	59.4	43.7	31.4	22.8	20.0	30.4	48.7	58.3	63.2	58.1	68.4	63.0	73.1	72.0	70.4	42.2	41.6	38.6	47.0	27.4	36.0	44.8	55.2	43.1	52.5	72.2	59.3	67.1	72.2	72.6	61.4	41.7	71.2	72.3	72.0
4:30 PM	71.4	71.1	66.6	47.8	41.0	22.1	21.1	30.4	46.2	52.4	55.2	56.8	68.2	64.3	72.4	71.9	72.2	41.5	41.1	42.8	42.2	28.9	34.8	50.7	42.4	44.1	53.3	73.9	62.4	58.8	68.6	69.7	58.5	46.3	72.3	72.7	72.5
4:35 PM	73.3	69.1	58.4	45.1	42.9	26.3	20.5	29.6	48.4	53.9	46.1	60.9	67.1	46.1	73.1	71.7	72.1	55.1	45.8	39.6	34.9	29.3	36.0	51.9	47.9	37.7	45.5	72.9	59.8	66.9	69.9	70.6	56.0	41.0	71.7	72.5	71.9
4:40 PM	73.3	73.4	69.0	49.2	49.5	24.9	18.6	29.8	47.7	52.8	43.3	61.0	69.2	60.2	73.1	65.2	72.5	57.8	49.0	38.1	42.5	26.6	35.6	54.2	45.0	36.0	56.2	68.2	54.4	61.4	71.9	67.8	52.3	45.3	72.9	74.3	73.5
4:45 PM	73.7	72.2	69.9	47.9	55.3	25.4	18.8	30.1	49.5	59.1	44.8	60.3	68.8	58.8	72.8	71.8	72.0	47.2	41.0	37.7	41.5	26.7	37.2	63.9	32.7	36.9	52.9	73.8	61.1	61.0	67.9	70.0	55.5	35.7	72.0	73.7	73.1
4:50 PM	74.0	73.0	70.0	47.2	61.2	30.1	19.0	30.3	47.8	61.8	40.6	60.9	67.0	62.8	73.6	73.2	73.9	53.6	32.4	38.7	48.7	28.4	38.1	56.6	31.3	36.0	54.1	73.4	53.2	66.6	69.2	69.0	49.9	45.1	70.2	72.0	72.5
4:55 PM	73.7	73.3	70.6	49.2	62.2	43.2	19.8	30.1	49.4	56.1	42.0	51.0	69.1	46.6	73.5	71.7	72.5	47.7	35.9	35.2	47.1	25.5	45.2	54.6	30.4	35.3	53.7	70.8	56.2	67.4	72.2	71.5	48.8	50.6	71.5	71.5	72.2
5:00 PM	73.9	72.8	71.2	54.6	63.8	50.5	26.7	26.9	50.7	53.9	37.8	50.7	69.2	57.5	72.7	73.4	73.9	49.1	32.5	32.2	49.4	28.6	46.6	53.8	28.9	37.7	54.8	72.9	59.5	58.3	69.5	70.7	50.1	51.3	72.0	73.4	73.0
5:05 PM	72.9	70.8	68.0	48.5	65.1	56.7	44.9	28.1	48.2	53.3	38.6	50.3	68.0	50.7	72.3	71.6	72.8	59.7	41.0	28.9	51.9	28.2	44.4	47.6	29.4	34.4	55.9	75.3	58.8	64.0	70.9	70.3	54.6	46.8	71.4	72.2	73.3
5:10 PM	74.5	72.8	70.5	53.1	60.5	54.6	47.4	31.9	48.3	45.2	38.4	45.9	70.4	57.1	73.2	72.0	71.8	47.6	48.3	34.7	57.5	32.4	44.0	57.3	30.5	32.0	54.5	74.0	52.7	71.2	72.0	73.1	57.6	44.2	72.1	73.2	72.5
5:15 PM	72.3	72.4	69.8	49.9	62.8	54.7	52.5	32.7	50.0	43.0	40.9	54.9	67.1	58.9	72.9	72.8	72.4	55.7	50.9	44.0	53.7	36.1	50.7	61.4	26.0	34.8	52.3	72.7	52.4	60.1	71.1	70.4	62.2	55.1	70.8	71.8	72.4
5:20 PM	73.1	71.8	69.4	50.4	62.6	53.6	57.0	34.1	50.5	47.7	38.7	56.5	56.2	63.6	71.9	71.0	72.3	46.8	57.7	43.7	50.4	35.3	53.6	62.5	31.9	41.1	56.7	73.9	57.1	54.7	70.8	68.0	58.2	42.5	70.9	73.1	73.2
5:25 PM	74.3	72.2	67.9	47.5	60.4	46.1	52.0	40.0	51.4	51.2	38.4	54.4	65.7	43.4	72.0	69.5	72.4	58.8	53.0	41.6	56.0	36.6	53.6	63.7	53.6	42.0	57.7	73.3	56.4	59.5	71.3	69.9	53.7	41.8	72.7	73.4	72.6
5:30 PM	73.3	73.5	68.8	51.5	60.7	49.6	49.1	42.8	54.7	56.3	39.0	50.1	66.6	45.1	72.6	72.5	72.9	58.0	54.6	38.7	55.1	39.9	54.7	69.5	55.0	43.6	53.6	74.4	63.9	66.0	72.1	71.1	53.7	41.7	70.6	72.1	73.3
5:35 PM	74.1	72.0	69.6	48.5	63.6	52.2	57.6	40.7	53.2	49.7	40.7	47.4	68.8	39.0	72.7	71.7	72.9	48.2	53.8	41.1	59.3	40.4	61.2	67.7	52.2	41.2	47.2	74.5	56.8	67.0	71.2	72.5	56.4	52.0	71.5	71.9	72.9
5:40 PM	73.6	72.8	70.9	45.5	63.1	50.9	58.4	46.5	54.6	54.5	41.7	44.9	65.9	51.1	73.8	71.5	72.4	55.2	57.1	40.9	62.9	33.6	64.7	70.5	66.1	43.1	55.7	73.9	59.9	66.3	72.1	72.3	52.8	57.2	72.5	74.0	72.4
5:45 PM	74.3	72.5	71.6	53.9	64.4	52.4	56.7	48.1	54.8	59.3	43.8	50.3	68.9	47.1	72.2	73.1	73.2	55.7	51.1	37.6	58.6	46.3	61.5	66.3	70.4	55.4	57.6	74.5	58.2	61.9	71.3	72.5	46.3	53.0	72.7	74.4	73.8
5:50 PM	74.3	72.6	70.0	47.1	63.8	53.8	60.5	47.9	54.5	62.1	49.1	54.6	67.7	55.4	73.4	71.7	72.6	58.2	55.2	44.3	58.0	41.9	59.2	68.9	69.9	61.4	66.3	74.6	55.9	67.1	69.8	68.3	52.1	64.5	74.3	74.6	74.4
5:55 PM	72.6	73.6	70.9	50.3	63.4	54.6	58.5	51.4	54.8	60.6	46.6	55.3	66.8	60.2	73.0	72.8	72.8	55.2	63.1	45.5	57.2	38.5	61.1	69.4	66.3	59.0	63.6	74.1	61.6	66.6	71.4	70.5	51.6	54.2	72.9	73.5	74.5
6:00 PM	72.8	73.0	70.0	49.5	65.4	57.3	59.8	53.5	58.0	62.1	50.5	53.1	67.9	53.5	72.4	70.3	72.6	51.0	54.5	37.6	60.4	48.6	64.9	71.3	68.2	59.1	62.3	75.1	63.6	67.7	71.9	72.2	63.2	57.6	74.3	74.9	74.3
6:05 PM	73.1	71.6	68.8	46.2	66.3	55.0	58.5	44.2	52.7	61.8	60.2	56.7	68.3	46.6	73.8	72.0	74.2	56.0	54.8	37.8	53.1	41.1	60.6	71.9	69.0	58.6	59.7	75.3	63.9	65.9	70.5	70.6	59.9	58.2	73.5	75.3	74.6
6:10 PM	73.2	72.7	70.7	49.5	66.0	57.2	58.2	39.4	51.2	47.2	64.7	58.4	69.7	63.0	72.6	67.9	73.0	60.5	65.7	40.5	61.6	43.7	66.9	71.8	63.3	59.9	68.9	74.8	61.8	69.3	70.0	71.4	60.5	57.9	74.1	74.6	74.4
6:15 PM	72.3	73.2	71.1	51.5	67.0	57.4	61.4	34.9	49.1	55.2	59.8	51.2	69.1	71.1	72.3	72.3	73.1	62.9	64.4	47.6	66.6	53.9	66.2	72.7	67.9	65.3	70.4	74.9	68.6	68.7	73.3	73.2	68.8	62.8	72.9	74.2	74.0
6:20 PM	72.0	72.4	70.9	49.4	67.6	61.8	61.3	33.6	50.1	51.0	60.9	51.3	68.9	71.6	71.9	72.5	73.0	57.7	62.3	44.3	59.2	42.4	63.5	73.2	70.8	63.6	69.9	74.4	66.5	72.9	73.1	73.2	67.9	67.3	75.3	75.2	74.4
6:25 PM	72.9	72.9	72.0	54.3	67.7	61.2	64.7	41.7	52.5	52.9	52.6	55.3	69.9	70.1	72.7	72.5	72.0	52.8	54.0	40.4	63.8	53.1	62.7	72.3	63.8	58.9	67.8	74.7	68.2	72.0	72.2	71.7	66.9	66.0	74.5	74.6	75.3
6:30 PM	72.0	72.8	71.4	50.7	67.5	63.8	66.7	44.0	53.3	58.0	57.3	54.1	67.8	67.0	72.3	73.1	72.8	58.2	57.8	31.0	58.0	46.0	62.4	73.0	67.0	60.3	69.0	74.8	65.6	71.7	72.9	73.2	68.0	58.6	74.3	75.1	75.0
6:35 PM	73.8	73.7	72.4	51.2	65.3	64.7	65.2	51.6	56.3	62.1	63.9	60.2	70.8	71.8	72.5	72.5	72.6	57.8	64.8	47.2	58.5	49.6	57.3	72.3	69.2	61.0	66.9	74.2	67.1	69.6	71.8	72.3	68.4	59.8	74.1	75.1	73.9
6:40 PM	73.5	73.8	72.7	56.4	68.1	64.8	69.8	68.4	65.3	69.3	68.6	57.5	69.3	69.6	72.2	73.0	72.6	64.0	68.5	49.1	56.9	35.0	62.8	73.2	63.8	63.2	67.7	73.8	63.9	71.8	72.0	71.9	65.8	63.2	75.0	75.9	75.5
6:45 PM	72.9	73.7	72.4	47.9	69.1	68.7	71.0	63.8	65.5	70.8	71.8	66.3	73.5	74.0	74.0	74.6	73.3	59.5	67.8	55.8	65.7	50.3	59.6	71.0	69.5	61.7	67.0	74.7	68.2	73.8	73.0	71.5	64.9	55.3	75.2	75.1	75.2
6:50 PM	74.4	74.1	71.9	53.2	67.1	63.5	70.0	67.0	66.6	71.2	72.0	67.4	72.2	73.7	74.2	74.6	73.7	57.8	71.3	59.7	69.6	47.8	69.0	73.8	70.3	64.6	68.7	74.4	66.3	71.5	71.5	72.1	66.6	64.5	75.3	75.6	74.5
6:55 PM	74.5	74.9	73.9	64.0	70.5	68.0	73.3	70.4	68.5	73.4	73.3	68.9	72.9	73.9	74.1	74.1	74.3	61.1	69.5	58.0	69.4	58.4	69.9	74.4	73.9	66.8	70.0	75.4	71.0	73.5	74.0	73.7	67.5	61.9	73.2	74.4	74.1
7:00 PM	72.0	74.0	72.8	52.5	67.6	64.3	72.7	70.7	71.2	73.8	73.8	71.6	74.3	75.6	75.8	75.9	75.5	62.0	73.1	60.2	72.1	61.1	69.3	74.2	70.8	66.7	69.2	74.7	68.9	73.5	73.9	73.9	71.8	69.9	75.7	75.7	75.4

