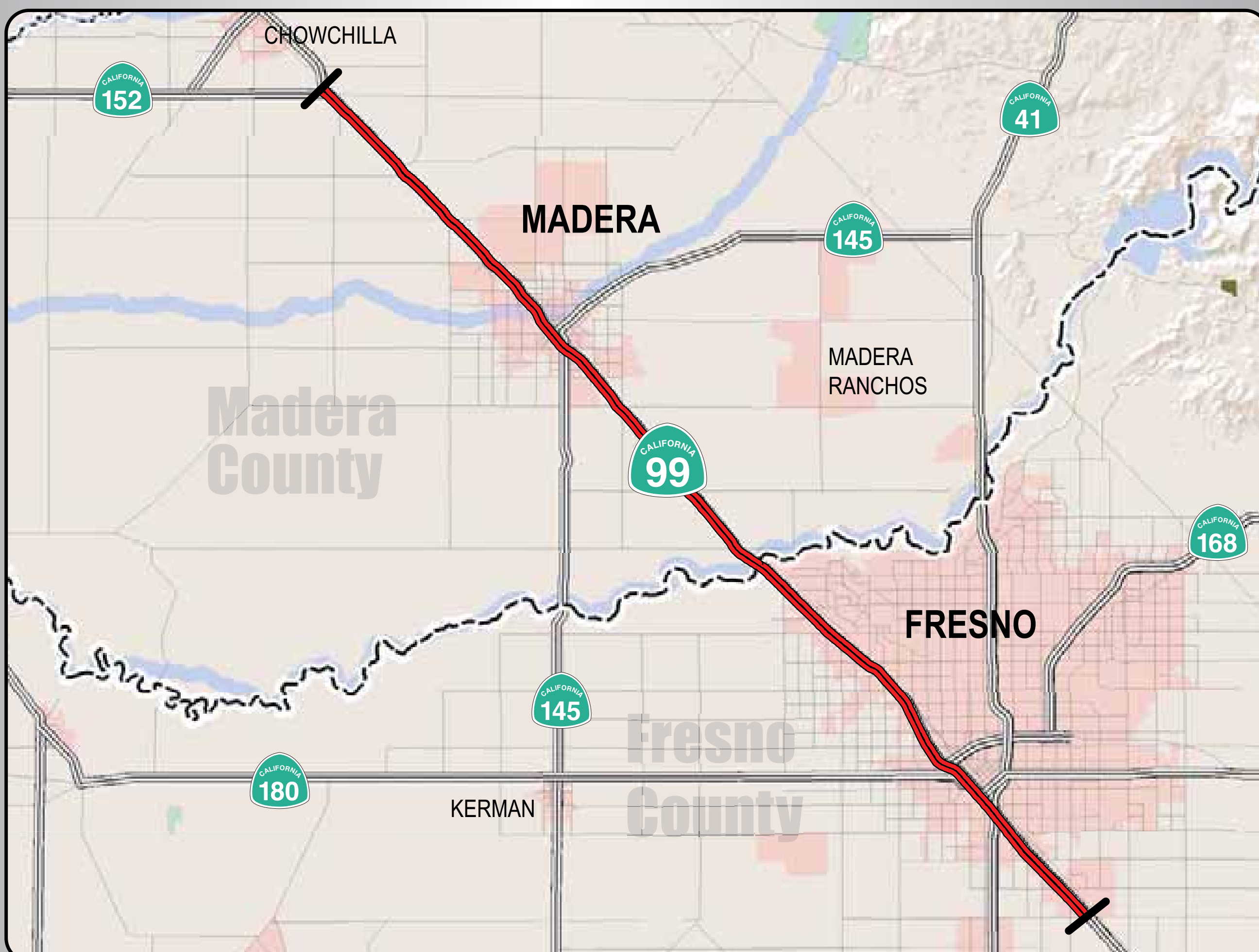
Fresno/Madera Urban Route 99

Corridor System Management Plan

Urban Fresno PM 99 14.5/31.6
Urban Madera PM 99 0.0/23.4



District 6 Planning Division
North Planning Branch
April 2009

Caltrans
CALIFORNIA DEPARTMENT OF TRANSPORTATION

For additional information on the Fresno/Madera Urban Route 99 CSMP, contact:

Caltrans District 6

Office of CSMP:
Joanne Striebich, Chief
Office of CSMP
(559) 488-4347
joanne_striebich@dot.ca.gov

Northern Planning:
Steve Curti, Chief
Northern Planning – Fresno and Madera Counties
(559) 488-4162
steve_curti@dot.ca.gov

Fresno/Madera Urban Route 99 Corridor System Management Plan

Route 99: Near the Southern Sphere of Influence of the City of Fresno at American Avenue through the interchange with Route 152 in Madera County

Caltrans District 6 – Postmile: (FRE–99–PM–14.5 – 31.6) through Postmile: (MAD–99–PM–0.0 – 23.4)

I approve this Corridor Management Plan as the overall Policy Statement and Strategic Plan that will guide transportation decisions and investments for the Route 99 Corridor.

Malcolm X. Dougherty
District Director
Caltrans - District 6

Trinidad M. Rodriguez
Chair, Policy Board
Council of Fresno County Governments

Sharri Bender Ehlert
Deputy District Director
Planning and Local Assistance
Caltrans - District 6

Max Rodriguez
Chairman, Transportation Policy Committee
Madera County Transportation Commission

John Y. Liu
Deputy District Director
Maintenance and Traffic Operations
Caltrans – District 6

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Corridor System Management Plan
April 2009

I. INTRODUCTION

A. Purpose and Need

The preparation of a Corridor System Management Plan (CSMP) is a California Transportation Commission (CTC) requirement for the use of "Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006" funds, approved by the voters as Proposition 1B on November 7, 2006. Proposition 1B funds have been allocated for three projects within the corridor encompassed by this CSMP: the "North Fresno 6-Lane," the "Island Park 6-Lane," and the "Reconstruct Avenue 12 Interchange" (Pages 35 - 36). In requiring the preparation of CSMPs for projects funded by Proposition 1B funds, the CTC was emphasizing the importance of maintaining the mobility gains from corridor capacity improvements after those improvements have been constructed.

This CSMP identifies the recommended management strategies for this portion of the Route 99 transportation corridor. A transportation corridor is not limited to the highway but encompasses all transportation components, taken as a whole, through a geographical area, on a major travel path. The corridor includes the highway, major local parallel arterials, local road intersections, ramps and ramp meters, signal controls, transit, rail, bikes, and pedestrians. The CSMP provides one unified concept for managing, operating, improving, and preserving the corridor across all modes and jurisdictions for the highest productivity, mobility, reliability, accessibility, safety, and preservation outcomes. The CSMP allows the State, regional agencies, and local jurisdictions to manage and operate the transportation corridor for the highest sustained productivity and reliability based on the assessment and evaluation of performance measures. The strategies for managing the corridor are phased and include both operational and more traditional long-range capital expansion strategies. This represents a shift from the traditional approach of identifying localized freeway problems and finding solutions that are often expensive and focused on capital improvements. The CSMP approach places greater emphasis on performance assessments and operational strategies that yield higher benefit-to-cost results.

This CSMP will provide a guide for managing the corridor. Management includes a commitment by all partners to apply the principles and practices of system and corridor management and the use of performance measures to provide for sustained corridor performance. This CSMP assesses current performance, identifies causal factors for congestion, and, based on testing of alternative corridor management and improvement scenarios, will propose the best mix of improvements, strategies, and actions to optimize corridor performance.

Implementation of this new approach to corridor management requires a commitment by Caltrans and the local transportation partners. The Madera County Transportation Commission, Council of Fresno County Governments, and Caltrans District 6 have all signed a Memorandum of Understanding (MOU). This MOU documents the commitment of all parties to manage the corridor through applying the principles and practices of system and corridor management and performance measurement for sustained corridor performance (Appendix A, Pages 44 – 49). The completed CSMP also requires adoption by these same partners. The adoption date is set for mid-2009.

B. Route 99 Background

Route 99 began as a California State highway in 1909. It was originally designated as Legislative Route Number 4, linking Sacramento and Los Angeles, passing through Fresno and Bakersfield. In 1913-14, the route was first paved. In the 1920s, the road was designated as "U.S. 99." Some segments of U.S. 99 were widened to three lanes in the 1930's, the middle lane being reserved for passing and turning. U.S. 99 was eventually widened, segment by segment, and often on a new alignment, to a four-lane expressway during the 1930s, 1940s, and 1950s. The last three-lane section of U.S. 99 in the San Joaquin Valley was replaced with a four-lane expressway north of Fresno in 1960. Since then, most segments have been upgraded to freeway status. Many of the at-grade crossings have either been eliminated or replaced with interchanges. Sections of the old U.S. 99 have been replaced by Interstate 5 (I-5). The current Route 99 begins at I-5, near the base of the Tehachapi Mountains in Kern County, passes through the counties of Tulare, Fresno, Madera, Merced, Stanislaus, San Joaquin, Sacramento, and Sutter counties, and ends at Route 36 near Red Bluff in Tehama County.

The area encompassed by this CSMP is predominately urban (see Map #1, Page 3), with significant urban-style development along the entire section of Route 99 that passes through the City of Fresno and the City of Madera. Within this urban section, the freeway also functions to move local traffic.

C. Corridor Team

The preparation and implementation of this CSMP required coordination with local agencies, Tribal governments, and stakeholders. This coordination was accomplished through the creation of a Project Development Team (PDT).

1. PDT Local Partner Members:

Chaushilha Tribe: Jerry Brown; City of Fresno Development Department: Keith Bergthold; City of Fresno Public Works Department: Scott Mozier/Bryan Jones; City of Madera Community Development Department: Les Jorgensen/Dave Merchen; City of Madera Engineering Department: Ray Salazar; Council of Fresno County Governments: Tony Boren; Fresno Area Express: John Downs; Fresno County Public Works and Planning (Planning): Lynn Gorman/Stan Nakagawa; Fresno County Public Works and Planning (Engineering): Janet Daley; Fresno County Rural Transit Agency: Jeffrey Webster; Madera

City and County Transit: Ellen Moy; Madera County Resource Management Agency (Planning): Rayburn Beach; Madera County Resource Management Agency (Roads): Johannes Hoevertsz; Madera County Transportation Commission: Patricia Taylor/Derek Winning; North Fork Rancheria Tribe: Rod Clemetts/ Elaine Fink; Picayune Rancheria of Chukchansi Indians: Samuel Elizondo/ Dustin Graham; San Joaquin Valley Unified Air Pollution Control District: Tom Jordan; California Public Utilities Commission Rail Safety Division: Kevin Schumacher/Moses Stites.