Table 8-17: Southbound I-15 Inter Peak Observed Speed Contours – Typical Day

Time	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06
10:05 AM	68.1	63.4	62.3	63.5	61.4	68.9	61.1	67.5	65.2	64.0	62.0	64.6	66.8	64.9	65.9	64.6	65.9	63.8	61.2	65.6	61.3	63.6	65.5	61.1	64.2	70.5	63.0	64.6	66.5	66.5	63.0	63.1	65.0	64.1	67.0	63.3	67.5	73.5	69.0
10:10 AM	68.4	63.8	62.3	63.7	61.3	68.9	61.0	67.5	64.8	64.3	62.0	64.6	66.8	64.8	66.0	64.6	66.3	64.0	60.4	65.8	61.4	63.5	65.5	60.2	64.3	70.8	63.1	64.3	66.7	66.0	63.1	62.7	65.2	64.5	67.0	63.4	67.6	73.7	68.9
10:15 AM	68.4	63.7	62.4	63.9	61.7	69.1	61.5	67.4	64.9	64.5	62.2	64.9	66.7	64.9	65.9	64.6	66.1	63.9	59.9	65.7	61.0	63.3	65.4	60.8	63.9	70.5	62.5	64.5	66.6	66.0	62.9	63.2	65.3	64.5	67.2	63.7	67.5	73.9	68.9
10:20 AM	68.3	63.1	61.9	63.8	61.5	69.0	61.5	67.4	64.8	64.5	62.1	65.0	67.1	64.9	65.8	65.0	65.9	63.8	60.6	65.5	61.1	63.5	65.3	60.2	64.2	70.4	62.8	64.4	66.6	66.2	63.0	63.3	64.8	64.4	67.3	63.5	67.4	73.9	68.9
10:25 AM	68.3	63.4	62.4	63.3	61.4	69.0	61.1	67.3	64.8	64.1	61.9	64.9	67.0	64.5	65.4	64.6	65.9	63.8	59.7	65.5	61.5	63.6	65.6	60.8	64.2	70.6	61.9	64.4	66.6	66.1	63.3	63.2	65.1	64.3	67.1	63.7	67.5	73.8	69.0
10:30 AM	68.2	63.5	62.6	64.3	61.5	69.0	61.2	67.4	64.8	63.9	61.9	64.5	66.8	64.4	65.5	64.0	65.9	63.9	60.4	65.6	61.3	63.4	65.2	60.9	64.2	70.4	61.8	64.5	66.5	66.1	63.4	64.1	65.6	64.6	67.3	63.4	67.3	73.9	68.9
10:35 AM	68.4	63.5	62.2	63.9	61.9	69.0	61.3	67.5	65.0	64.1	62.1	64.8	67.1	64.9	65.6	64.6	65.5	63.6	60.0	65.2	60.6	63.2	65.2	60.2	64.1	70.6	62.3	64.7	66.5	65.6	63.3	63.7	65.4	64.6	67.3	63.3	67.2	73.8	68.9
10:40 AM	68.2	63.3	62.1	63.9	61.5	68.8	61.1	67.5	65.0	64.2	62.1	64.7	67.0	64.6	65.6	64.7	66.0	64.1	59.8	65.9	61.3	63.1	65.5	60.0	64.0	70.5	62.2	64.8	66.4	65.7	63.4	63.3	65.4	64.7	67.2	63.3	67.4	73.8	68.9
10:45 AM	68.4	63.4	62.1	63.9	61.6	68.6	61.3	67.3	65.2	64.2	62.0	64.6	66.8	64.5	65.8	64.5	65.8	63.9	60.2	65.7	61.3	63.5	65.5	60.3	64.4	70.5	63.3	64.5	66.7	65.8	63.5	63.8	65.3	64.5	66.9	63.3	67.3	73.7	68.7
10:50 AM	68.3	63.3	62.0	64.0	61.5	69.1	61.3	67.8	64.4	64.3	62.0	64.6	67.1	64.5	65.8	64.3	65.6	63.3	60.1	65.7	60.6	63.4	65.5	60.3	64.3	70.4	62.3	64.5	66.7	65.6	63.6	64.6	65.5	64.8	67.3	63.7	67.4	73.8	68.9
10:55 AM	68.3	63.5	62.4	64.4	61.9	69.1	61.3	67.6	64.7	64.3	62.2	64.9	67.2	64.6	65.6	64.2	66.0	63.8	59.6	65.3	60.8	63.2	65.2	60.3	64.1	70.5	61.7	64.1	66.8	65.5	63.2	63.9	65.0	64.1	67.0	63.3	67.1	74.1	69.0
11:00 AM	68.3	63.9	62.1	63.8	61.8	69.2	61.6	67.8	65.5	64.2	62.5	64.9	67.2	64.8	65.7	64.4	65.6	63.7	60.1	65.3	61.0	63.4	65.3	60.0	64.1	70.4	62.0	64.1	67.0	65.9	63.3	63.9	65.0	64.2	67.0	63.1	67.3	74.0	69.0
11:05 AM	68.2	63.2	62.3	63.7	62.1	69.1	61.8	67.6	65.1	64.3	62.0	64.9	67.2	64.3	65.6	64.1	66.1	63.7	60.9	65.5	61.1	63.3	65.3	59.6	64.3	70.8	62.0	64.5	67.0	65.6	63.1	63.1	65.0	63.9	67.2	63.0	67.4	74.0	69.0
11:10 AM	68.3	63.3	62.5	63.4	61.0	69.0	61.0	67.5	65.0	64.0	61.8	64.4	66.9	64.2	65.5	64.0	65.7	63.5	59.0	65.5	61.2	62.9	65.3	59.8	64.3	70.8	62.1	64.8	67.0	65.8	63.5	63.5	65.1	64.3	67.3	63.2	67.5	74.0	68.8
11:15 AM	68.2	63.1	62.6	63.8	61.3	69.0	60.8	67.5	64.8	64.2	62.0	64.7	66.6	64.1	65.0	64.0	65.8	63.0	59.3	65.1	60.9	62.9	64.9	59.5	63.9	70.6	61.8	64.8	67.0	66.0	63.1	63.5	65.3	64.5	67.2	63.9	67.4	74.2	69.0
11:20 AM	68.3	63.1	62.7	63.7	61.6	69.0	61.0	67.6	64.8	64.3	62.0	64.3	66.5	63.8	64.9	64.0	65.9	63.3	60.0	65.3	60.6	62.8	64.9	60.0	63.8	70.5	61.8	64.2	66.9	65.7	63.0	62.9	65.2	64.0	67.3	63.5	67.3	74.0	69.2
11:25 AM	68.2	63.0	62.9	63.3	61.3	69.1	61.5	67.6	65.0	64.0	62.1	64.4	66.9	64.2	65.5	64.1	65.8	63.3	59.7	64.9	60.5	63.0	65.3	59.3	64.1	70.6	62.0	64.1	66.7	65.5	62.9	63.4	65.1	64.1	67.6	62.8	67.3	74.0	69.1
11:30 AM	68.3	63.3	62.8	63.3	61.1	69.0	61.3	67.4	64.6	64.1	62.1	64.4	66.7	64.0	65.5	64.1	66.0	63.4	59.5	65.3	60.5	63.0	65.0	59.3	63.8	70.5	62.0	64.0	66.8	65.7	62.9	63.3	65.0	64.4	67.4	63.2	67.2	74.0	68.7
11:35 AM	68.2	63.1	63.3	64.0	61.5	69.0	61.5	67.5	64.7	64.1	62.0	64.2	66.8	64.0	65.1	64.0	65.9	63.4	59.3	65.1	60.7	63.1	65.3	59.3	64.1	70.5	61.5	64.4	66.8	65.5	63.3	63.9	65.4	64.3	67.5	63.4	67.3	74.0	68.9
11:40 AM	68.5	63.0	62.5	64.0	61.5	69.2	61.4	67.8	64.5	64.0	62.4	64.5	67.1	64.2	65.6	64.3	65.8	63.2	59.0	65.2	60.9	63.1	65.3	59.8	64.2	70.4	62.3	64.3	66.7	65.7	62.9	62.7	65.2	64.1	67.3	63.4	67.2	73.9	68.9
11:45 AM	68.5	62.9	62.6	63.3	61.3	69.1	61.5	67.9	64.6	64.0	62.1	64.5	66.9	64.0	65.3	64.3	66.0	63.3	60.4	65.5	61.2	63.5	65.5	60.4	64.3	70.4	62.6	64.3	66.6	66.0	63.1	63.1	65.4	64.4	67.4	63.2	67.2	74.0	69.1
11:50 AM	68.5	63.3	63.1	63.9	61.8	69.3	61.7	67.7	64.8	64.6	62.1	64.1	66.8	63.9	65.2	63.9	65.8	62.8	59.5	65.4	61.1	63.5	65.3	60.9	64.5	70.6	61.8	64.4	66.9	65.4	63.5	63.0	65.3	64.3	67.5	63.4	67.3	73.9	69.1
11:55 AM	68.6	63.4	63.2	64.1	61.9	69.3	61.6	67.8	64.9	64.5	62.3	64.3	67.0	64.3	65.8	64.1	65.5	63.3	59.1	65.2	60.9	63.1	65.1	60.1	64.1	70.7	62.4	64.5	66.9	66.0	63.5	63.2	65.5	64.5	67.5	63.6	67.5	74.0	69.1
12:00 PM	68.4	63.4	63.1	64.3	62.3	69.4	62.3	67.9	65.2	64.8	62.4	64.5	66.7	64.3	65.6	64.1	66.0	63.4	59.5	65.2	60.4	63.3	65.2	59.5	64.4	70.5	62.9	64.5	67.1	66.0	63.5	63.6	65.5	64.5	67.9	63.3	67.5	74.1	69.2
12:05 PM	68.5	63.5	62.9	64.1	61.6	69.5	61.9	67.9	65.0	64.6	62.3	64.7	67.1	64.5	65.8	64.3	66.1	64.0	58.9	65.5	61.3	63.4	65.2	60.0	64.3	70.7	62.4	64.1	67.2	65.7	63.1	63.0	65.2	64.5	67.6	63.6	67.5	74.1	69.1
12:10 PM	68.1	63.9	63.3	64.2	62.0	69.4	61.9	68.0	65.0	64.6	62.4	64.6	66.9	64.6	65.8	64.5	65.8	63.8	59.4	65.5	61.3	63.6	65.8	60.0	64.8	70.8	63.1	64.5	67.1	65.8	63.3	63.2	65.3	64.3	67.6	63.5	67.5	74.0	69.2
12:15 PM	68.3	63.7	63.2	64.0	61.8	69.3	61.9	67.8	65.1	65.1	62.5	64.8	67.3	64.6	65.5	64.4	66.0	64.1	59.3	65.3	60.8	63.5	65.5	60.1	64.5	70.6	62.9	64.8	67.0	65.8	63.5	63.1	65.5	64.5	67.6	63.8	67.5	74.0	69.1
12:20 PM	68.4	63.1	63.0	64.1	61.7	69.3	62.1	67.8	65.4	65.0	62.5	64.7	67.0	64.6	65.4	64.6	66.3	63.9	60.0	65.5	61.1	63.8	65.6	59.9	64.9	70.7	62.5	64.7	66.9	66.0	63.6	63.5	65.5	64.5	67.6	63.9	67.3	74.0	69.1
12:25 PM	68.6	64.1	63.3	64.2	61.7	69.1	62.1	67.6	65.1	65.1	62.9	64.9	67.1	64.5	65.8	64.5	65.8	63.8	59.9	65.7	61.1	63.5	65.6	60.0	65.1	70.6	62.4	64.7	67.1	66.3	63.4	63.6	65.8	64.7	67.9	64.0	67.4	74.0	69.1
12:30 PM	68.6	64.0	63.9	65.0	62.1	69.3	62.0	67.8	64.8	64.8	62.7	64.5	67.0	64.6	65.5	64.0	66.0	63.9	60.2	65.8	61.2	63.7	65.5	60.3	64.6	70.5	62.9	64.5	67.0	65.6	63.6	63.5	65.9	65.0	67.8	63.9	67.4	73.8	69.1
12:35 PM	68.5	64.1	63.7	64.8	62.3	69.1	62.0	68.0	65.0	64.9	62.9	64.9	67.0	64.7	65.8	64.5	65.8	63.6	59.6	65.7	61.5	63.6	65.6	60.0	64.7	70.6	63.0	64.5	66.9	66.1	63.6	63.7	65.5	64.6	67.4	64.0	67.2	73.8	69.2
12:40 PM	68.5	63.9	63.1	64.0	62.1	69.1	62.2	67.9	65.1	65.0	62.7	64.8	67.2	64.5	65.3	64.3	65.7	63.8	59.2	66.0	61.6	63.6	65.9	59.9	64.8	70.6	62.8	64.7	67.0	65.8	63.5	63.1	65.6	65.0	67.5	64.0	67.3	73.6	68.9
12:45 PM	68.4	63.7	63.5	64.3	62.4	69.1	62.2	67.9	65.5	65.1	62.8	64.6	66.9	64.2	65.2	63.8	66.2	63.6	59.6	66.0	61.5	64.1	66.0	60.8	65.0	70.4	63.5	65.0	66.8	66.5	64.0	62.8	66.0	65.3	67.6	64.0	67.4	73.8	69.0
12:50 PM	68.4	64.2	63.7	64.9	62.5	69.5	62.5	68.0	65.5	65.2	63.0	64.8	67.1	64.5	65.5	64.3	66.4	63.9	60.1	66.1	61.4	63.9	65.5	61.4	64.9	70.5	63.9	64.8	67.0	65.9	64.1	63.8	66.2	65.4	67.5	64.6	67.5	73.7	69.0
12:55 PM	68.5	64.2	63.4	64.8	62.1	69.4	62.2	68.0	65.5	65.3	63.2	65.2	67.3	65.1	65.8	64.2	66.2	64.0	60.1	65.8	61.6	63.7	65.7	60.4	65.1	70.4	64.2	64.5	66.9	65.1	63.7	63.8	65.8	65.1	67.8	64.4	67.6	73.6	69.0
1:00 PM	68.5	64.2	63.3	64.0	61.9	69.4	61.7	67.9	65.2	64.9	62.9	64.6	66.9	64.8	65.7	64.6	66.0	63.8	59.5	66.1	61.8	64.2	66.1	61.0	65.1	70.8	64.2	64.5	66.9	65.2	63.8	64.3	65.9	65.0	67.7	63.9	67.6	73.9	69.0
1:05 PM	68.3	64.4	63.0	64.2	62.1	69.2	61.9	68.0	65.7	65.4	63.0	65.0	67.1	64.8	65.7	64.4	66.0	63.9	60.0	65.9	61.5	64.0	65.8	60.5	64.8	70.6	61.2	64.9	67.2	65.7	64.0	64.5	66.0	65.1	67.9	64.4	67.6	73.7	69.0
1:10 PM	68.4	63.2	63.2	64.1	61.5	69.2	62.3	68.0	64.5	65.3	63.0	64.9	67.0	64.9	65.5	64.6	66.5	64.3	60.1	66.1	62.0	63.9	65.6	61.2	65.2	70.6	61.9	64.6	67.2	65.4	63.7	64.4	65.9	65.1	67.6	64.3	67.6	73.7	69.2
1:15 PM	68.1	63.8	63.4	64.5	61.7	69.1	62.1	68.0	64.9	65.0	62.9	64.7	66.9	64.6	65.4	64.6	66.3	64.0	59.8	66.2	61.9	64.0	65.7	61.0	65.1	70.7	62.6	64.9	67.1	65.5	63.5	63.8	66.0	64.9	67.8	64.2	67.6	73.8	69.3
1:20 PM	68.5	64.5	62.9	64.3	61.9	68.8	61.8	67.8	64.9	65.4	63.1	64.8	66.9	64.7	65.4	64.0	65.7	63.6	58.7	66.3	61.9	64.1	65.5	61.4	64.8	70.5	62.7	64.7	67.1	65.8	63.7	64.8	66.1	65.2	67.8	64.5	67.7	73.6	69.3
1:25 PM	68.3	64.2	63.9	64.7	62.0	69.0	62.2	67.9	65.0	65.2	63.0	65.0	66.5	64.7	65.3	64.1	66.0	64.0	59.9	66.2	62.1	64.2	65.7	61.4	64.7	70.4	63.0	64.5	67.2	65.5	63.7	63.1	66.0	65.2	67.9	64.1	67.5	73.6	69.1
1:30 PM	68.5	64.0	63.8	65.0	62.4	69.1	62.2	67.9	65.0	65.3	63.3	65.2	66.9	64.7	65.5	64.0	65.9	64.0	59.9	66.5	61.9	64.1	65.7	61.3	64.8	70.6	63.0	64.7	67.2	65.8	63.8	62.8	65.9	65.0	67.8	64.4	67.6	73.7	69.0
1:35 PM	68.2	63.5	63.3	64.3	62.1	69.0	62.3	67.9	64.6	65.0	63.1	64.9	66.6	64.8	65.7	64.5	66.2	64.4	60.3	66.6	62.2	64.2	65.6	61.3	64.7	70.6	63.0	64.3	66.9	66.2	63.5	62.9	66.0	64.7	67.7	64.3	67.5	73.7	69.0
1:40 PM	68.1	63.6	62.8	64.7	62.2	68.9	61.9	67.8	64.6	65.0	63.3	65.2	66.4	64.6	65.4	63.9	65.9	64.0	59.6	65.8	61.5	64.0	65.6	61.5	64.8	70.7	64.1	65.0	67.1	66.2	63.8	63.1	65.8	65.1	67.9	64.3	67.6	73.5	69.0
1:45 PM	68.3	64.0	63.0	64.2	61.8	69.0	62.2	67.9	65.0	65.3	63.1	64.9	66.7	64.5	65.2	64.1	65.7	64.0	59.9	65.8	61.2	63.9	65.3	61.2	64.4	70.4	63.3	64.4	66.8	66.4	63.9	64.4	66.1	65.3	67.7	64.4	67.7	73.6	69.1
1:50 PM	68.4	64.2	63.3	64.1	62.1	69.2	62.0	67.8	65.1	65.0	62.9	65.1	66.8	64.6	65.5	64.1	65.7	63.9	59.7	65.9	61.4	63.6	65.1	60.6	64.2	70.2	62.6	64.4	66.8	66.0	63.4	64.3	65.8	64.7	67.3	64.2	67.4	73.4	69.0
1:55 PM	68.3	64.1	62.7	63.9	62.4	69.0	62.6	68.1	65.1	65.3	63.2	64.8	66.6	64.8	65.5	64.4	65.9	64.0	59.7	66.1	61.6	63.8	65.2	61.1	64.4	70.3	61.9	63.6	66.8	65.0	63.0	63.1	65.1	64.1	67.0	63.8	67.2	73.0	69.0
2:00 PM	68.3	64.0	63.4	63.9	61.9	69.0	62.4	67.9	64.7	65.6	63.4	65.3	66.8	64.8	65.5	64.5	66.3	64.1	59.1	66.2	61.8	63.4	65.0	60.2	64.1	70.3	62.2	63.8	66.8	64.8	63.0	63.3	64.9	64.1	67.0	63.6	67.1	72.9	68.5