2. Caltrans PDT Members:

Central Region Environmental: Trais Norris; Graphics: Jeff Fowler; Headquarters Division of Transportation Planning: Al Arana, Kelly Eagan; Maintenance and Traffic Operations: Joel Aguilar, David Arias, Albert Lee, John Liu, Bill Moses, Marco Sanchez, Dan Singh; Northern Planning: Steve Curti; Project Management: Jim Bane, Bob Hull; Technical Planning: Cesar Castaneda, Steven McDonald, Vernie Ratnam; Traffic Management Center: Jose De Alba.

MAP #1
URBAN ROUTE 99 CSMP CORRIDOR

II. CORRIDOR DESCRIPTION

A. Corridor Limits:

This CSMP encompasses the portion of Route 99 that passes through the urbanized areas of the City of Fresno and the City of Madera. The corridor is approximately 40 miles long, 17 miles in Fresno County, and 23 miles in Madera County. It begins near the southern Sphere Of Influence of the City of Fresno at American Avenue [Postmile (PM): FRE-99-PM-14.5], and continues through the Route 99/Route 152 interchange in the County of Madera (PM: MAD-99-PM-23.4). These termini encompass the existing urban land uses along this section of

Route 99, and will interconnect at Route 152 with the Route 99 CSMP prepared by Caltrans District 10.

B. Corridor Width:

Route 99 is a 6-lane freeway from the southern termini of this CSMP area through to Ashlan Avenue (PM: FRE-99-PM-26.7). From this point to the end of the CSMP corridor section in Madera County, Route 99 is a 4-lane freeway. The 2030 concept for this segment of Route 99 is a 6-lane freeway with an auxiliary lane through the section included in Fresno County and a 6-lane freeway through Madera County. The Ultimate Transportation Concept (UTC) is an 8-lane freeway plus an auxiliary lane in the Fresno County section and an 8-lane freeway through Madera County (please see Table 1, Summary Chart, Page 5).

C. Corridor Function:

1. Description of the corridor

Route 99 serves the primary population centers in the San Joaquin Valley as well as much of the rural agricultural areas. Urban areas within the valley tend to be widely separated from one another and Route 99 provides the major means of travel between many of these communities. Route 99 is also the primary link that connects the San Joaquin Valley with the Sacramento metropolitan area and, via I-5, with the Los Angeles area. As a regional route, the facility is a major link for recreation-bound traffic.

The San Joaquin Valley is tied to primary agricultural production and Route 99 functions as a "farm-to-market" transportation route. It is the transportation backbone for the movement of agricultural products, as well as serving a fundamental role in the movement of other commercial goods. In its capacity as an interregional thoroughfare for the movement of people and goods, Route 99 is critical to the economic vitality of the State.

The facility also serves local traffic within the urban sections of the Cities of Fresno and Madera, providing a means of moving from point-to-point within the metro areas.

2. Population Characteristics

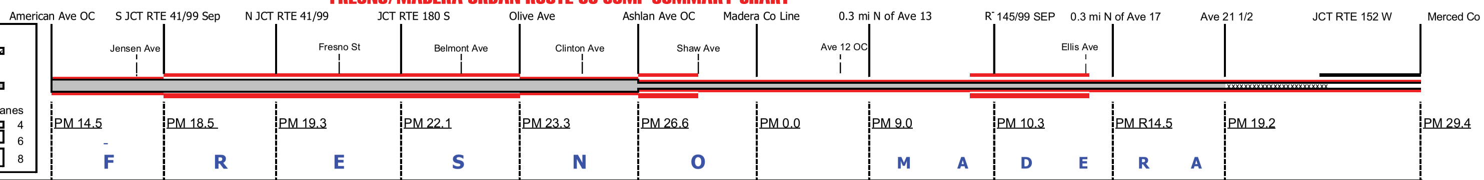
Communities in California are undergoing rapid growth. The Fresno and Madera Metropolitan areas are no exception to this growth trend. In 2000, Fresno County had a population of 799,407, with the City of Fresno's population at 427,652. Fresno County's population is expected to reach 1,402,349 by the year 2030, with much of this increase being accommodated by the City of Fresno. In 2000, Madera County had a population of 123,109, with the City of Madera's population at 43,207. Madera County's population is expected to reach 281,300 by the year 2030. This is due in large part to the availability of land, the proximity of the urban centers of Fresno and Madera Cities to other large urban areas such as Los Angeles and San Francisco, and the relatively low cost of land in the San

Table #1

FRESNO/MADERA URBAN ROUTE 99 CSMP SUMMARY CHART

LEGEND

- Existing Lanes
- Existing & Auxiliary Lanes
- Planned or Programmed by 2030
- Through Lanes / Through and Auxiliary Lanes / Auxiliary Lanes
- Expressway
- Freeway
- Number of Lanes: 4, 6, 8
- * Not to scale