Table 8-18: Southbound I-15 Inter Peak Modeled Speed Contours – Typical Day

Time	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06
10:05 AM	73.6	72.6	74.7	67.8	70.8	66.3	62.8	68.6	68.3	65.4	71.0	69.3	73.6	75.5	75.5	73.4	75.2	73.8	74.7	75.1	73.3	73.0	75.7	72.3	74.4	72.3	72.7	76.2	65.3	72.5	68.6	73.8	73.1	73.4	73.1	73.6	73.9	74.0	74.3
10:10 AM	75.3	74.2	74.3	61.8	65.4	61.6	62.3	67.2	68.4	64.3	70.0	70.5	72.7	72.8	72.3	71.2	74.0	70.9	74.5	73.6	68.8	72.7	76.0	71.1	74.3	71.4	74.3	75.5	69.1	72.9	72.7	75.4	74.7	74.8	77.4	72.5	74.0	74.8	74.7
10:15 AM	74.5	73.5	74.3	63.6	66.4	62.4	64.9	68.7	69.9	66.7	68.2	67.3	72.8	72.8	72.4	71.0	73.9	71.5	73.5	73.3	71.9	68.7	74.4	68.7	73.3	70.7	72.6	75.7	65.4	73.3	74.5	75.4	74.6	74.8	76.5	74.4	74.9	74.7	75.1
10:20 AM	73.7	72.4	73.6	63.3	63.7	62.8	65.6	70.0	69.6	67.3	69.6	70.9	73.3	73.2	73.1	71.6	73.6	70.2	73.6	73.5	71.7	71.2	74.1	69.6	72.4	70.6	71.9	75.0	67.3	71.6	72.8	74.7	74.6	74.7	76.7	74.5	74.4	74.7	74.9
10:25 AM	73.5	73.2	73.8	66.4	67.9	64.3	65.4	68.1	71.1	69.8	70.7	69.3	72.5	72.2	72.8	72.1	74.5	72.5	74.0	73.5	70.5	69.6	75.0	69.3	73.6	70.4	69.8	75.0	66.2	72.2	70.2	74.3	73.8	74.1	77.0	74.9	75.0	74.6	75.6
10:30 AM	73.9	73.0	73.6	65.0	66.9	63.3	68.5	70.0	69.2	67.3	70.6	72.6	74.0	73.5	73.3	71.8	74.5	72.2	73.6	72.4	69.2	68.3	74.4	67.2	72.5	69.9	72.0	75.4	65.6	72.5	72.6	74.2	73.3	73.3	76.1	73.8	74.4	74.3	74.6
10:35 AM	74.8	71.9	73.1	66.0	65.9	63.2	63.9	67.1	68.5	66.6	69.9	71.1	73.5	73.9	74.1	71.8	74.4	72.2	74.1	74.8	70.2	70.5	75.6	70.3	73.4	70.6	72.2	74.6	64.9	71.1	71.2	73.9	73.8	74.2	75.7	73.0	74.7	74.8	74.7
10:40 AM	75.1	73.1	74.2	63.7	68.4	66.6	61.3	66.8	68.9	66.5	69.3	70.1	72.2	72.8	73.6	71.1	74.3	72.5	74.3	73.6	71.8	71.7	74.2	67.6	72.8	70.0	72.6	75.5	63.3	72.1	69.1	74.3	74.4	74.8	76.9	73.7	73.6	72.2	74.8
10:45 AM	74.0	73.6	73.1	64.4	64.5	61.9	65.1	68.4	70.9	68.9	70.7	70.5	72.8	73.3	73.0	71.8	74.0	72.0	73.3	72.8	71.2	71.0	74.4	69.2	73.0	70.7	71.9	75.5	67.4	69.2	73.1	74.5	73.3	73.9	74.4	75.0	74.4	74.6	74.6
10:50 AM	74.2	72.4	74.0	59.4	63.1	60.9	66.4	69.6	67.7	63.7	69.1	69.7	73.0	72.9	73.8	71.9	73.7	71.8	73.4	73.1	70.8	69.1	74.4	69.3	71.9	67.0	70.2	74.7	66.3	73.3	73.4	74.6	74.2	74.4	75.0	74.0	73.4	74.4	74.7
10:55 AM	74.6	74.2	73.1	64.6	68.4	65.7	61.7	66.1	66.5	62.4	68.3	68.2	72.4	72.9	72.8	71.8	74.2	72.6	73.8	73.3	68.9	70.9	74.7	70.2	72.9	69.7	71.9	74.8	64.4	70.1	71.6	73.9	73.6	73.9	75.0	74.3	75.0	74.7	75.1
11:00 AM	74.4	72.7	73.2	67.9	69.4	67.7	69.0	69.4	69.1	64.6	70.6	71.2	73.5	73.5	73.1	71.5	73.9	71.5	73.4	73.3	70.4	69.6	73.5	68.0	72.6	70.4	72.0	75.9	67.7	73.8	75.2	74.8	73.9	74.3	76.8	73.0	73.5	74.2	75.1
11:05 AM	75.5	74.7	73.7	61.9	65.0	60.9	67.3	68.7	68.3	66.0	71.6	72.2	74.6	74.6	74.2	73.1	74.7	73.2	74.2	73.5	72.2	70.8	75.2	69.8	72.0	69.6	71.0	74.5	66.9	72.5	71.7	74.6	73.4	73.5	74.9	74.8	74.6	75.1	75.1
11:10 AM	75.0	74.1	74.9	61.0	67.5	64.4	67.9	69.1	68.1	63.2	68.4	70.7	72.1	72.7	73.0	72.1	74.4	72.6	74.1	74.2	72.6	72.6	74.6	70.7	74.9	71.8	72.3	75.4	69.8	73.5	71.7	74.8	74.5	74.7	77.0	74.1	74.2	74.6	74.5
11:15 AM	74.5	72.8	73.2	58.9	68.0	63.4	65.7	67.8	70.4	67.6	70.7	71.9	74.1	74.2	74.3	73.0	74.5	72.9	73.7	73.4	72.1	69.4	74.9	69.5	73.5	70.3	72.6	75.3	69.7	73.4	74.6	75.1	74.2	74.0	76.9	74.1	74.4	75.2	75.3
11:20 AM	75.3	73.5	73.3	62.4	67.4	65.2	63.8	66.3	68.1	63.4	67.2	69.4	72.3	73.4	73.6	71.2	74.7	72.1	73.6	74.2	71.5	70.6	75.1	70.0	73.6	71.3	71.8	75.4	68.3	73.8	72.9	75.4	74.3	74.5	76.8	74.7	74.9	74.7	75.1
11:25 AM	75.0	73.5	74.2	62.4	65.1	60.5	66.8	67.3	67.8	65.2	70.1	70.3	71.7	73.3	72.8	70.1	73.8	72.5	73.7	73.3	69.5	68.7	74.1	69.9	73.7	69.9	72.6	75.6	68.3	73.5	74.6	75.3	74.5	74.6	76.7	74.4	74.5	74.3	75.0
11:30 AM	74.8	73.7	74.7	58.1	68.9	66.5	65.5	69.5	69.3	65.2	71.5	72.1	74.0	73.7	74.0	72.6	74.4	72.0	73.5	73.1	70.6	70.2	74.4	69.3	73.1	68.9	72.0	75.7	68.1	73.3	73.3	74.9	74.0	74.5	77.2	75.0	74.4	74.9	75.4
11:35 AM	73.8	73.5	74.0	60.5	68.8	65.7	69.3	69.8	67.9	62.1	70.7	71.9	74.3	73.4	73.3	72.6	74.6	72.3	74.6	74.9	67.9	69.6	75.8	69.4	73.8	68.2	70.4	75.2	68.2	73.0	73.7	74.6	73.1	73.3	75.6	74.0	73.9	75.2	75.4
11:40 AM	75.7	74.6	74.8	61.9	64.4	60.0	62.8	67.9	69.9	67.8	69.8	71.1	72.2	73.0	73.2	73.0	74.2	71.7	73.5	74.3	71.8	70.0	74.5	70.8	72.7	66.2	71.9	76.1	65.6	73.2	71.7	74.7	74.8	74.8	77.0	74.5	74.4	74.5	74.5
11:45 AM	74.0	72.9	73.4	59.0	62.3	59.2	63.7	66.1	64.9	61.1	68.1	69.1	72.6	73.4	73.0	71.1	73.8	71.8	73.2	73.3	70.5	68.5	75.1	69.5	73.6	70.8	71.6	74.7	66.8	71.7	71.8	74.5	73.8	73.8	75.9	73.2	73.8	74.5	75.3
11:50 AM	75.0	73.8	74.8	65.0	66.1	62.0	63.0	67.5	69.6	64.4	70.8	71.1	72.1	73.0	72.8	71.4	73.8	72.2	72.8	73.3	70.8	66.0	74.6	70.0	71.6	69.2	71.1	75.1	66.0	63.6	73.5	75.4	73.6	73.7	75.3	73.7	74.1	74.3	74.6
11:55 AM	74.5	73.6	73.3	62.3	68.3	65.3	68.6	70.0	68.7	64.4	71.0	71.1	74.0	73.2	72.8	71.5	74.7	71.8	73.6	72.7	70.5	69.5	74.0	69.6	72.3	69.7	71.1	75.0	62.7	68.1	72.0	74.3	73.8	73.9	72.3	74.6	74.0	74.4	75.1
12:00 PM	74.3	73.2	72.6	60.9	68.6	65.0	70.0	70.8	67.4	59.3	70.3	71.9	74.2	73.5	73.6	71.1	74.3	72.3	73.9	73.3	65.1	68.5	74.8	69.8	74.0	71.0	72.4	74.2	67.8	72.8	71.1	74.4	74.0	74.1	76.0	74.3	74.5	74.4	74.9
12:05 PM	76.0	74.5	75.0	60.5	66.6	62.5	66.7	67.9	66.6	62.9	70.6	69.4	73.8	73.8	73.3	72.4	74.8	70.8	74.3	74.3	71.0	70.7	75.8	70.5	73.1	71.8	72.9	75.5	67.1	72.3	73.9	74.8	74.4	74.8	75.5	73.6	74.6	74.9	74.7
12:10 PM	75.1	73.6	75.0	60.3	69.1	63.5	71.0	71.8	68.6	63.7	72.7	72.9	75.6	74.7	74.0	73.2	74.2	71.8	73.6	73.4	68.8	70.3	74.8	69.6	73.8	71.2	72.1	76.1	67.7	73.5	73.5	75.3	74.1	74.7	77.0	74.4	74.5	75.1	75.1
12:15 PM	74.7	74.8	75.1	63.7	66.0	62.9	67.1	69.5	72.2	68.0	72.4	71.7	72.8	74.6	74.3	72.7	74.9	73.8	74.6	74.7	71.5	72.2	75.7	71.1	73.2	68.6	72.1	75.4	66.4	72.7	73.7	74.9	74.4	74.2	76.5	74.4	75.3	74.7	74.9
12:20 PM	74.6	73.5	73.6	60.3	67.6	65.7	68.1	70.5	69.8	64.8	72.1	71.6	73.9	74.5	73.8	72.5	74.6	73.4	74.7	74.3	72.3	70.7	75.5	70.6	73.7	70.2	72.9	76.1	68.6	70.8	72.7	75.3	74.5	74.5	76.8	74.4	74.3	75.1	74.7
12:25 PM	75.5	74.1	73.9	62.9	69.0	63.4	70.3	71.0	67.4	62.3	71.9	72.2	72.8	73.7	74.0	72.6	74.6	71.7	73.5	74.5	72.3	71.4	75.4	71.1	73.9	72.0	73.3	76.0	68.8	72.9	73.6	75.6	74.1	73.9	75.7	74.5	75.5	74.5	74.3
12:30 PM	74.3	73.2	73.7	61.3	66.9	64.7	66.8	71.1	69.0	64.4	71.5	69.9	73.9	74.6	74.2	73.3	75.0	72.9	73.9	73.4	71.5	69.8	74.4	69.6	73.5	70.6	72.5	75.3	70.4	71.7	73.6	74.9	74.4	74.5	76.5	74.9	74.5	75.2	75.1
12:35 PM	75.9	74.1	75.3	59.7	68.1	65.6	64.6	67.2	68.1	64.2	70.5	71.9	73.2	74.7	74.6	71.6	75.0	71.9	74.3	74.1	71.3	68.5	75.3	70.3	73.5	70.3	72.3	75.7	65.0	72.4	73.3	75.1	74.0	73.9	76.5	73.9	74.6	74.1	75.5
12:40 PM	74.8	73.3	74.8	57.6	65.5	61.0	68.4	70.1	69.5	66.3	71.3	72.3	72.9	73.4	73.3	71.1	74.0	73.5	74.7	73.9	72.0	70.2	74.8	69.3	71.4	69.5	71.9	75.8	66.8	73.3	72.9	75.1	74.2	74.1	76.3	74.2	75.0	75.1	75.0
12:45 PM	75.2	73.8	74.4	64.5	66.3	63.0	65.8	67.9	64.7	57.8	71.0	71.4	74.5	74.1	74.3	72.6	74.9	73.0	74.6	74.8	72.4	70.7	75.4	69.9	73.2	72.0	73.8	75.9	67.1	70.5	68.6	73.9	73.6	73.2	74.6	74.2	75.3	73.9	74.5
12:50 PM	75.2	73.6	72.6	62.4	65.8	61.9	60.2	67.0	66.4	63.6	70.9	70.3	73.4	73.1	73.1	71.5	74.0	72.1	73.8	73.6	71.8	69.9	75.2	68.7	72.5	70.0	71.8	75.9	67.5	73.8	72.1	75.3	74.3	74.6	71.4	74.5	74.9	75.2	75.1
12:55 PM	75.4	74.5	76.0	64.9	68.3	65.7	66.1	69.5	67.6	63.3	69.1	68.8	72.5	73.3	73.5	71.1	75.2	73.9	75.2	73.7	71.3	68.9	74.3	67.6	73.3	70.2	71.9	75.4	66.1	73.1	72.3	74.6	72.9	73.7	75.2	74.0	73.5	74.1	74.4
1:00 PM	75.4	74.2	73.6	61.9	68.9	63.1	68.5	70.7	69.9	64.5	72.4	72.8	74.4	74.3	74.1	72.2	74.9	72.4	73.7	74.0	72.0	71.4	75.1	71.1	73.5	71.2	72.7	75.5	66.5	74.4	71.0	75.1	74.1	73.9	72.5	73.0	73.5	73.6	74.5
1:05 PM	75.3	74.5	73.8	62.1	68.2	65.0	67.2	69.7	69.5	65.9	70.8	69.6	72.2	74.2	74.1	73.2	74.7	73.9	74.6	74.7	64.8	71.5	75.4	70.8	73.8	71.8	72.7	75.7	68.0	73.8	73.1	75.1	75.1	75.1	77.0	74.5	74.3	74.6	75.2
1:10 PM	74.6	73.2	73.9	66.3	68.6	65.2	69.4	70.0	71.4	67.8	72.1	70.5	72.4	74.1	74.3	72.1	74.5	71.6	74.1	73.6	71.8	71.4	75.4	71.5	73.0	69.8	74.0	76.2	70.1	74.4	73.2	75.2	74.4	74.2	76.8	74.2	74.7	75.2	74.9
1:15 PM	75.4	74.0	74.5	67.5	66.6	64.4	66.2	69.7	70.0	65.3	71.5	72.5	73.7	73.7	74.0	72.7	74.6	73.1	74.1	74.3	70.6	68.4	75.2	70.9	74.5	71.6	71.7	75.9	69.7	69.8	73.0	75.5	74.5	74.8	76.5	74.3	75.6	75.3	74.3
1:20 PM	75.5	75.3	75.6	67.7	67.4	62.6	69.3	69.9	68.8	65.2	71.4	71.9	74.6	74.1	73.7	72.7	74.6	73.2	74.7	74.4	72.5	70.9	75.4	69.8	72.8	68.3	72.0	75.7	69.2	73.1	72.5	75.1	74.1	74.1	77.1	74.2	75.5	74.5	74.5
1:25 PM	75.1	72.8	74.2	66.8	69.5	65.0	71.1	71.3	67.3	61.6	72.0	71.2	73.9	74.2	74.1	72.6	74.5	72.6	74.2	73.1	69.8	71.3	75.0	71.0	72.6	69.3	72.4	75.4	67.3	73.6	73.0	74.7	73.7	74.2	74.4	74.9	74.5	75.0	75.5
1:30 PM	74.3	73.4	74.1	64.4	67.8	63.3	68.8	71.0	69.6	65.3	72.7	72.4	74.3	74.6	74.5	73.9	75.0	73.5	74.3	74.1	71.1	72.0	74.7	69.5	72.6	69.3	72.6	75.6	71.1	74.3	69.1	75.8	74.5	74.6	75.8	73.8	74.0	74.8	74.4
1:35 PM	75.3	73.5	73.8	63.0	68.1	62.6	66.3	70.4	71.6	69.6	72.7	70.3	75.0	74.2	74.3	72.1	74.3	72.5	74.4	73.9	70.5	71.7	75.6	70.8	74.4	69.9	73.5	75.7	67.6	73.2	72.9	75.1	74.2	74.7	73.9	74.1	74.1	74.2	75.2
1:40 PM	74.4	73.9	74.2	60.5	64.9	61.6	67.1	68.5	66.4	63.5	71.6	71.0	72.1	73.8	73.3	71.5	74.6	73.0	74.3	74.6	69.8	71.7	74.9	69.9	73.0	69.4	71.9	75.6	67.3	70.2	73.0	75.4	74.5	74.6	77.0	74.9	75.3	75.0	74.8
1:45 PM	75.8	74.0	73.7	54.3	63.7	60.4	65.0	66.8	64.8	60.5	69.7	71.0	73.6	74.1	74.3	73.1	74.1	72.5	73.5	73.0	66.3	67.9	74.4	67.7	72.5	71.8	72.8	75.2	68.3	73.2	70.6	74.0	73.6	73.7	76.0	74.1	74.0	74.7	74.8
1:50 PM	73.2	73.3	74.4	61.4	61.8	58.0	64.5	64.8	63.3	59.6	68.1	68.3	71.2	72.3	72.7	70.1	74.6	72.9	74.4	73.9	69.7	69.6	74.8	68.0	72.8	69.0	71.0	75.1	63.9	71.1	70.8	74.8	73.6	74.1	74.7	73.4	74.2	74.9	74.7
1:55 PM	75.0	74.0	74.2	53.4	63.4	60.2	66.2	68.0	63.1	57.1	70.7	70.1	71.9	74.0	73.3	70.5	73.4	71.5	73.3	73.7	70.9	68.6	75.0	69.9	73.4	69.5	72.1	75.3	67.2	73.2	72.3	73.9	73.0	73.2	73.7	73.4	74.8	74.0	74.7
2:00 PM	74.4	73.6	74.3	57.4	63.7	59.3	61.3	66.9	65.1	61.4	70.3	70.9	74.4	73.5	73.1	72.1	73.8	72.2	73.3	72.5	61.2	71.1	75.0	70.1	72.0	65.7	69.6	75.4	64.9	72.1	72.4	74.9	73.4	73.7	76.6	73.0	74.1	74.6	74.4

Table 8-19: Northbound I-15 Inter Peak Observed Speed Contours – Typical Day

Time	1115713	1120611	1115721	1117909	1108536	1122469	1120167	1108439	1115739	1108415	1115749	1108717	1108585	1122487	1113985	1123002	1108590	1123030
10:05 AM	70.3	66.7	66.5	68.5	62.8	68.4	63.3	63.1	62.4	63.6	67.8	64.5	64.8	69.0	64.2	61.6	64.0	60.7
10:10 AM	70.6	66.9	66.6	68.7	62.9	68.5	63.6	63.6	62.4	63.3	67.7	64.0	64.3	69.1	63.6	61.8	63.9	60.5
10:15 AM	70.6	66.9	66.5	68.8	62.8	68.6	63.3	63.0	62.2	63.3	67.9	64.0	64.6	69.0	63.6	61.9	63.4	60.4
10:20 AM	70.6	67.1	66.4	68.6	62.6	68.6	63.4	63.4	62.6	63.5	68.0	64.0	64.4	69.0	63.8	61.8	63.4	60.3
10:25 AM	70.5	67.2	66.4	68.7	62.6	68.5	63.1	63.2	62.5	63.1	67.9	64.0	64.1	69.0	63.3	61.7	63.4	60.6
10:30 AM	70.4	67.0	66.3	68.3	62.8	68.5	62.9	63.0	62.0	63.0	67.8	63.9	64.2	69.0	62.9	61.5	63.5	60.3
10:35 AM	70.3	67.2	66.3	68.3	62.8	68.5	63.2	63.2	61.9	63.4	67.9	64.1	64.3	68.6	63.2	61.5	63.5	59.7
10:40 AM	70.4	67.4	66.2	68.5	62.6	68.6	63.3	63.6	62.5	63.5	67.6	64.0	64.2	69.0	64.0	61.6	63.3	59.9
10:45 AM	70.7	66.8	66.3	68.3	62.6	68.3	63.3	63.3	62.3	63.4	67.6	64.0	64.3	68.9	63.7	61.6	63.5	60.1
10:50 AM	70.5	67.0	66.2	68.3	62.8	68.2	63.4	63.4	62.0	63.0	67.6	64.3	64.8	68.9	63.8	61.9	63.8	60.5
10:55 AM	70.5	67.1	66.2	68.3	62.7	68.2	63.5	63.4	62.1	63.3	67.6	64.3	64.5	68.9	63.9	61.6	63.4	60.5
11:00 AM	70.8	67.4	66.4	68.2	62.6	68.4	63.1	63.1	62.0	63.1	67.8	64.1	64.1	69.0	63.7	61.2	63.4	60.4
11:05 AM	70.9	67.5	66.3	68.2	63.0	68.5	63.5	63.3	62.3	63.2	67.7	63.9	64.2	69.1	63.5	61.5	63.0	60.4
11:10 AM	70.7	67.2	66.3	68.5	62.7	68.5	63.4	63.2	62.4	63.4	67.5	64.2	64.4	69.0	63.9	61.4	63.6	60.2
11:15 AM	70.5	67.6	66.3	68.4	62.9	68.4	63.6	63.3	62.0	63.4	67.6	64.4	64.5	69.0	63.7	61.2	63.5	60.4
11:20 AM	70.4	67.5	66.4	68.3	62.8	68.3	63.6	63.8	62.5	63.5	67.8	64.4	65.0	69.0	63.9	61.1	63.4	60.5
11:25 AM	70.5	67.5	66.1	68.2	62.5	68.3	63.5	63.5	62.0	63.5	67.7	64.3	64.7	69.0	64.1	61.6	63.7	60.6
11:30 AM	70.5	67.8	66.2	68.0	62.8	68.2	63.5	63.5	62.3	63.4	67.6	64.1	64.7	69.0	64.1	61.3	63.6	61.1
11:35 AM	70.8	67.8	66.0	68.3	63.0	68.2	63.8	63.9	62.1	63.5	67.6	64.3	64.6	69.1	64.1	61.4	63.8	60.8
11:40 AM	70.5	67.8	66.1	68.1	62.8	68.0	63.5	63.8	62.3	63.7	67.5	64.1	65.0	69.1	64.3	61.6	63.7	60.6
11:45 AM	70.7	67.5	66.0	68.3	63.1	68.0	63.9	63.6	62.5	63.6	67.6	64.1	65.1	69.1	63.7	61.3	63.8	61.0
11:50 AM	70.5	67.9	66.0	68.1	63.0	68.0	63.8	63.9	62.5	63.8	67.5	64.5	65.2	69.1	63.7	61.1	63.9	61.1
11:55 AM	70.3	67.6	66.4	68.1	63.0	68.2	63.6	63.9	62.1	63.6	67.5	64.4	65.3	68.9	64.0	61.3	63.9	60.9
12:00 PM	70.6	67.7	66.3	68.0	62.5	68.0	63.4	63.8	62.3	64.0	67.5	64.4	65.3	69.1	63.9	61.0	63.8	60.9
12:05 PM	70.4	67.4	66.4	67.8	62.4	68.0	63.1	63.5	61.9	63.6	67.4	64.3	64.7	69.0	63.8	61.0	63.5	60.6
12:10 PM	70.7	67.6	66.4	67.7	62.5	67.8	63.3	63.5	62.0	63.4	67.3	64.1	64.9	69.0	64.0	61.3	63.5	60.3
12:15 PM	70.7	67.6	66.4	67.8	62.9	67.7	63.2	63.5	61.9	63.3	67.1	64.3	65.1	68.9	64.1	61.4	63.7	60.7
12:20 PM	70.5	67.4	66.4	67.3	62.7	67.8	63.2	63.5	62.3	63.6	67.1	64.3	65.0	69.0	64.0	61.4	64.0	60.6
12:25 PM	70.6	67.9	66.3	67.3	62.9	67.9	63.8	63.9	62.3	63.5	67.0	64.7	65.4	68.8	64.3	61.3	64.0	61.0
12:30 PM	70.6	67.9	66.3	67.7	63.0	67.9	63.9	64.5	62.5	64.0	67.0	64.6	65.0	68.6	64.5	61.5	63.8	60.9
12:35 PM	70.6	67.8	66.0	67.7	62.9	67.8	63.6	64.1	62.4	64.1	67.1	64.7	65.1	68.8	64.6	61.9	63.6	60.9
12:40 PM	70.1	67.7	66.1	68.0	62.9	67.9	63.6	64.2	62.4	63.8	67.0	64.6	65.5	68.9	64.5	61.5	64.0	60.8
12:45 PM	70.4	67.4	66.0	67.5	63.0	67.8	63.8	64.4	62.6	64.0	66.9	64.6	65.2	68.4	64.3	61.5	64.0	60.8
12:50 PM	70.3	67.6	66.1	67.2	63.1	67.8	63.9	64.0	62.5	63.9	67.0	64.8	65.7	68.6	64.5	61.8	64.1	61.1
12:55 PM	70.4	68.0	66.2	67.3	63.1	67.7	63.9	64.1	62.6	63.9	67.1	64.8	65.6	68.7	64.4	61.8	64.2	61.6
1:00 PM	70.3	67.7	66.2	67.4	63.1	67.8	63.8	64.2	62.8	64.0	67.2	64.7	65.5	68.9	64.7	61.8	64.6	61.5
1:05 PM	70.4	67.9	66.1	67.1	62.8	67.9	63.7	63.9	62.4	63.6	67.1	64.8	65.6	68.9	64.5	61.7	64.4	61.5
1:10 PM	70.5	67.5	66.0	67.0	62.6	67.8	63.5	63.9	62.5	63.4	67.0	64.5	65.4	68.5	64.6	61.6	64.4	61.4
1:15 PM	70.1	67.6	65.8	66.9	62.6	67.5	63.5	63.5	62.0	63.4	67.0	64.4	65.3	68.8	64.6	61.7	64.2	61.1
1:20 PM	69.8	67.5	65.8	66.8	62.4	67.4	63.1	63.4	62.1	63.2	66.7	64.2	65.4	68.6	63.9	61.6	64.2	61.1
1:25 PM	69.8	67.8	65.8	66.6	62.8	67.4	63.3	64.1	62.1	63.7	66.7	64.2	65.4	68.5	64.4	61.4	64.1	60.9
1:30 PM	70.0	67.6	65.7	66.8	62.6	67.2	63.8	63.6	62.1	63.6	66.8	64.7	65.9	68.5	64.6	61.9	64.5	61.3
1:35 PM	70.1	67.6	65.5	66.5	62.6	67.3	63.5	64.1	62.6	63.9	66.7	64.8	66.0	68.4	64.0	61.7	64.3	61.1
1:40 PM	69.8	67.4	65.6	66.5	62.5	67.3	63.5	64.1	62.5	63.9	66.7	64.8	66.0	68.4	64.6	61.7	64.6	61.3
1:45 PM	69.7	67.4	65.5	66.8	62.4	67.3	63.4	63.9	62.3	63.5	66.7	64.6	65.8	68.6	65.0	61.7	64.8	61.5
1:50 PM	69.5	67.3	65.2	66.3	62.3	67.1	63.6	63.6	62.1	63.5	66.5	64.7	65.8	68.4	64.8	61.5	64.5	61.2
1:55 PM	69.3	67.1	65.2	66.3	62.2	66.9	63.5	63.9	62.2	63.7	66.8	64.7	65.9	68.3	64.6	61.9	64.6	61.5
2:00 PM	69.2	67.3	65.4	66.0	62.6	66.9	63.5	63.6	62.2	63.6	66.3	64.3	65.9	68.1	64.5	61.8	64.7	61.0

Time	1108592	1120994	1108597	1121037	1108595	1121099	1121131	1108562	1121118	1108767	1121067	1125872	1108769	1125886	1108771	1108773	1119736	1119743	1119749
10:05 AM	64.5	61.3	63.2	62.7	64.5	62.5	64.5	65.0	62.9	59.7	58.5	69.0	64.5	67.6	60.5	60.1	59.0	68.5	68.2
10:10 AM	64.4	61.4	62.6	62.5	64.5	62.4	64.5	64.8	62.8	59.5	59.0	68.9	64.5	67.8	61.0	60.4	59.1	68.5	68.4
10:15 AM	64.0	61.3	62.8	62.4	63.9	62.0	64.5	64.5	62.7	59.8	58.8	69.0	64.6	68.0	61.0	60.0	58.4	68.4	68.4
10:20 AM	63.5	61.4	62.7	62.4	64.3	62.4	64.4	64.2	62.1	59.9	58.4	68.8	64.5	67.9	61.0	60.0	59.4	68.6	68.4
10:25 AM	63.7	60.9	62.5	62.1	64.1	61.9	64.3	64.5	62.5	59.9	58.7	69.0	64.3	67.9	60.1	60.0	59.5	68.4	68.5
10:30 AM	63.8	61.3	62.7	62.5	64.1	62.2	64.5	64.3	62.3	59.9	58.8	68.6	64.5	67.8	59.9	60.3	59.4	68.6	68.4
10:35 AM	63.9	61.1	62.4	62.4	64.0	62.1	64.1	64.4	62.5	59.6	58.2	68.6	64.4	67.8	60.4	60.5	59.6	68.4	68.5
10:40 AM	63.7	60.3	62.9	62.0	63.9	62.3	64.3	64.3	62.3	59.4	58.3	68.4	63.8	67.7	60.3	59.9	59.6	68.6	68.4
10:45 AM	63.6	60.9	62.9	62.0	64.0	62.1	64.1	64.1	62.3	59.1	59.0	68.5	64.2	67.6	60.1	60.1	59.0	68.6	68.4
10:50 AM	63.4	60.4	62.8	62.2	64.1	62.0	64.1	64.2	62.3	59.4	58.6	68.4	63.9	67.5	60.3	60.3	58.9	68.5	68.3
10:55 AM	64.0	61.1	62.6	62.4	64.0	62.1	64.5	64.3	62.3	58.8	58.4	68.5	64.0	67.6	60.2	59.4	58.6	68.5	68.4
11:00 AM	63.7	60.6	63.1	62.3	64.2	62.2	64.4	63.9	62.2	58.8	58.7	68.5	64.1	67.6	60.4	60.0	59.3	68.6	68.3
11:05 AM	63.3	60.5	62.5	61.7	63.9	62.0	64.1	64.0	62.1	59.4	58.5	68.5	63.8	67.5	60.3	59.7	59.5	68.5	68.4
11:10 AM	63.5	60.4	62.5	61.6	63.6	61.6	63.8	63.8	61.7	59.0	57.9	68.5	63.9	67.4	60.1	59.4	59.6	68.5	68.6
11:15 AM	63.6	60.6	62.6	62.2	63.9	62.0	64.1	64.0	61.5	58.9	57.8	68.5	63.6	67.3	59.7	59.5	58.9	68.5	68.3
11:20 AM	64.0	60.6	62.5	62.1	63.9	62.1	64.2	64.1	62.2	59.0	57.6	68.5	63.9	67.3	60.5	59.5	58.9	68.5	68.1
11:25 AM	63.8	61.1	62.9	62.5	63.7	62.2	64.2	64.1	62.0	59.4	58.9	68.6	63.8	67.5	60.3	59.5	59.4	68.7	68.2
11:30 AM	64.0	61.1	62.9	63.0	64.3	62.3	64.3	64.4	62.3	59.4	58.4	68.3	64.0	67.2	60.5	60.0	59.9	68.8	68.5
11:35 AM	63.9	61.0	62.5	62.9	64.1	62.4	64.2	64.5	62.4	59.3	58.5	68.3	64.5	67.3	60.4	60.1	59.5	68.7	68.5
11:40 AM	64.1	61.6	62.9	63.1	64.0	62.5	64.3	64.2	62.1	59.3	58.1	68.1	64.0	67.2	61.1	60.3	59.5	68.8	68.5
11:45 AM	64.1	61.6	63.1	63.1	64.5	62.5	64.4	64.3	62.3	59.4	58.9	68.1	64.3	67.4	60.6	59.9	59.4	68.6	68.7
11:50 AM	64.0	61.4	63.2	63.1	64.6	62.9	65.0	64.6	62.8	59.6	59.2	68.3	64.8	67.1	60.3	60.0	59.6	68.6	68.5
11:55 AM	64.1	61.7	63.2	62.9	64.6	62.9	64.8	64.6	62.5	59.5	59.6	68.1	64.5	67.1	60.5	60.3	59.5	68.8	68.6
12:00 PM	64.1	61.5	63.2	63.1	64.4	62.9	64.8	64.8	62.6	59.4	59.5	68.4	64.5	67.4	60.5	60.0	59.4	68.7	68.6
12:05 PM	63.9	61.8	62.7	62.8	64.3	62.6	64.5	64.5	62.5	58.5	58.8	68.3	64.1	67.3	60.2	59.9	59.3	68.7	68.6
12:10 PM	63.5	61.5	62.5	62.4	63.9	62.5	64.3	64.3	62.4	58.9	58.9	68.2	63.8	67.4	60.4	59.8	59.1	68.6	68.5
12:15 PM	64.1	61.6	62.9	62.5	64.2	62.5	64.4	64.3	62.3	58.6	58.4	68.1	63.6	67.5	60.2	59.8	59.6	68.6	68.5
12:20 PM	64.0	61.5	62.9	62.8	64.2	62.6	64.6	64.6	62.4	58.5	58.2	68.0	63.8	67.5	60.1	59.6	58.8	68.6	68.2
12:25 PM	63.9	61.5	63.0	63.0	64.7	62.7	64.8	64.6	62.9	59.2	58.2	67.9	63.5	67.3	60.0	60.3	59.3	68.6	68.4
12:30 PM	64.3	61.6	63.3	63.1	64.5	62.8	64.8	64.7	63.0	59.1	58.5	67.9	64.0	67.3	60.0	60.1	59.0	68.6	68.4
12:35 PM	64.2	61.9	62.9	63.5	64.3	62.5	64.6	64.6	62.9	59.1	59.1	68.0	64.4	67.4	60.2	59.9	59.1	68.7	68.5
12:40 PM	64.4	62.0	63.2	63.5	64.5	62.9	64.7	64.6	62.8	59.4	59.2	68.0	64.0	67.5	60.2	60.4	60.0	68.8	68.4
12:45 PM	64.1	61.5	63.3	63.4	64.4	63.1	65.0	64.9	63.0	59.0	59.2	68.1	64.4	67.6	60.9	60.6	60.1	68.6	68.5
12:50 PM	64.1	61.5	63.1	63.1	64.3	62.9	64.9	64.7	62.7	58.9	59.3	67.9	64.1	67.5	61.0	61.0	59.8	68.6	68.3
12:55 PM	64.1	62.0	63.4	63.1	64.6	63.0	64.8	64.6	62.7	58.3	59.3	68.1	64.2	67.2	60.3	60.5	60.0	68.5	68.3
1:00 PM	64.2	62.2	63.3	63.2	64.3	63.1	65.0	64.8	63.1	59.0	60.0	68.1	64.0	67.3	60.5	60.9	59.5	68.3	68.2
1:05 PM	64.7	62.9	63.4	63.2	64.6	63.1	64.8	64.8	62.9	59.2	59.5	68.2	63.7	67.5	60.2	59.9	59.8	68.5	67.8
1:10 PM	64.6	62.9	63.3	63.5	64.6	63.2	65.0	65.1	63.3	58.9	59.9	68.1	63.5	67.5	60.2	59.9	59.9	68.3	67.7
1:15 PM	64.3	62.6	63.3	63.5	64.6	63.0	64.8	64.8	63.2	58.9	59.5	68.0	63.4	67.3	60.3	60.0	59.7	68.6	67.8
1:20 PM	64.2	62.5	63.1	63.3	64.6	63.0	64.9	65.0	62.9	58.6	59.5	67.8	64.0	67.2	60.2	59.5	59.8	68.4	68.0
1:25 PM	64.2	62.0	63.3	62.7	64.1	63.0	64.8	64.9	63.2	58.3	59.5	67.9	63.9	67.2	60.1	59.9	60.0	68.4	67.9
1:30 PM	64.2	62.2	63.3	63.5	64.4	63.0	64.8	65.0	62.9	59.0	59.1	67.9	63.4	67.0	60.1	60.0	59.8	68.5	68.0
1:35 PM	64.6	62.3	63.6	63.2	64.4	63.1	64.8	64.8	62.9	59.5	59.7	67.8	63.6	66.7	59.9	59.9	59.9	68.3	67.6
1:40 PM	64.3	62.3	63.8	63.1	64.5	63.2	65.0	64.9	63.4	58.9	60.5	67.6	63.9	66.9	59.9	59.6	59.9	68.6	67.9
1:45 PM	64.8	62.8	63.6	63.6	64.5	63.2	65.0	65.0	63.1	58.9	60.0	67.5	64.0	66.9	60.1	59.6	60.0	68.5	68.0
1:50 PM	64.5	62.3	63.6	63.6	64.4	63.2	65.0	64.9	63.3	59.2	60.7	67.8	64.1	66.9	60.1	60.1	59.8	68.4	67.8
1:55 PM	64.5	62.4	63.7	63.6	64.5	63.4	65.1	64.9	63.3	58.9	60.3	67.6	63.6	67.0	60.5	60.4	60.2	68.4	67.8
2:00 PM	64.5	62.4	63.4	63.4	64.8	63.4	64.9	64.8	63.3	59.0	60.6	67.4	63.6	66.8	60.3	59.9	60.7	68.4	68.0