SEGMENT	25	26	27	28	29	30	31	32	33	34	35	
County / Route	FRESNO / 99	FRESNO / 99	FRESNO / 99	FRESNO / 99	FRESNO / 99	FRESNO / 99	MADERA / 99	MADERA / 99	MADERA / 99	MADERA / 99	MADERA / 99	MADERA / 99
Description Begin	AMERICAN AVE OC	SOUTH JCT RTE 41/99 SEP	NORTH JCT RTE 41/99 SEP	JCT RTE 180 S	OLIVE AVE OC	ASHLAN AVE OC	MADERA CO LINE	0.3 MI N OF AVE 13	RTE 145/99 SEPARATION	0.3 MI N OF AVE 17	AVE 21 1/2	JCT SR 152
Description End	SOUTH JCT RTE 41/99 SEP	NORTH JCT RTE 41/99 SEP	JCT RTE 180 S	OLIVE AVE OC	ASHLAN AVE OC	MADERA CO LINE	0.3 MI N OF AVE 13	RTE 145/99 SEPARATION	0.3 MI N OF AVE 17	AVE 21 1/2	JCT SR 152 W	AVE 24
Postmile Limits Begin/End (PM)	14.5 / 18.5	18.5 / 19.3	19.3 / 22.1	22.1 / 23.3	23.3 / 26.6	26.6 / 31.6	0.0 / 9.0	9.0 / 10.3	10.3 / R14.5	R14.5 / 19.9	19.9 / 22.7	22.7/23.37
Length (MI)	4.0	0.8	2.8	1.2	3.3	5.0	9.0	1.3	4.2	5.4	2.8	0.67
Rural / Urban	Urban	Urban	Urban	Urban	Urban	Urban	Rural	Urban	Urban	Urban	Rural	Rural
Terrain	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat
Facility: Existing	6F	6F	6F	6F	6F	4F	4F	4F	4F	4F	4E	4F
2030 Concept	6F + AUX	6F + AUX	6F + AUX	6F + AUX	6F + AUX	6F + AUX	6F	6F	6F	6F	6F	6F
UTC	8F + AUX	8F + AUX	8F + AUX	8F + AUX	8F + AUX	8F + AUX	8F	8F	8F	8F	8F	8F
LOS: 2006	E	F	D	F	E	E	E	E	E	D	D	C
LOS: 2020	E	F	F	F	E	D	F	F	F	F	E	C
LOS: 2030	F	F	F	F	F	F	F	F	F	F	F	E
LOS: Concept 2030	D	D	D	D	D	D	D	D	D	D	C	C
Deficiency/Year Deficient	2006	2006	2020	2006	2006	2006	2006	2006	2006	2020	2006	2030
Project in STIP/RTP (Y/N)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LOS W/ Concept Improvement	F	F	F	F	F	F	F	F	F	F	F	D
Directional Split (Peak Hour)	56/44	56/44	56/44	56/44	54/46	55/45	55/45	56/44	57/43	57/43	57/43	57/43
AADT: 2006	95,000	108,000	90,000	134,000	100,000	65,000	63,000	67,000	69,000	55,000	53,000	38,500
AADT: 2020	124,450	141,480	117,900	175,540	146,000	94,900	110,565	117,585	124,269	99,055	95,453	67,375
AADT: 2030	148,300	168,700	158,000	209,300	176,000	123,500	157,500	174,000	178,710	143,000	137,000	96,250
Peak Hour 2005	9,500	10,800	9,000	13,400	10,000	6,500	6,300	6,700	6,900	5,500	5,300	3,850
Peak Hour: 2020	12,445	14,148	13,420	17,554	14,600	9,490	11,057	11,759	12,427	9,906	9,545	6,738
Peak Hour: 2030	14,830	16,870	19,980	20,930	17,600	12,350	15,750	17,400	17,871	14,300	13,700	9,625
% Truck, AADT	23	24	24	24	24	24	24	24	23	24	24	23
Truck AADT 5+Axle: 2006	21,850	25,920	21,600	32,160	24,000	15,600	15,120	16,080	15,870	13,200	12,720	8,855
Truck AADT 5+Axle: 2020	29,850	34,890	32,210	43,290	35,280	25,760	23,900	25,050	26,980	25,190	21,690	15,100
Truck AADT 5+Axle: 2030	40,780	46,920	47,950	56,920	52,560	42,430	37,500	38,750	46,180	47,260	38,160	26,570

Segment: Is self-explanatory except for several data sets:

Rural/Urban: Indicates whether the segment is in a rural area or city limits.

Terrain: Shows the general highway grade: minimal grade = level; moderate grade = rolling; and severe grade = mountainous.

Ultimate Transportation Corridor (UTC): Is the typical ROW needed for the ultimate facility,i.e., 8 lane freeway(8F) 218 feet is the standard typical UTC ROW - will be updated upon corridor plan lining by specific sections of highway.

Facility: Shows the Existing Facility, the desired facility type (2030 Concept) by 2030-RTPA's and Caltrans, and the Ultimate Facility to preserve ROW and plan line beyond 2030. 2C(I) indicates that the highway has been improved in select locations with

LOS: The current (2005) LOS (level of service), along with the expected calculated LOS in 2015 and 2030. The 2030 Concept is the target LOS desired, i.e., LOS C, for attainment by 2030 Caltrans.

Deficiency: Occurs when the target LOS is degraded, i.e., LOS D worse than LOS C, with the year of occurrence shown. It also shows whether a capacity improving project is in the STIP, and what the LOS would be with the 2030 Concept improvement.