Table 8-20: Northbound I-15 Inter Peak Modeled Speed Contours – Typical Day

Time	1115713	1120611	1115721	1117909	1108536	1122469	1120167	1108439	1115739	1108415	1115749	1108717	1108585	1122487	1113985	1123002	1108590	1123030
10:05 AM	75.5	74.0	73.3	67.7	69.1	65.1	72.2	70.8	71.2	73.6	74.7	71.9	73.3	73.9	75.2	75.3	75.2	64.5
10:10 AM	73.2	74.3	72.9	69.0	71.3	69.4	73.7	70.8	72.4	74.8	75.1	73.5	73.6	74.4	75.0	75.4	75.3	67.7
10:15 AM	73.3	72.5	72.5	65.1	70.3	65.7	72.7	71.6	72.0	74.5	74.1	73.8	74.0	74.8	75.7	76.0	75.7	70.9
10:20 AM	73.9	73.1	72.6	65.7	67.6	63.8	72.6	72.4	70.1	72.5	74.4	72.7	73.7	74.8	74.7	74.8	74.9	69.0
10:25 AM	73.6	73.4	73.5	66.5	71.1	66.3	73.2	72.5	70.9	73.8	74.4	73.3	73.7	73.4	74.9	75.6	75.4	63.5
10:30 AM	74.0	73.2	73.0	66.4	70.2	64.4	72.7	71.5	70.8	73.0	75.0	73.0	74.6	75.9	75.1	75.6	75.0	69.5
10:35 AM	74.7	73.7	73.1	66.1	70.1	61.7	73.0	70.9	71.0	73.3	74.4	73.0	74.0	75.0	75.3	76.1	75.6	69.7
10:40 AM	74.6	74.5	73.8	65.3	70.1	65.7	72.9	70.8	69.5	74.2	74.8	73.4	74.1	74.2	74.7	75.6	75.5	66.5
10:45 AM	74.4	73.5	73.9	66.8	69.5	64.9	72.9	73.1	69.8	74.4	74.7	73.3	74.7	74.5	75.4	76.1	75.7	70.1
10:50 AM	74.6	74.6	73.5	69.4	70.2	69.3	72.6	69.8	67.4	72.2	74.2	72.8	73.9	74.7	74.7	75.3	75.3	67.8
10:55 AM	74.7	73.8	73.7	68.5	70.4	67.2	73.4	71.2	70.9	74.5	73.6	72.2	73.4	73.9	75.5	76.1	74.9	68.0
11:00 AM	73.4	73.9	73.6	63.6	71.0	66.8	73.2	69.4	67.7	73.3	73.9	74.6	74.4	74.3	75.9	76.2	75.0	66.3
11:05 AM	74.2	72.5	72.5	62.4	67.7	65.4	72.2	68.4	69.7	74.3	74.2	73.4	74.5	74.9	75.9	75.5	75.7	68.8
11:10 AM	74.9	74.8	74.0	67.2	69.9	65.5	72.3	70.8	69.4	73.4	73.1	71.5	73.9	74.0	75.2	76.3	75.7	70.6
11:15 AM	73.1	73.4	72.0	65.3	69.7	66.2	73.2	71.4	69.6	73.7	74.8	73.8	74.4	75.2	74.5	75.7	75.5	70.8
11:20 AM	74.7	73.8	73.0	65.8	69.1	64.6	72.6	68.8	70.2	73.8	74.7	73.3	73.7	75.1	75.2	75.5	75.2	64.0
11:25 AM	73.8	73.8	73.6	68.7	71.0	68.0	72.3	69.0	70.3	73.6	73.9	72.5	74.3	74.3	75.3	76.0	75.6	68.0
11:30 AM	73.7	73.4	72.8	68.7	68.8	66.4	72.7	68.7	69.6	73.9	74.5	72.7	73.2	74.3	74.5	74.9	75.2	69.4
11:35 AM	74.9	73.4	73.9	67.7	69.0	62.7	71.3	69.9	68.8	73.3	74.7	71.3	73.0	74.6	74.8	75.2	75.4	69.9
11:40 AM	73.7	73.2	72.9	66.2	70.8	65.1	72.5	67.0	66.0	72.8	74.4	73.3	74.3	74.6	75.4	75.8	75.3	66.4
11:45 AM	73.8	73.4	72.1	65.6	69.6	66.1	72.8	67.4	65.0	71.7	73.2	71.0	73.6	74.6	74.6	76.0	75.7	69.5
11:50 AM	73.7	73.4	72.8	55.7	68.0	62.7	71.1	66.9	67.6	73.0	73.6	70.8	73.6	74.0	74.6	75.5	75.3	69.9
11:55 AM	72.5	73.1	72.3	59.4	68.4	59.2	69.4	66.4	66.7	72.7	74.0	72.6	73.4	74.8	74.7	75.4	74.7	69.1
12:00 PM	74.1	73.1	72.0	57.0	67.4	65.6	71.7	67.2	66.4	71.9	72.5	72.2	71.9	74.1	74.4	75.3	75.5	66.9
12:05 PM	74.1	73.1	72.7	60.0	67.8	59.9	70.4	67.8	67.2	71.9	73.6	70.5	72.5	73.8	73.9	74.8	74.7	63.9
12:10 PM	75.3	74.4	73.0	62.3	69.1	65.1	72.8	68.0	67.5	73.9	75.1	71.6	73.9	74.2	75.0	74.0	74.5	66.5
12:15 PM	72.8	73.4	73.3	66.0	68.8	67.5	73.0	68.0	68.2	74.3	73.6	72.9	74.0	74.6	75.9	75.2	75.9	69.5
12:20 PM	73.6	73.1	71.9	64.0	68.4	62.2	71.3	68.5	64.4	73.0	74.3	72.4	73.2	73.5	74.1	75.9	74.9	63.6
12:25 PM	73.8	73.4	73.2	59.4	69.1	60.8	71.5	67.9	66.8	72.2	74.1	72.3	73.3	73.1	74.4	75.1	74.5	65.8
12:30 PM	73.7	72.7	72.5	59.9	68.7	61.7	70.6	64.6	66.3	71.9	72.1	71.0	72.7	72.9	74.3	75.8	75.4	64.9
12:35 PM	73.2	72.6	72.5	55.5	64.4	65.4	71.1	67.8	66.9	71.0	71.6	71.0	73.1	73.8	74.6	74.8	74.9	64.5
12:40 PM	73.9	72.7	72.5	66.1	67.7	62.9	70.7	67.5	65.0	71.9	72.8	71.2	72.9	73.3	74.6	75.3	74.5	65.9
12:45 PM	72.7	72.1	71.9	62.4	68.4	65.9	71.7	69.2	68.7	73.5	72.6	71.5	73.9	74.8	73.5	74.3	74.3	65.4
12:50 PM	73.8	72.6	72.3	58.6	65.7	58.7	70.9	67.8	65.8	72.6	73.1	72.0	73.4	74.1	75.4	75.5	74.8	59.4
12:55 PM	74.3	73.6	73.0	68.4	70.1	61.6	71.8	70.1	67.4	70.8	72.8	71.9	73.3	74.2	73.9	74.8	75.2	61.0
1:00 PM	73.1	71.9	72.1	65.7	69.2	65.5	72.3	67.9	68.4	73.1	73.6	70.9	73.4	74.6	75.0	75.1	75.2	63.4
1:05 PM	74.5	74.3	73.8	59.7	68.7	58.4	70.3	68.3	64.5	72.4	72.3	71.7	73.0	75.2	74.5	75.0	74.8	65.6
1:10 PM	74.2	74.3	73.4	66.4	70.6	63.3	71.8	68.7	68.2	73.3	74.6	70.3	73.4	74.3	74.0	75.2	74.2	64.1
1:15 PM	73.1	72.7	72.3	62.9	69.8	67.5	73.2	69.4	67.5	73.6	73.8	72.9	73.9	74.6	75.4	75.2	74.5	63.7
1:20 PM	73.1	72.4	71.8	62.4	67.4	62.3	70.5	67.8	66.6	72.1	74.6	73.4	74.0	74.8	75.3	76.2	75.3	60.7
1:25 PM	73.2	73.8	72.7	63.8	65.7	67.1	71.7	68.8	67.2	71.2	73.7	70.1	72.6	73.9	74.3	75.0	74.5	67.7
1:30 PM	72.9	73.0	72.5	66.2	68.8	64.9	71.8	68.8	68.1	72.9	73.8	70.0	74.0	74.2	74.7	75.5	74.3	64.3
1:35 PM	73.7	72.7	72.1	62.2	68.0	61.1	71.4	67.5	66.2	72.4	72.6	70.3	73.3	74.2	74.8	75.2	75.0	68.8
1:40 PM	73.6	72.5	72.5	58.1	66.8	63.7	70.2	64.6	67.9	70.9	72.1	71.1	71.7	73.4	74.6	75.7	75.7	66.3
1:45 PM	72.0	70.8	71.1	56.1	66.9	63.0	70.6	66.5	65.9	71.2	72.6	70.5	72.3	72.8	73.9	75.0	74.1	64.9
1:50 PM	72.3	70.0	70.1	53.8	64.4	58.6	69.7	62.1	61.8	71.5	70.8	70.9	73.4	73.8	74.3	74.5	74.1	61.2
1:55 PM	72.5	70.0	70.8	54.0	64.2	59.6	68.0	62.6	62.8	69.3	71.8	68.6	71.9	72.9	74.0	75.3	75.1	64.5
2:00 PM	72.3	72.3	70.7	54.1	64.6	51.3	69.2	65.5	66.4	70.5	71.7	67.4	71.4	71.5	73.2	73.8	73.7	48.0

Time	1108592	1120994	1108597	1121037	1108595	1121099	1121131	1108562	1121118	1108767	1121067	1125872	1108769	1125886	1108771	1108773	1119736	1119743	1119749
10:05 AM	73.3	65.0	73.5	67.5	70.9	74.2	73.8	71.3	71.2	75.2	72.8	74.6	73.7	73.9	70.3	65.8	74.1	75.0	73.9
10:10 AM	73.1	63.2	72.6	65.4	71.2	74.3	73.7	70.4	68.4	73.6	70.9	72.7	73.3	73.4	67.6	70.5	75.2	75.2	74.8
10:15 AM	73.2	68.2	74.5	67.1	71.2	75.3	75.7	72.3	72.4	76.0	70.9	73.0	73.1	73.7	70.9	65.8	74.9	75.4	75.7
10:20 AM	74.1	70.2	74.4	69.3	73.5	75.4	75.3	71.6	71.5	75.8	73.3	75.3	74.6	74.2	70.8	68.6	76.3	75.8	75.6
10:25 AM	74.1	70.5	73.7	65.8	72.4	74.7	74.9	71.9	72.4	75.5	72.1	74.8	75.0	75.1	72.8	70.9	75.4	76.1	74.8
10:30 AM	72.8	69.7	74.8	67.3	71.2	75.4	75.2	73.6	73.7	76.3	72.8	75.0	74.9	74.8	71.7	68.9	75.0	76.6	76.2
10:35 AM	73.9	70.8	73.4	62.0	71.1	74.5	74.1	70.6	71.7	75.6	71.8	74.3	74.1	74.2	72.8	69.8	76.4	76.2	75.5
10:40 AM	73.6	68.3	75.0	64.5	72.5	76.2	75.3	71.9	73.7	76.4	73.9	74.4	74.2	73.4	71.6	67.6	76.3	75.9	75.3
10:45 AM	74.6	70.5	75.1	67.8	73.1	75.3	75.4	72.6	72.1	75.8	72.8	73.5	75.2	75.3	74.1	71.3	75.1	75.7	75.7
10:50 AM	74.3	70.9	74.2	66.9	73.0	76.0	75.8	72.9	72.3	76.4	73.5	75.5	75.1	75.0	71.2	70.6	76.7	76.9	75.9
10:55 AM	71.8	69.6	73.3	64.0	70.3	74.6	74.2	70.9	72.7	76.1	72.1	75.3	75.2	75.1	74.3	70.3	75.3	75.6	75.2
11:00 AM	74.1	69.6	74.2	68.4	72.3	74.6	74.2	68.6	70.7	75.9	72.9	73.2	73.3	74.2	72.5	70.3	75.8	76.5	76.0
11:05 AM	74.1	70.4	74.9	68.8	73.2	75.8	74.1	72.6	73.0	75.8	72.9	74.7	74.9	75.0	71.8	69.9	75.1	75.5	75.0
11:10 AM	74.6	69.3	73.9	64.5	72.4	75.4	75.1	73.3	73.9	76.8	73.4	75.5	74.9	74.9	73.6	71.7	76.4	76.2	75.0
11:15 AM	73.6	71.5	74.2	61.4	71.3	75.5	74.6	71.8	73.1	76.2	71.6	74.3	75.0	74.8	72.8	69.8	76.7	77.1	76.3
11:20 AM	72.8	69.2	73.0	66.0	70.7	74.3	73.8	71.4	72.6	75.7	71.6	73.6	74.9	75.1	72.5	70.8	75.9	76.6	76.0
11:25 AM	73.7	69.4	73.5	63.8	72.2	74.6	73.6	70.0	72.1	75.4	70.1	74.3	74.0	74.1	68.3	69.9	75.4	76.9	75.5
11:30 AM	72.9	67.4	74.1	66.9	71.7	75.0	75.6	71.9	73.2	76.4	72.3	74.6	75.1	75.2	72.3	70.7	75.9	76.4	76.5
11:35 AM	73.2	67.0	72.1	57.2	71.3	74.2	73.8	71.3	71.4	75.5	71.2	74.0	74.5	74.6	72.8	71.6	76.5	77.1	76.6
11:40 AM	73.1	68.8	72.4	62.4	70.6	74.7	73.7	69.4	71.8	75.7	74.1	73.9	74.8	74.1	69.5	70.5	75.7	76.2	76.0
11:45 AM	73.8	66.8	73.6	63.4	72.3	75.2	74.1	69.8	72.4	75.9	70.0	71.5	74.1	74.4	67.0	68.3	76.5	76.8	75.8
11:50 AM	74.0	68.0	75.0	62.5	71.7	74.6	73.4	70.6	71.0	76.2	73.2	75.4	74.7	75.2	74.4	68.7	76.0	76.4	76.2
11:55 AM	72.2	67.1	72.4	63.3	70.6	74.5	73.7	71.2	72.4	75.9	72.0	74.5	75.2	75.4	72.2	68.9	76.0	76.5	76.2
12:00 PM	73.8	67.3	73.9	57.8	71.5	74.6	74.1	71.1	70.2	75.2	67.8	72.5	73.1	74.0	71.9	71.3	75.7	76.5	76.2
12:05 PM	72.3	64.2	73.2	64.2	70.8	74.5	74.2	72.7	72.4	76.5	72.1	74.0	75.1	75.3	70.9	69.9	76.4	76.2	75.3
12:10 PM	72.7	67.8	73.7	62.2	70.3	74.7	74.4	68.2	70.6	75.2	70.2	72.8	73.9	74.3	69.4	69.8	76.2	76.7	76.2
12:15 PM	73.4	65.2	74.3	62.3	70.8	74.5	73.6	66.6	70.9	75.4	68.2	72.8	73.8	74.1	68.7	68.6	75.8	76.3	75.5
12:20 PM	71.7	65.5	73.4	64.6	70.9	74.8	74.4	68.5	71.5	75.9	69.5	74.1	73.9	73.4	65.7	67.8	74.2	75.6	75.4
12:25 PM	73.6	64.3	72.6	60.7	71.5	74.7	74.5	69.8	70.9	75.5	72.4	73.6	74.5	74.9	71.5	66.5	75.9	76.3	74.6
12:30 PM	72.6	64.4	74.0	54.8	69.3	74.6	74.0	69.8	71.2	74.7	69.1	73.1	73.5	73.8	71.1	68.5	76.1	76.9	75.5
12:35 PM	73.2	65.8	72.9	62.5	70.9	73.9	73.4	68.8	70.5	75.2	71.0	71.3	73.2	73.7	67.7	67.1	75.6	76.0	75.0
12:40 PM	72.1	65.7	72.7	61.0	71.6	74.8	73.4	71.2	71.8	75.8	72.2	71.4	72.5	72.5	67.8	63.2	74.7	75.2	74.9
12:45 PM	71.4	64.6	72.8	61.0	70.2	74.0	72.1	69.4	70.0	75.7	70.8	74.1	74.4	74.2	70.3	66.5	75.0	75.9	75.5
12:50 PM	71.3	61.8	72.5	55.1	68.1	74.5	71.7	69.4	70.6	73.9	68.7	72.9	73.6	73.8	69.0	66.4	75.0	75.7	75.4
12:55 PM	71.5	62.6	71.5	67.3	71.0	74.7	74.1	70.4	73.3	76.0	70.6	72.1	72.5	72.9	70.8	63.5	75.5	76.1	75.9
1:00 PM	72.6	63.3	71.4	62.8	69.9	73.7	73.1	71.1	70.8	75.4	70.8	73.2	73.0	73.8	68.5	65.2	74.7	76.2	75.5
1:05 PM	72.6	63.2	73.9	62.3	71.7	75.3	74.9	68.7	71.3	75.6	70.7	73.2	73.0	73.3	67.7	67.5	75.4	75.3	74.6
1:10 PM	72.8	65.6	71.2	64.7	72.1	75.0	74.5	71.4	70.4	76.0	71.6	72.7	73.5	74.2	69.4	67.6	75.6	76.3	75.5
1:15 PM	73.0	65.7	73.1	65.3	70.5	74.6	74.1	69.9	71.0	76.3	72.0	74.1	74.2	74.5	70.5	67.7	75.2	75.9	75.0
1:20 PM	72.1	62.0	72.1	59.9	70.0	75.0	73.9	68.8	71.2	74.8	71.2	73.7	73.5	73.6	69.1	68.8	75.0	75.7	74.9
1:25 PM	73.2	66.4	72.2	55.7	70.6	74.4	74.9	69.8	72.7	76.2	69.6	72.6	72.3	73.8	68.2	62.7	74.5	74.9	75.3
1:30 PM	71.4	59.9	73.3	69.4	70.7	74.3	73.4	70.4	71.1	75.2	71.2	72.6	72.5	73.6	70.8	66.8	76.1	76.7	75.4
1:35 PM	72.7	65.7	71.7	65.2	69.3	73.5	73.6	70.2	71.9	75.5	69.7	70.4	74.4	74.2	68.5	65.9	75.4	75.3	74.7
1:40 PM	72.9	61.4	72.4	64.5	71.2	74.4	74.3	69.3	70.3	74.5	68.7	72.5	71.9	72.2	68.3	61.8	74.9	75.7	74.4
1:45 PM	72.3	59.4	71.4	58.3	69.3	75.6	75.7	71.2	72.8	76.4	71.5	73.4	73.1	73.3	65.8	63.3	74.7	75.6	75.5
1:50 PM	72.2	62.2	72.4	61.7	69.1	74.6	71.7	67.6	70.7	75.0	68.5	73.3	73.8	73.6	68.9	65.2	74.7	75.6	74.8
1:55 PM	72.2	68.3	72.3	63.8	70.5	74.1	74.4	69.9	72.4	75.3	70.6	73.7	73.1	73.8	69.0	67.1	74.2	75.7	74.8
2:00 PM	68.2	58.9	69.4	65.4	69.3	74.2	74.5	72.7	72.8	75.9	67.8	72.4	74.7	74.3	69.3	64.8	75.5	75.8	75.5

Chapter 9. Evaluation Approach

This section shows the system evaluation plan to answer the DMA and ATDM research questions based on the analysis conducted and the approach to conducting sensitivity analysis.

9.1 Evaluation Plan to Answer DMA and ATDM Questions

The San Diego Testbed will primarily focus on the analysis of three ATM strategies as well as three ADM strategies. They are Dynamic Lane Use, Dynamic Speed Limits, Dynamic Merge Control, Predictive Traveler Information, Dynamic Managed Lanes and Dynamic Routing. In addition, the testbed also aims at simulating three DMA application/bundles, contingent upon timely availability. They are INFLO (SPD-HARM), MMITSS (I-SIG) and INFLO (CACC). The team has acquired SPD-HARM and I-SIG applications and is currently assessing the level of effort required to incorporate them into the model.

Phase 1 includes 16 scenarios with the focus on the analysis of each ATDM strategy individually as well as the SPD-HARM/Q-WARN applications. These scenarios will change according to the operational conditions suggested by SANDAG. Each scenario has sub-scenarios with different levels of market penetration as well as different prediction attributes.

Phase 2 includes 16 scenarios with the focus on the analysis of combination of ATDM strategies as well as the MMITSS application(s). If CACC application is available for use from other prototype developers in time, then it will be included in Phase 2 runs. Phase 3 includes 15 scenarios with the focus on more combination runs with ATDM and DMA applications together. A detailed table on the scenarios for each phase is given in Section 4.3.

9.2 Sensitivity Analyses

The San Diego Testbed facility extends from the interchange with SR 78 in the north to the interchange with Balboa Avenue, and includes the cities of Escondido, Poway, and San Diego. Currently, neither this specific corridor, nor any other corridor in the country is equipped with any true ATDM strategies or DMA applications. Therefore, there is not enough experience with actual deployments of ATDM and DMA to know the response of travelers to these strategies and applications. Consequently, any strategy or strategy combination evaluated as part of this project is subject to assumptions made by the modeling team. To mitigate this liability, sensitivity analyses will be performed to delineate the impacts of these assumptions. The previous section explains the attribute and response variations that will be modeled to account for any insecurity in input data assumptions. Sensitivity analysis will also be done on driver compliance on different applications as a component of the market penetration as shown in Section 4.3.

Chapter 10. Execution Plan

10.1 Execution Summary

This section summarizes the process used to conduct the development and analysis for the San Diego Testbed. The analysis scenarios for this Testbed will span three analysis phases to evaluate ATDM strategies and also the combination of ATDM strategies with DMA applications:

- Phase 1
  - Testbed development tasks to be performed
    - Base traffic model calibration (Operational Condition #1, #2, and #3)
    - ATDM application module development
    - System Manager development
    - Testbed support module (e.g., Scenario Manager, etc.) development
    - Data Bus and interface development
    - Integration of QWARN and SRDHARM
  - Evaluation tasks to be performed
    - Testbed runs based on Operational Condition #1, #2, and #3
    - Run based on QWARN, SPDHARM
    - Base runs with Dynamic Lane Use, Dynamic Speed Limits, Dynamic Merge Control, and Dynamic HOV/Managed Lanes
    - Data compilation
    - Documentation
- Phase 2
  - Testbed development tasks to be performed
    - Prediction System Development
    - MMITSS System Development
    - Integration of CACC System
    - Dynamic Routing Implementation
  - Evaluation tasks to be performed
    - Testbed runs based on DMA and ATDM Applications
    - Base run with MMITSS and CACC
    - Base runs with Predictive Traveler information and Dynamic Routing
    - Sensitivity analysis for prediction horizon
    - Data compilation
    - Documentation
- Phase 3
  - Testbed development tasks to be performed
    - DMA/ATDM application implementation in combination

    - TCA Integration to the DMA application framework
    - Adding latency parameters to the simulation-application data flow.
- Evaluation tasks to be performed
    - 50 testbed runs based on Operational Condition #2 and #3
    - Data compilation
    - Documentation

Appendix

USDOT ICM Evaluation Team Cluster Analysis

As the evaluation of the system focuses on peak periods, the cluster analysis was performed for the AM, PM and Midday periods. Furthermore, the final data sets provided were reduced to the AM and PM peak period as the evaluation focused on periods where the ICM system developed and deployed a response plan in reaction to non-reoccurring congestion. As the I-15 corridor is a North/South corridor serving daily commuters to and from downtown San Diego, the data sets provided focused on the AM Southbound and the PM Northbound cluster. Table A - 1 and Table A - 2 show the summary results of the top clusters analyzed from the AM and PM periods. Clusters highlighted in green represent clusters where a representative set of data was provided to the team for a day within the cluster where an incident was present and an ICM response plan was implemented.

Table A - 1: AM Southbound ICM AMS Evaluation Cluster Analysis Summary

Cluster		Duration (min)	Volume (vehicle per hour [vph])	Travel Time (min)	Single Incident Delay Impact (min)	Incidents Per Period	Days in Cluster	Total Cluster Delay Impact (min)
1	SB AM 1	32.64	6,201	15.72	1.72	1.9	29	49.88
2	SB AM 2	42.89	6,348	16.77	2.77	3.7	39	108.03
3	SB AM 3	41.20	6,038	18.33	4.33	5.9	8	34.64
4	SB AM 4	46.01	6,154	16.91	2.91	10.6	5	14.55
5	SB AM 5	804.00	6,314	15.70	1.70	1.0	1	1.70
6	SB AM 6	229.00	6,350	16.52	2.52	1.0	1	2.52
7	SB AM 7	35.44	4,774	15.30	1.30	1.7	3	3.90
8	SB AM 8	32.25	3,417	15.14	1.14	1.5	2	2.28
9	SB AM 9	50.40	5,658	21.81	7.81	9.7	3	23.43

Table A - 2: PM Southbound ICM AMS Evaluation Cluster Analysis Summary

Cluster		Duration (min)	Volume (vehicle per hour [vph])	Travel Time (min)	Single Incident Delay Impact (min)	Incidents Per Period	Days in Cluster	Total Cluster Delay Impact (min)
1	NB PM 1	35.00	6,416	16.04	2.46	2.5	17	41.82
2	NB PM 2	32.53	6,955	16.5	2.92	8.8	8	23.36
3	NB PM 3	46.18	9,034	16.35	2.77	5.5	36	99.72
4	NB PM 4	44.46	8,870	16.11	2.53	2.1	25	63.25
5	NB PM 5	34.71	6,836	19.83	6.25	4.7	3	18.75
6	NB PM 6	38.05	9,156	18.02	4.44	13.0	2	8.88
7	NB PM 7	733.25	7,778	16.45	2.87	4.0	1	2.87
8	NB PM 8	51.29	6,178	24.05	10.47	7.0	1	10.47
9	NB PM 9	189.00	4,620	14.77	1.19	1.0	1	1.19

For the four AM and five PM clusters, nine sets of data were provided. These data sets included the speed and volume detector station data for the following:

- 27 NB HOV Lanes stations: 22 working stations and 5 faulty stations;
- 25 SB HOV Lanes stations: 21 working stations and 4 faulty stations;
- 39 NB General Purpose Lanes stations: 36 working stations and 3 faulty stations;
- 43 SB General Purpose Lanes stations: 39 working stations and 4 faulty stations;
- 77 On/Off Ramp stations;

Although the data was provided for the ramp stations, following a review of the initial data provided, this data was not part of the cluster analysis and is only available for calibration purposes. Figures 1 through 10 show the summary plots for the following five northbound and five southbound stations that provide an overall representation of the corridor:

- 1119743 – NB I-15 S/O El Norte
- 1108773 – NB I-15 Valley Pkwy
- 1121037 – NB I-15 N/O Bernardo Center
- 1113985 – NB I-15 SR-56
- 1120167 – NB I-15 Miramar Rd
- 1108607 – SB I-15 Miramar Way
- 1108429 – SB I-15 Ted Williams Pkwy (SR-56)
- 1121038 – SB I-15 N/O Bernardo Center
- 1108558 – SB I-15 9th Ave
- 1125265 – SB I-15 S/O SR-78

Figure A - 1: 1119743 – NB I-15 S/O El Norte Summary Flow and Speed Graphs [Source: TSS]

Figure A - 2: 1108773 – NB I-15 Valley Pkwy Summary Flow and Speed Graphs [Source: TSS]

Figure A - 3: 1121037 – NB I-15 N/O Bernardo Center Summary Flow and Speed Graph [Source: TSS]

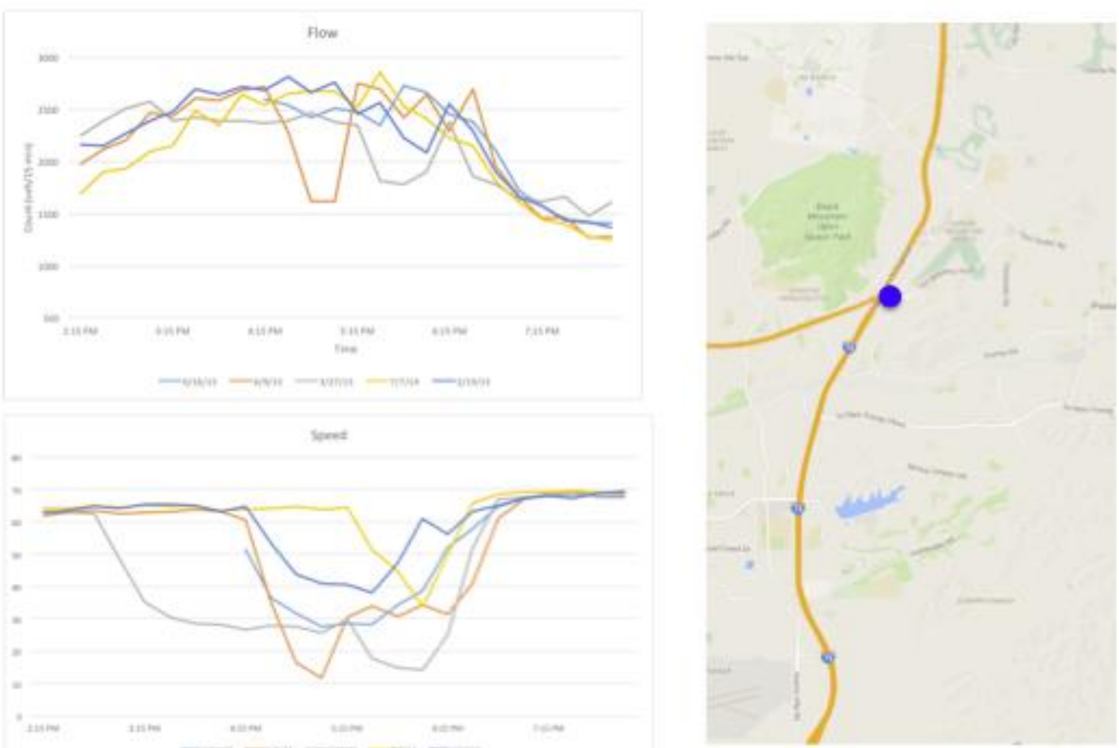

Figure A - 4: 1113985 – NB I-15 SR-56 Summary Flow and Speed Graphs [Source: TSS]

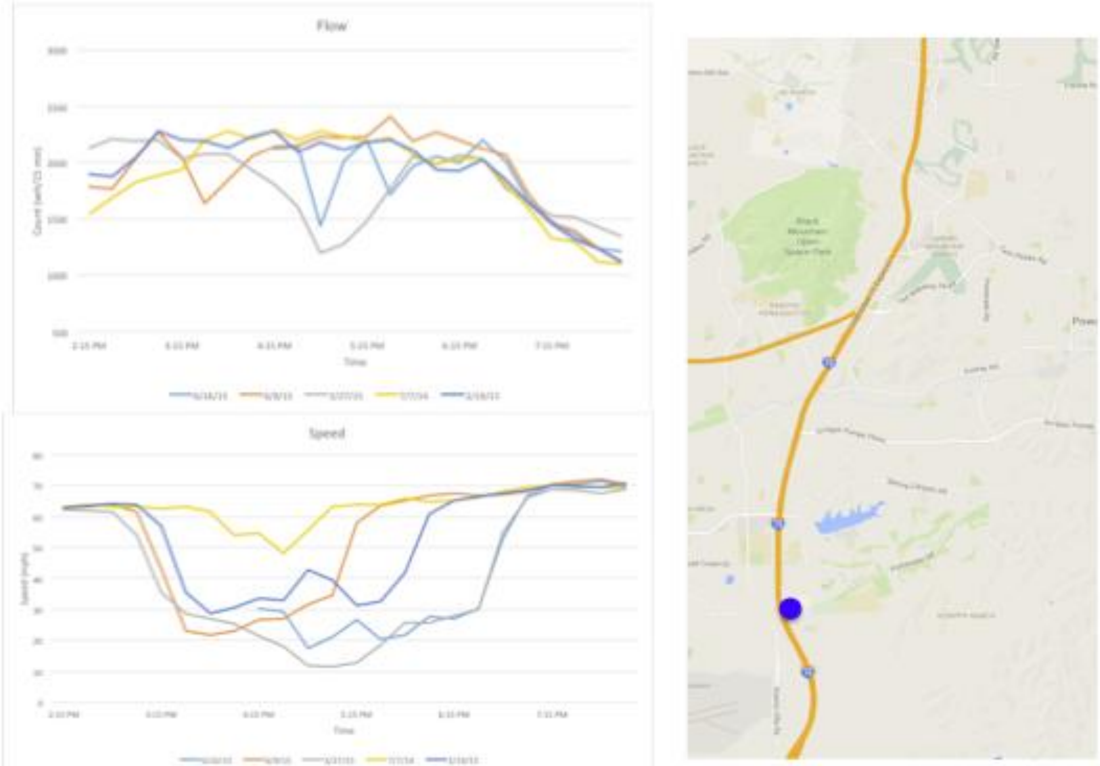

Figure A - 5: 1120167 – NB I-15 Miramar Rd Summary Flow and Speed Graphs [Source: TSS]