Directional Split: Denotes the split in the peak hour traffic flow on a directional basis (NB/SB or WB/EB) either in the morning (AM) or evening (PM).

% Trucks: shows the percentage of trucks for AADT and Peak Hour.

AADT: signifies Annual Average Daily Traffic.

Peak Hour: Indicates a representation of the maximum hour of traffic flow during the day.

Joaquin Valley. The anticipated growth necessitates a new approach to managing the corridor.

3. Goods Movement

Various modes are used in California to move goods, including seaports, airports, railways, dedicated truck lanes, logistics centers, and border crossings. The California economy relies heavily on the efficient and safe delivery of goods to and from our ports and borders, as well as distribution within the State. This includes the movement of raw materials to manufacturing and processing plants, as well as the movement of finished products to market.

The San Joaquin Valley region is one of the four major international trade regions in California, designated in the 2002 Global Gateways Development Program. The San Joaquin Valley (SJV) Goods Movement Study, prepared for Caltrans and the eight counties of the San Joaquin Valley (Kern, Fresno, Tulare, Kings, Madera, San Joaquin, Stanislaus, and Merced), determined that trucking is the dominant mode for moving freight. Rail accounted for only approximately 11% of the total tonnage. The increase in freight movement by trucks on State highways is growing faster than can be accommodated by the existing capacity. Route 99's Annual Average Daily Traffic (AADT) ranges from 30,000 to 109,000, with trucks constituting up to 30% of the AADT in some sections, even though the State average is only 9% (see truck percentages, Table 1, Summary Chart, Page 5).

Goods Movement is critical to the economy of the State and represents an increasingly important employment sector for Californians. It is vital to our quality of life and to our economy to improve the essential infrastructure needed to enhance the transport of goods. Improving the goods movement infrastructure, and thereby providing alternatives to the reliance on trucking, will also aid in relieving congestion on freeways and will increase mobility for everyone in California.

4. Alternative modes of transportation

a) Freight Rail

The Union Pacific Railroad (UPRR) runs north-south along the eastern side of Route 99 through the entire corridor encompassed by this CSMP. The UPRR provides freight service, much of it long distance movement of goods.

The San Joaquin Valley is a major corridor for freight/goods movement. Route 99 has been the preferred route for freight movement by trucks. The report prepared by the Business, Transportation and Housing Agency and the California Environmental Protection Agency entitled "Goods Movement Action Plan" identified that one possible solution to reducing truck traffic within the corridor would be to encourage alternatives to highway freight movement. A logical alternative identified in the report was to increase rail transport of freight/goods by taking advantage of the available capacity on rail mainlines. The PDT for this CSMP includes representatives from the California Public Utilities Commission (CPUC), Rail Safety Division. The CPUC will assist in coordinating any necessary planning activities with the railroads.

b) Passenger Rail

In most states, inter-city passenger train service is provided solely by Amtrak. This service is provided with no assistance of any sort from state or local governments. California, through Caltrans, is one state that has been assisting Amtrak in order to allow Amtrak to provide more than just the basic service. Capital grants and support for station and track improvements (including signaling), locomotives and cars, and connecting Amtrak bus service have been provided. The *Pacific Surfliner*, *San Joaquins*, and *Capitol Corridor* Amtrak lines are funded primarily by the State of California, with Amtrak and Caltrans operating as partners, helping to reduce ticket fares. These trains operate in addition to Amtrak's own interstate trains: the *Coast Starlight,* the *California Zephyr*, the *Southwest Chief*, and the *Sunset Limited,* that provide a passenger rail connection for California to the rest of the country.

Amtrak provides accessible Thruway Motorcoach (bus) service on some routes. Portions of the trip may be by bus, depending on the line. Amtrak Motorcoaches also extend Amtrak's services, providing connectivity to areas not served by passenger rail. When disruptions to train service occur, arrangements may be made to provide alternative accessible accommodations via motorcoach or other means of transportation.

The Amtrak line known as the "San Joaquins" runs north-south, linking Bakersfield and the Bay Area with stops in Fresno, Madera, Stockton, and Sacramento. The San Joaquins is the fourth busiest route in the Amtrak national system, and operates six times in each direction, 365 days per year. At the present time, four round trips daily operate between the Bay Area and Bakersfield, and two round trips operate directly between Sacramento (no bus to Stockton) and Bakersfield. Some portions of the trip may be by Amtrak Motorcoach. Ridership in fiscal year 2003 – 2004 was over 750,000. Adding trains to the existing San Joaquins line has been considered.

In November 2006, Proposition 1B, the "Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006" was passed by voters and will provide up to $400 million dollars in new funds to expand passenger services. These funds are to provide all passenger and freight services the ability to operate more efficiently by improving capacities, sidings, and track signals.

c) High-Speed Rail

The California High Speed Rail Authority (HSRA) has developed a plan to build a high-speed rail line, capable of reaching speeds of 220 miles per hour that would service the major metropolitan centers of California. The rail line would eventually run from San Diego to as far north as Sacramento, with several proposed stations in the San

Joaquin Valley. It is projected that 32 million inter-city passengers and another 10 million commuters would use the system per year. Based on a comprehensive screening evaluation of alignment and station options, the Authority recommended alignments through the Valley that include both the UP/SP and BNSF railroad corridors (both running generally parallel to Route 99). The rail line would eventually run from San Diego to as far north as Sacramento. Proposed Valley stations include Hanford, Visalia, Fresno, Merced, Modesto, Stockton, and Sacramento. It is anticipated that the high-speed route through the fast-growing San Joaquin Valley would produce the highest ridership and revenue. However, its impact on traffic on Route 99 will not be known until some time in the future. Total cost of the high-speed rail is estimated to be $40 billion. A bond measure to fund at least a portion of the High-Speed Rail was passed in November 2008. The bond measure authorizes $9.95 billion in spending for high-speed rail improvements and other rail services. With passage of the bond, construction could begin as early as 2011.

d) Transit

This CSMP includes sections of Route 99 that pass through both Madera and Fresno Counties. The local jurisdictions have not identified any unmet transit needs that would be reasonable to meet.

i. Fresno County. The Fresno County Regional Transit Agency (FCRTA) offers both fixed route and dial-a-ride services. FCRTA services the outlying areas of Fresno County including the thirteen rural incorporated cities of Fresno County: Coalinga, Firebaugh, Fowler, Huron, Kerman, Kingsburg, Mendota, Orange Cove, Parlier, Reedley, Sanger, San Joaquin, and Selma. There is limited service to communities in neighboring counties including: Granville, Hardwick, and Hanford in Kings County; Dinuba in Tulare County; Madera and Children's Hospital - Central Valley in Madera County; and Dos Palos in Merced County. Many unincorporated rural communities are also served, including the following: Alder Springs, Auberry, Burrough Valley, Cantua Creek, Caruthers, Dunlap, Easton, El Porvenir, Five Points, Friant, Halfway, Jose Basin, Lanare, Laton, Marshall Station, Meadow Lakes, Mile High, Miramonte, New Auberry, O'Neills, Pinehurst, Prather, Raisin City, Riverdale, Squaw Valley, Sycamore, Three Rocks, Tollhouse, Tranquillity, and the American Indian Rancherias of Big Sandy, Cold Springs, and Table Mountain. FCRTA offers connections to the following area transportation providers: Fresno Area Express' (FAX) scheduled fixed route service with connections to Valley Children's Hospital in Madera County; FAX's Handy Ride ADA demand responsive services; Clovis Transit's Stageline scheduled, fixed route service; and Clovis Round-Up's demand responsive ADA services. Urban areas of Fresno are serviced by the Fresno Area Express (FAX), Clovis Round-Up, and the Clovis Stage Line.

Greyhound and Orange Belt Stages provide transit services to areas outside the county. In addition, Transportes Intercalifornias provides two daily round trips from Fresno to Los Angeles, with connecting services onward to Santa Ana, San Ysidro and Tijuana.

The City of Fresno has a Bus Rapid Transit (BRT) system in the planning stages. BRT is a type of limited-stop service that relies on technology to help speed up the service. It can operate on exclusive transitways, high-occupancy-vehicle lanes, expressways, or ordinary streets. A BRT line combines ITS technology, priority for transit, rapid and convenient fare collection, and integration with land uses to substantially upgrade bus system performance. The City of Fresno is initiating a pilot project to add a BRT line along one of the major local street corridors. If this line is successful, others will likely be added elsewhere within the City, possibly along the Route 99 corridor.

ii. Madera County. The City of Madera operates its Madera Area Express (MAX) as both a fixed route and dial-a-ride system. The Madera County Connection (MCC) operates a fixed route system from Bass Lake/Oakhurst to Valley Children's Hospital via Routes 41, 99, 145, and Avenue 12 as well as a fixed route system between the Cities of Chowchilla and Madera. The Greyhound Bus Line serves the county of Madera via Route 99 and Route 152 to Chowchilla, and areas north, south, and west of the county. Seven social service agencies provide transportation in Madera County, largely to their own clients at specific sites. Several private carriers provide inter-city services. The City of Madera's Downtown Intermodal Center provides interconnects with Dial-A-Ride operations, the Madera fixed route system, and Greyhound inter-city services. Planning is underway to improve access to Amtrak service.

Both counties within the CSMP area have passed local sales tax measures to be used for transportation-related improvement projects. Fresno County has passed an extension of Measure C and Madera County has passed Measure T. Measures C and T have specifically directed money to Public Transportation, so expansion of services may be possible.

iii. Transit Studies. The Merced County Association of Governments, MCAG, is the administrative lead for the "San Joaquin Valley Express Transit Study." The study is under the guidance of the San Joaquin Policy Council, with the San Joaquin Unified Air Pollution Control District (SJUAPCD) and Caltrans as partners. The eight counties of the San Joaquin Valley (San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern) currently do not have transit services or a transit operator that focuses on providing commuter service inter-regionally or to neighboring regions. The lack of these services leaves commuters with no alternative other than the automobile. The study's purpose is to identify markets that can support inter-county transit service within the San Joaquin Valley region, and between this region and its neighbors. A new transit services operating plan will be prepared and an institutional and financial structure defined for the new service.

e) Casino Bus Lines

This is a possible source of expansion for transit. These buses typically use State highways. Adding buses to transport customers to and from casinos can reduce some of the traffic impacts. Caltrans and local jurisdiction interaction with the casinos would be during the environmental process of any proposed new casino or an expansion of an existing casino. This would be an ongoing effort and Caltrans District 6 has been encouraging this approach as part of the traffic mitigation for casinos.