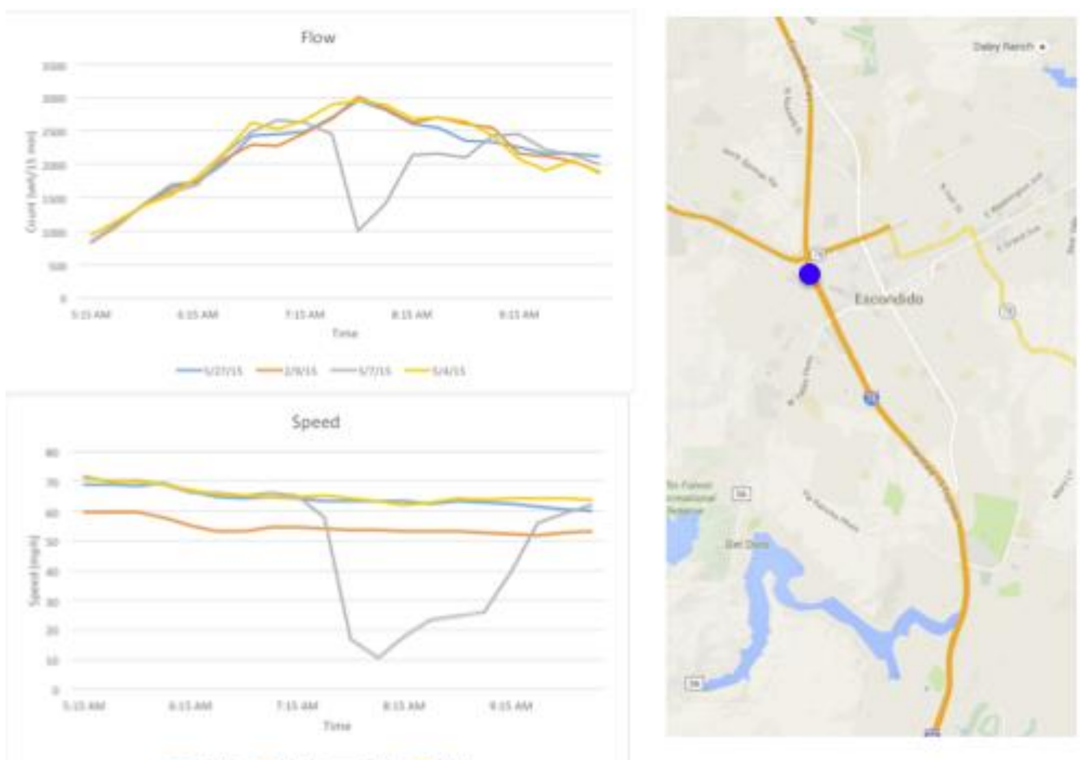

Figure A - 6: 112565 – SB I-15 S/O SR-78 Summary Flow and Speed Graphs [Source: TSS]

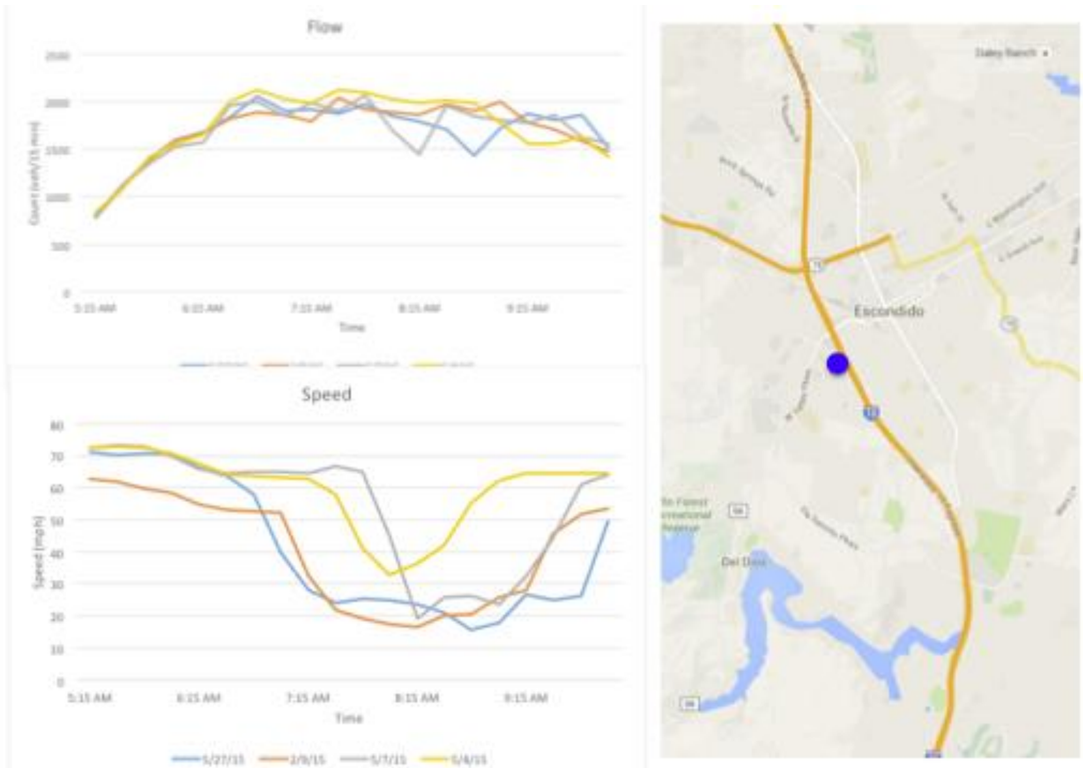

Figure A - 7: 1108558 – SB I-15 9th Avenue Summary Flow and Speed Graphs [Source: TSS]

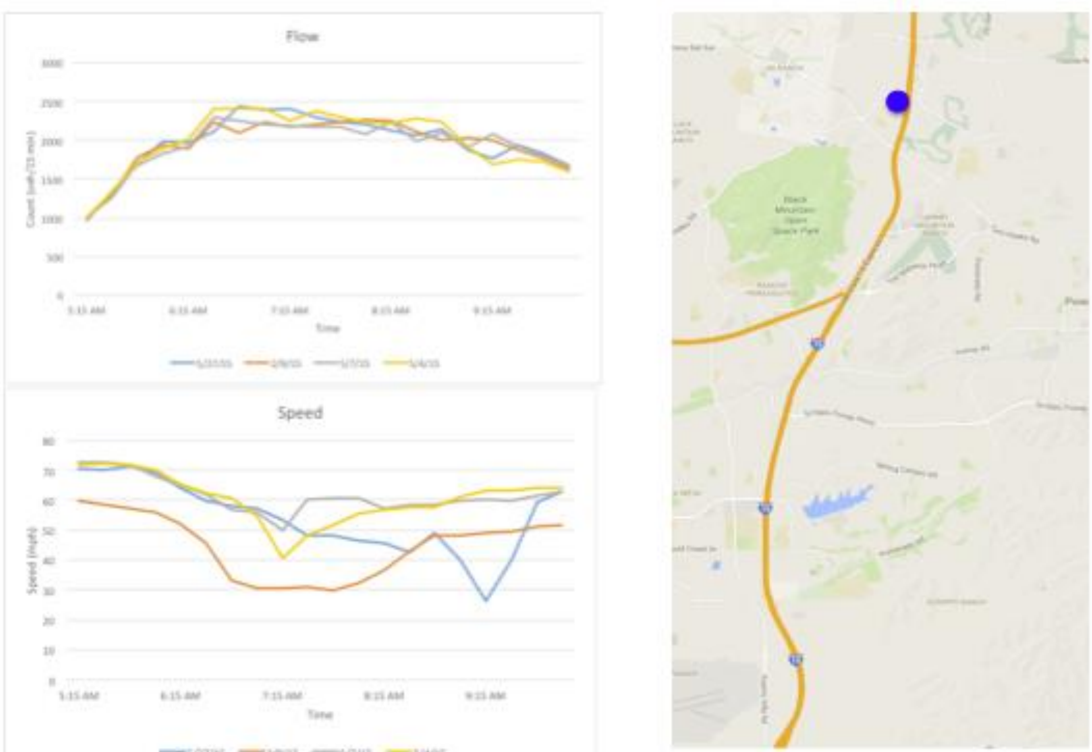

Figure A - 8: 1121038 – SB I-15 N/O Bernardo Center Summary Flow and Speed Graphs [Source: TSS]

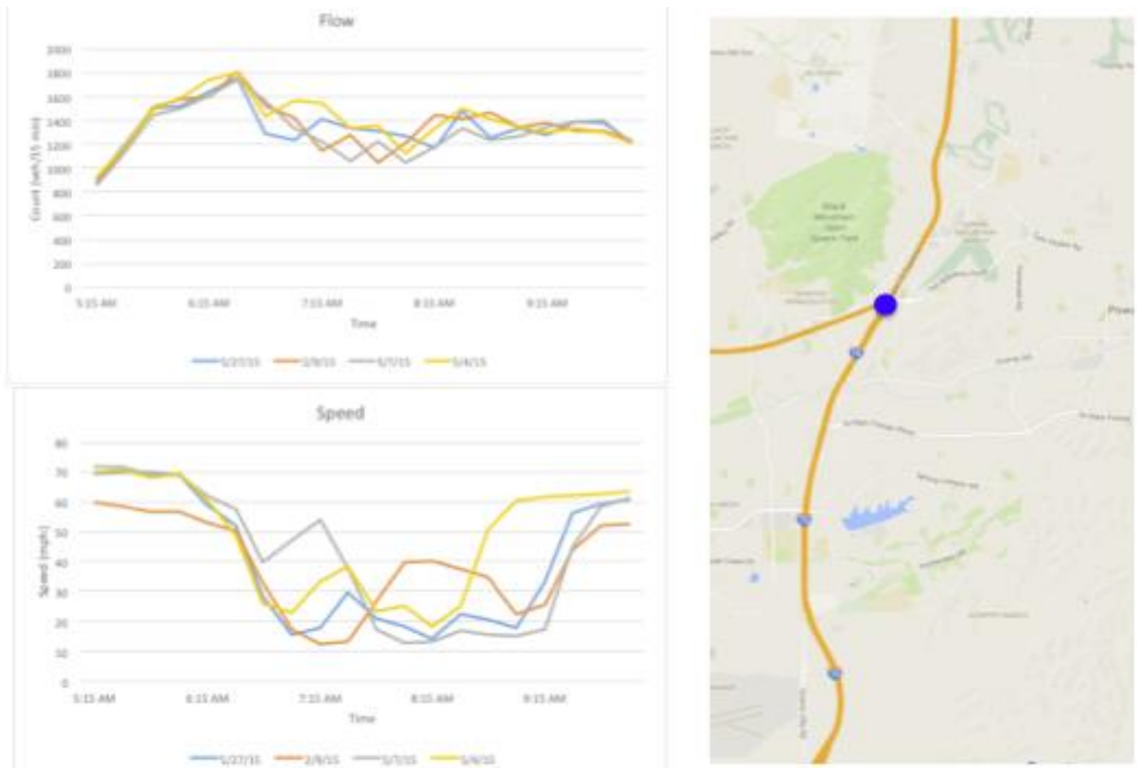

Figure A - 9: 1108429 – SB I-15 Ted Williams Pkwy (SR-56) Summary Flow and Speed Graphs [Source: TSS]

Figure A - 10: 1108607 – SB I-15 Miramar Way [Source: TSS]

Typical Day Cluster Analysis

As part of the ICM system, that is currently running 24 hours a day 7 days a week, 11 different day types or “clusters” were developed to provide the demand matrices and the historical data sets for the ICM prediction models and for the ICM event generation and evaluation process. One primary difference from this cluster analysis and the analysis performed previously as mentioned in the Appendix section above is that this analysis was for non-incident conditions. Below are the 11 day types that were identified:

- Type 1 – Monday
- Type 2 – Tuesday and Thursday
- Type 3 – Wednesday
- Type 4 – Friday
- Type 5 – Saturday
- Type 6 – Sunday
- Type 7 – Rainy weekday
- Type 8 – Rainy weekend
- Type 9 – Soft holiday – these are holidays like Columbus Day, which some people treat as a normal working day.
- Type 10 – Hard holiday
- Type 11 – Christmas and Thanksgiving (although hard holidays, these ones have a particularly low demand.)

Mining the historical data and identifying the various trends in the traffic selected these 11 days. These demands were further adjusted to better match the current conditions using detection count data, and running an origin/destination adjustment process in Aimsun. These adjusted demands are the demands that can be used for both the online system and for any offline analysis of the corridor under typical conditions. This demand data and the real-time context data from the available feeds allow for the Aimsun Online model and therefore the offline models to be able to model any conditions.

The data used to develop the trends and day types was first collected in 2012, and has been updated with more recent data with the latest update to the types 1-4 being completed in November of 2015. In using the data sets, two strategies for identifying the patterns and training the models were as follows:

1. Using qualitative variables: such as the day of the week, weather, special events, etc.
2. Through similarities of the observed traffic flow: by making groups of similar days, just using real data, no matter what the contextual variables are (it only matters for the resulting flow profile)

Early tests with the two strategies showed that strategy number two required substantial computational effort and that both methods provided similar results for this reason strategy number one was chosen. Figure 4 shows the plots of the data for one detection station identified by day type. The various patterns can be observed within this plot with a significant variation between Weekdays, Weekends, and raining days, and only minor variation between the various weekdays.

Following the completion of each update to the system, that typically uses 3-4 months of new data to update the demand patterns within the system, each day type goes through a quality check to insure that the data is able to provide a reasonable fit to the real data provided for the network area. The use of this typical day data and the previous quality checks means that this day can be used to analyze a non-incident condition within the system.

As part of the evaluation of the ICM system and the ongoing system maintenance a recent update to the travel demand data (cluster like analysis to update typical day types) was performed using data from over 200 arterial and freeway detection stations that were collected in February 2015 to May 2015.

The following are the steps involved with the update to the travel demands, and are similar to the steps that were done with previous updates and the initial development of the day types.

Step 1. Review and Update of Detection

A revision of the whole model was done and the detection was updated to account for the updates of the external systems. In this process a large number of Vehicle Detection Stations were add to the detection previously used, and 13 stations were added for just speed calibration as the stations do not cover all of the mainline lanes. Detection from five new Ramp Metering Information Systems stations were also included along SR-56. It should be noted that some of the new stations are replacements to older stations.

Step 2. Data Collection

Raw data was collected from PeMS, RAMS and CPS sources between the dates of January 2015 and May 2015 to update the historical patterns for the Monday, Tuesday/Thursday, Wednesday and Friday day types. The data were converted from the raw form to five minute aggregated data. Figure A - 11 shows an example of the data collected for station 1108427.

Step 3. Creation of Patterns for the Different Day Types

After collecting the raw data and aggregating to 5 minute intervals, several filters were implemented, and detectors with non-valid data were determined. Some of the filters are implemented before any data treatment (detectors with PeMS Observed Parameter lower than 100, comparison with the inventory) and some of the filters were applied to discard detectors after treating the data. Some examples of the filters after grouping data are: filtering consecutive zeroes, calculating patterns only when four or more historical time series were available, and checking visually for anomalies. Figure A - 12 shows an example of a detector that was discarded due to irregular data where a distinct pattern cannot be found, as demonstrated by the spikes in each day plot.

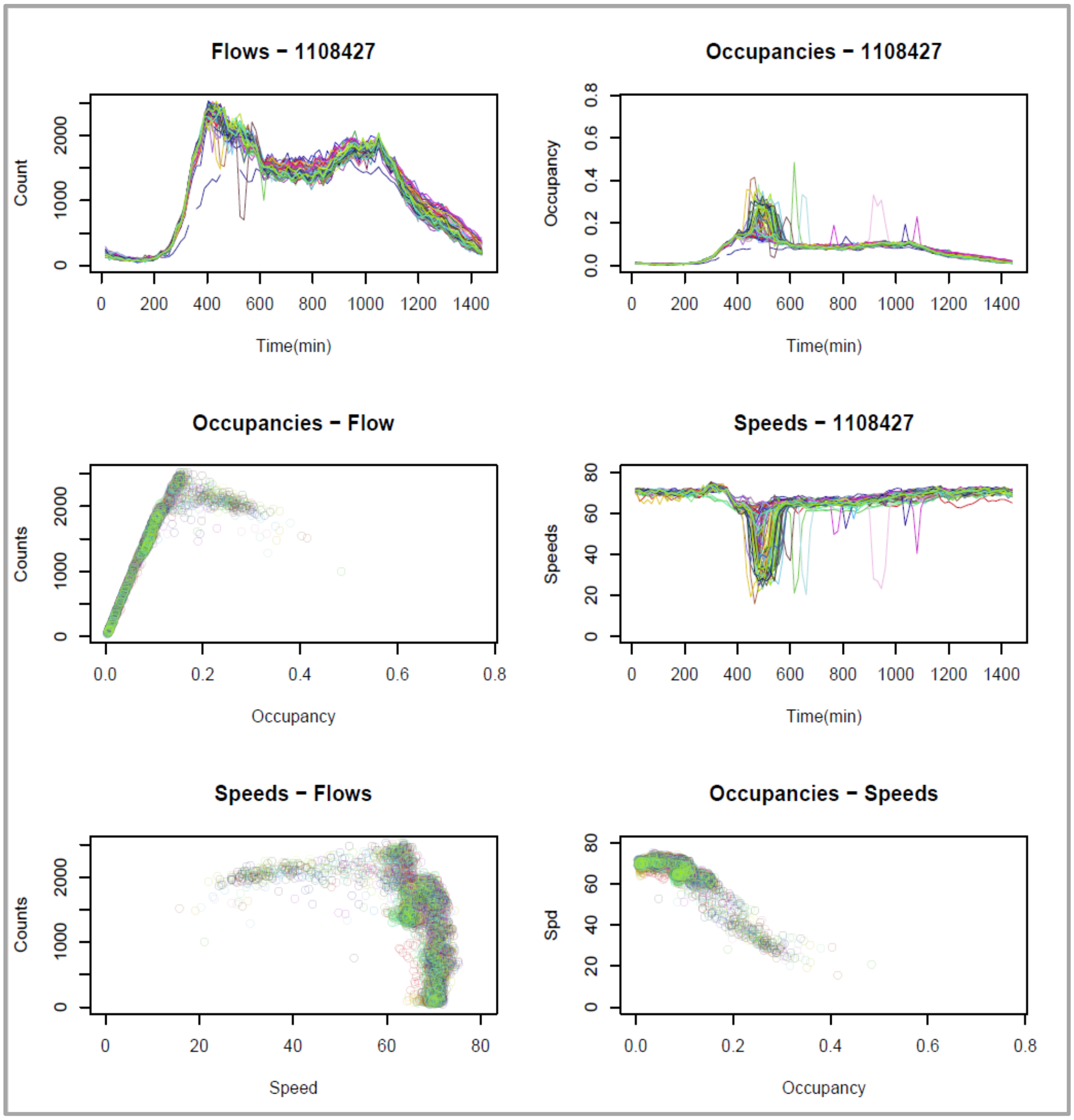

Figure A - 11: Example of Historical Data Available for Detector 1108427 (Colored by Type of Day) [Source: TSS]

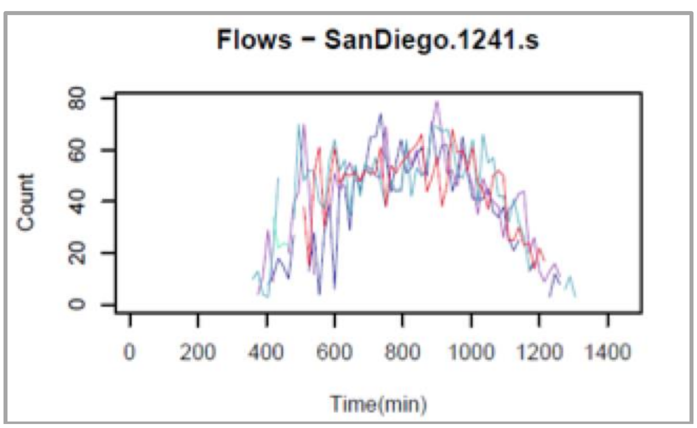

Figure A - 12: Example of Detector Discarded for Irregular Data (SanDiego.1241.s) [Source: TSS]

The historical daily time series available were grouped by type of day for weekdays, considering Monday as one pattern, Tuesday/Thursday as another, Wednesday, and finally Friday. All weekday data were classified into four different patterns. The patterns were calculated for 5, 15 and 60-minute intervals, with the 15-minute interval being the ones the study was mainly focused on. Once the historical daily time series were classified, the daily pattern was obtained by using the median values. Occasional outliers do not influence as significantly the median as they would influence the mean values. Figure A - 13 shows the example of pattern for Wednesday for detector 1100498 with 15-minute intervals (the black line is the median pattern and the orange lines are historical data).

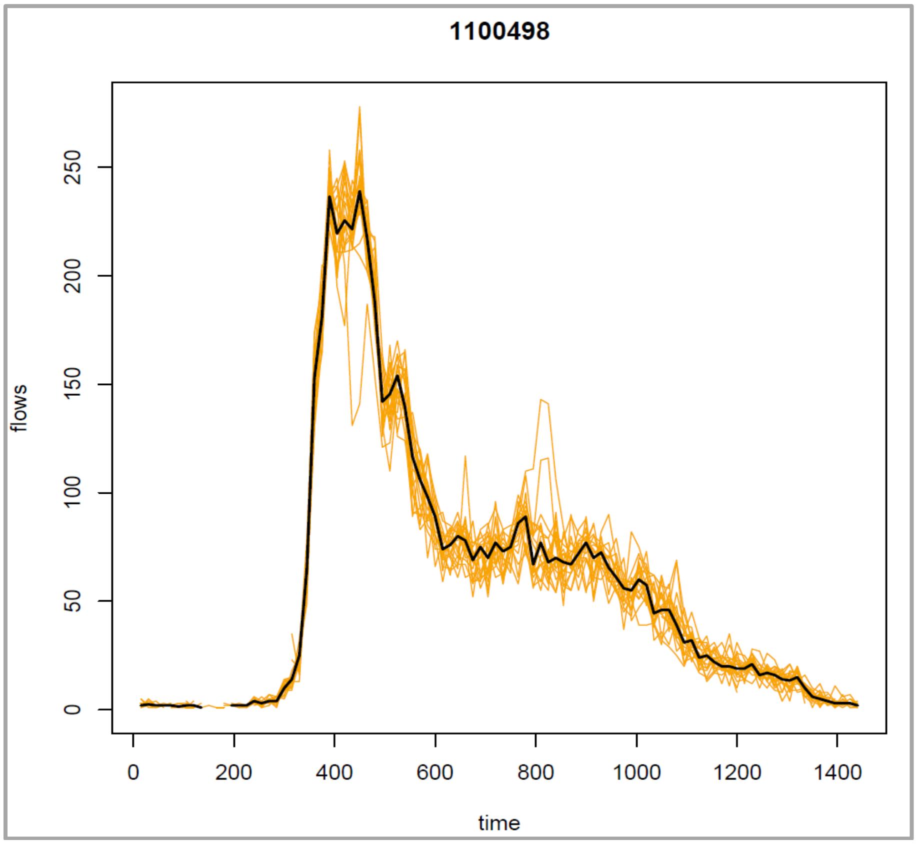

Figure A - 13: Example Wednesday Pattern Data for Detector 1100498 [Source: TSS]

Step 4. Creating and Training the Models

The same time period of data (January through May of 2015) was used to train the models. The models building methodology can be described as follows: “given a time point t and a detector D, a prediction of the flow (or other provided measure) of that detector at time t+h is desired, using all the information available at the moment t”. This can be specified as: Y = f(X), where Y is the objective variable (flow, occupancy, or speed at time (t+h), X the matrix containing the necessary information to feed the model and calculate the prediction at time t, and finally f represents the model function which maps the input X to the desired output Y. The dataset used to build the models comprehends the period between January and May, 2015. For all the corresponding days, this set has been subset for each detector and time point of the day (with a 15 minutes offset) and within this data subset X models have been built for each forecasting horizon (15, 30, 45, 60 and 75 minutes).

The matrix X is built with the explanatory variables of the model, including those variables that can explain the behavior of Y. For instance, this includes the data of the selected detector at time t, but also data from all the neighbor detectors (upstream and downstream) within a specified travel time radius (determined by the forecasting horizon). This relation of upstream and downstream detectors in the network is calculated based on a Macro Assignment scenario that provides the paths that vehicles will follow.

The model training process has been based on the LASSO method which adds a regularization term to LS (L1 norm). Although it may seem similar to ridge regression, it has added benefits. For instance, it performs regression and variable selection at the same time. A variant of the LASSO is the group LASSO, which penalizes groups of variables together, performing not a variable selection, but a group selection. So (regarding a group as a detector through a time window) it selects the relevant detectors, leading to a high level of interpretability in terms of traffic modeling. Elastic net is a variation of the LASSO method that deals better with multicollinearity. See [Tibshirani, 96], [Zou and Hastie, 05] and [Yuan and Lin, 06].

Finally, after the parameter calibration process, we include a validation step to measure the ability of the model to generalize when another set of new data is used (different from the data used for training). In order to select the model with higher accuracy, a 5-fold cross-validation scheme was used. This is the most standard way to ensure that the errors estimated in the training stage will be consistent with future predictions. In the 5-fold cross-validation, the set of historical days is split into 5 groups. For each group g the procedure is: Remove the group g of days (called the test sample) from the historical data. The remaining set is called the training sample. Then train the model with the training sample, evaluate predictions with the test sample, then the mean of the errors achieved by these five test samples is calculated.

Step 5. Generation of Demand Matrices for each Typical Day

With the patterns updated, the detector models trained, and simulation network updated the final step is to produce the typical day Origin/Destination (OD) matrices by performing an OD estimation both with a static and dynamic adjustment the steps are as follows:

- Execute static adjustments, with the old matrices as the starting point, adjusting against the new pattern data. One adjustment is done for every 15 minutes period for each pattern (96x4patterns static adjustments) taking into account 11 vehicle types.
- Creation of the path assignment files running a macro assignment every 15 minutes of 1-hour duration. These will be the initial paths for the dynamic adjustments.
- Execute dynamic adjustments, with the adjusted matrices from the static adjustment as the starting point, and using the path assignment files produced. The dynamic adjustment helps in redistributing the demand along the day taking into account the travel to avoid a shift in the peak hours between the demands versus the values experienced in the model/road.

Figure A - 14, Figure A - 15, and Figure A - 16 show the demand profiles for the AM, MD and PM peak periods.

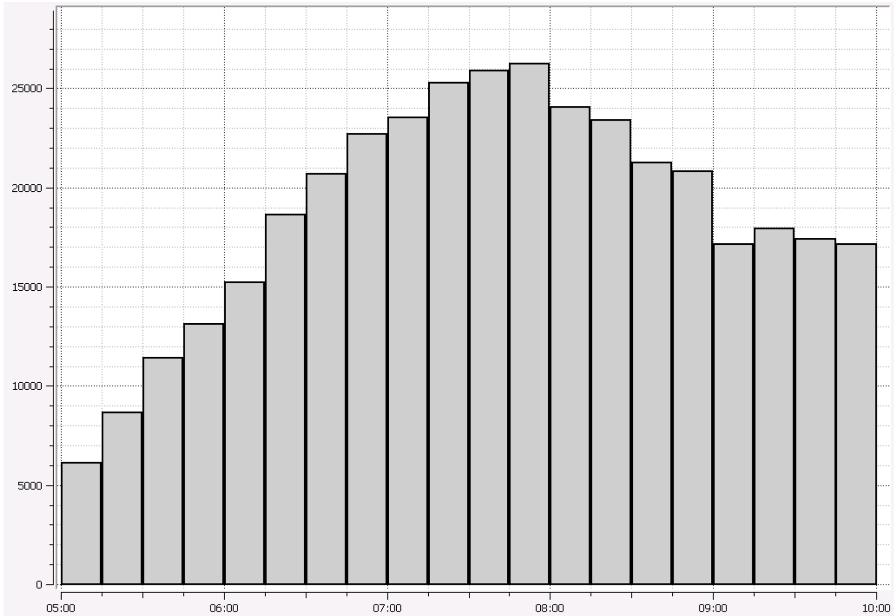

Figure A - 14: AM Travel Demand Profile (5-10 AM) [Source: TSS]

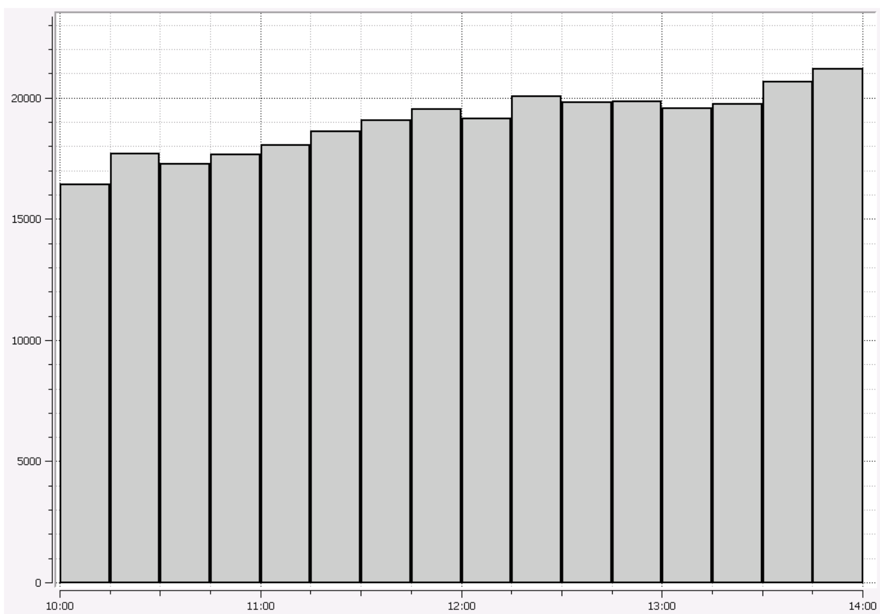

Figure A - 15: Mid-Day Travel Demand Profile (10 AM to 2 PM) [Source: TSS]

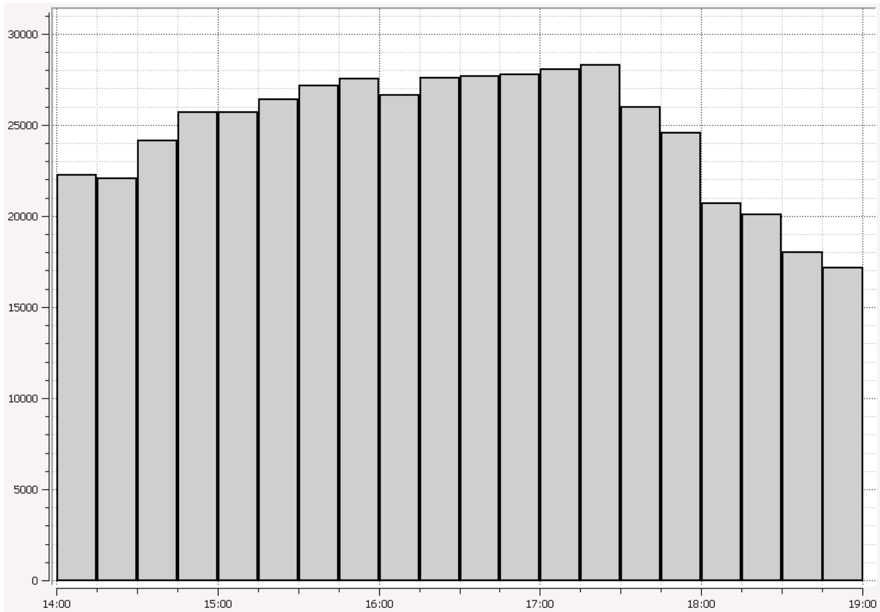

Figure A - 16: PM Travel Demand Profile (2-7 PM) [Source: TSS]

Summary

Based on the available data from both the AMS evaluation cluster analysis and the ICM Real Time System, four periods have been identified to be used as potential model periods for testing of the ATDM and DMA applications. Those days are as follows:

- AM Typical Day (day type 2 Tuesday and Thursday) 6:00am to 7:00am;
- PM Typical Day (day type 2 Tuesday and Thursday) 4:00pm to 8:00pm;
- 2 AM Incident Clusters;
- 2 PM Incident Clusters;

The following clusters and days for the incident cases based cluster frequencies were selected from the completed cluster analysis in the first section of the appendix under ‘USDOT ICM Evaluation Team Cluster Analysis’:

	SB-MD-MI	***SB-MD-HI***	***NB-HD-HI***	***NB-HD-MI***
Representative Day	5/27/2015	2/9/2015	3/27/2015	7/7/2015
Operational Condition	Southbound (AM) + Medium Demand + Medium Incident	Southbound (AM) + Medium Demand + High Incident	Northbound (PM) + Heavy Demand + High Incident	Northbound (PM) + Heavy Demand + Medium Incident
VPH	6,201	6,348	9,034	8,870
Total Cluster Delay (mins)	49.88	108.03	99.72	63.25
Number of Incidents/Period	1.9	3.7	5.5	2.1

The team will provide an update to the model calibration with the selection of a real data set from the system data and comparison with the typical day models.

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