f) High-Occupancy Vehicle Lanes (HOV)

Projected growth in the Valley will necessitate the consideration of some form of congestion relief. HOV facilities are one alternative. HOV lanes are facilities that have been designated for a specific use by the traveling public. Criteria for using these facilities include the number of passengers per vehicle (two or more), transit vehicles, trucks, and motorcycles. These facilities emphasize "person movement" rather than vehicle movement, with an emphasis on increasing the number of persons per vehicle via transit, vanpool, and all forms of ridesharing. This provides for a more efficient utilization of the existing freeway capacity. HOV facilities may result in not only relieving congestion, but may also play a role in improving the overall air quality in the San Joaquin Valley. Currently, Route 99 within the San Joaquin Valley does not include any HOV lanes.

In December 2004, Caltrans Districts 6 and 10 completed a study entitled "High Occupancy Vehicle Lane Viability for the San Joaquin Valley" to identify potential HOV corridors. The Department's Policy and Procedures Memorandum (P89-01) states that the "Department will consider an HOV lane alternative for projects which add capacity to metropolitan freeways or proposed new metropolitan freeways." The HOV Guidelines indicate that HOV lanes should be considered if certain criteria are met. These criteria include freeways with 6 lanes or more, recurrent congestion, and facilities falling below Level of Service (LOS) "D." The portion of the Route 99 corridor through the Fresno urban area was identified as a potential HOV route. After study, however, it was determined that an HOV alternative in this portion of the Route 99 corridor would result in under-utilization of the HOV lane. While the HOV lane would have a superior Level of Service, the mixed-flow lanes would be congested and operate at LOS F.

The success of an HOV facility does not rely solely on the identification of a road segment that meets specific criteria, but is also contingent on public involvement and education, supporting policy and programs, and interagency coordination. Caltrans will continue to evaluate, in collaboration with local partner agencies, the possibility of HOV facilities within the San Joaquin Valley. Such a facility, or facilities, may prove viable in the future.

g) Bicycles and Pedestrians

Bicycles are normally permitted on all conventional state highways and many state expressways and freeways. However, due to controlled access that occurs along all portions of this freeway within Fresno and Madera counties, neither bicycles nor pedestrians are permitted.

h) Aviation

Within the metropolitan areas included in this Route 99 CSMP area, there are four airports; three in the City of Fresno, and one in the City of Madera.

i. Fresno Metro Area. Fresno Yosemite International (FYI) Airport is the largest airport in the combined metro area, and is located approximately seven miles to the east of Route 99. The airport is publicly owned, and open to the public. Access to FYI has improved recently with the development of two new freeways. Route 168 provides access to the airport. Route 168 connects with Route 180 East, which also connects with Route 99.

Sierra Skypark is approximately three miles east of the Route 99 corridor and is a privately owned, open to the public, airport. The most convenient access to Sierra Skypark from Route 99 is via Herndon Avenue.

Chandler Executive airport is a general aviation airport, publicly owned and open to the public. It is located just over one mile from the Route 99 corridor and is most conveniently accessed from Route 99 via Route 180 West.

ii. Madera Metro Area. Madera Municipal Airport includes a main runway that is available for night operations, and will accommodate most business jet and turbojet aircraft. Another secondary runway is in service for restricted daylight operations. The airport is publicly owned and open to the public. The interchanges at both Avenue 16 and Avenue 17 provide access from Route 99 to the Madera Municipal Airport.

D. Corridor Inventory:

Current AADT, Level of Service, % Trucks, Peak-Hour AADT, 10 and 20-year AADT forecasts, by segment of the Route 99 Corridor, are presented in Table 1, Summary Chart, Page 5.

1. Traffic Volumes and Type

The high rate of growth in the San Joaquin Valley is quickly using and exceeding the capacity of the Route 99 corridor. In the next 20 years, Goods Movement is expected to increase, creating even greater pressure on this primary north-south route. The existing facility does not have the capacity to accommodate this increase in growth and goods movement. To maintain the corridor's ability to support ongoing development, facilitate efficient goods movement, and improve the quality of life, a substantial investment is needed to maintain and improve the corridor. Creative solutions to deal with this impact will be needed, solutions beyond simply increasing capacity. This CSMP is the first step in the process.

The various transportation improvement alternatives, including capacity-enhancing projects, will be analyzed to ensure that the best solution for a given section of the corridor is chosen. In the past, capacity-enhancing projects were the first solution, designed to accommodate the additional traffic and reduce congestion.

Route 99, as a regional facility, is impacted by special events. These events include, but are not limited to:

- Large events at Fresno State, such as the "Promise Keepers",
- Football/Basketball games at Fresno State,
- Concerts/events at the SaveMart Center,
- Concerts/events at Selland Arena,
- Conventions at the Fresno City Downtown Convention Center
- Baseball games/events at Chukchansi Park Downtown,
- The Madera County Fair,
- The Fresno County Fair,
- The Kings County Fair in Hanford,
- The Fourth of July Celebration in Madera,
- Buck Owens' Crystal Palace in Bakersfield,
- "El Protector" events (CHP sponsored), and
- The Tulare Farm Show/World Ag Expo.

While many of these events are not adjacent to Route 99, Route 99 is the major north-south route, and as such is used by many people coming from out of the area. Large special events require coordination with the CHP and the Traffic Management Center to keep traffic flowing and reduce both delays and accidents.

2. Geometrics

Route 99 is a 6-lane freeway from the southern termini of this CSMP area (American Avenue in Fresno County), through to Ashlan Avenue. From this point to the end of the CSMP corridor section at Route 152 in Madera County, Route 99 is a 4-lane freeway. The width of the median ranges from 16 to 94 feet, the width of the paved shoulders varies from 2 to 17 feet, and the lane width is 12 feet (see Table 2, Geometrics, Page 13). The corridor includes freeway-to-freeway connections at Routes 41, 180, and 152. Many of the ramps and bridges along this section do not meet current standards.

Table #2

FRESNO/MADERA URBAN ROUTE 99 CSMP GEOMETRICS

LEGEND

Existing Lanes — Expressway
Existing & Auxiliary Lanes — Freeway

Planned or Programmed by 2030: Through Lanes, Through and Auxiliary Lanes, Auxiliary Lanes

Number of Lanes: 4, 6, 8

* Not to scale

American Ave OC, S JCT RTE 41/99 Sep, N JCT RTE 41/99, JCT RTE 180 S, Olive Ave, Ashlan Ave OC, Madera Co Line, 0.3 mi N of Ave 13, R 145/99 SEP, 0.3 mi N of Ave 17, Ave 21 1/2, JCT RTE 152 W, Merced Co Line

Jensen Ave, Fresno St, Belmont Ave, Clinton Ave, Shaw Ave, Ave 12 OC, Ellis Ave, JCT RTE 233

PM 14.5, PM 18.5, PM 19.3, PM 22.1, PM 23.3, PM 26.6, PM 0.0, PM 9.0, PM 10.3, PM R14.5, PM 19.2, PM 22.7, PM 29.4

F R E S N O — M A D E R A — CHOWCHILLA

Segment: Is self-explanatory except for several data sets:

Functional Classification: A process by which streets and highways are grouped into or classification systems.

Freeway/Expressway System: The Statewide system of highways declared to be essential to the future development of California.

Regionally Significant: Serves regional transportation needs including at a minimum all principal arterial highways and all fixed guideway transit facilities.

STRAHNET: A highway that provides defense access, continuity, and emergency capabilities for movements of personnel and equipment in both peace and war.

Lifeline: A route on the State highway system that is deemed so critical to emergency response/life-saving activities of a region or the state that it must remain open.

IRRS: (Interregional Road System): A series of State highway routes, outside the urbanized areas, that provide access to the State's economic centers, major recreational areas, and urban and rural regions.

STAA (Surface Transportation Assistance Act): This act required states to allow larger trucks on the National Network. "Terminal Access" routes are State highways that can accommodate STAA trucks. Other designations i,e., California Legal offer more limited access.

Scenic: A highway may be designated scenic depending upon how much of the natural landscape can be seen by travelers.

ICES (Intermodal Corridor of Economic Significance): Significant National Highway System Corridors that link intermodal facilites most directly, conveniently and efficiently to intrastate, interstate, and international markets.

NHS (National Highway System): Included is all interstate routes, a large percentage of urban and rural principal arterials, the defense strategic highway network, and strategic highway connectors.

Shoulder Range: Is a range of treated surface (8' standard), both inside and outside shoulders

SEGMENT	F	R	E	S	N	O		M	A	D	E	R	A		CHOWCHILLA

SEGMENT												
County / Route	FRESNO / 99	FRESNO / 99	FRESNO / 99	FRESNO / 99	FRESNO / 99	FRESNO / 99	MADERA / 99	MADERA / 99	MADERA / 99	MADERA / 99	MADERA / 99	MADERA / 99
Description Begin	AMERICAN AVE OC	SOUTH JCT RTE 41/99 SEP	NORTH JCT RTE 41/99 SEP	JCT RTE 180 S	OLIVE AVE OC	ASHLAN AVE OC	MADERA CO LINE	0.3 MI N OF AVE 13	RTE 145/99 SEPARATION	0.3 MI N OF AVE 17	AVE 21 1/2	JCT SR 152 W
Description End	SOUTH JCT RTE 41/99 SEP	NORTH JCT RTE 41/99 SEP	JCT RTE 180 S	OLIVE AVE OC	ASHLAN AVE OC	MADERA CO LINE	0.3 MI N OF AVE 13	RTE 145/99 SEPARATION	0.3 MI N OF AVE 17	AVE 21 1/2	JCT SR 152 W	MERCED CO LINE
Postmile Limits Begin/End (PM)	14.5 / 18.5	18.5 / 19.3	19.3 / 22.1	22.1 / 23.3	23.3 / 26.6	26.6 / 31.6	0.0 / 9.0	9.0 / 10.3	10.3 / R14.5	R14.5 / 19.9	19.9 / 22.7	22.7 / 29.4
Length (MI)	4.0	0.8	2.8	1.2	3.3	5.0	9.0	1.3	4.2	5.4	2.8	6.7
Functional Classification	Principal Arterial - Urban (P1P)	Principal Arterial - Urban (P1P)	Principal Arterial - Urban (P1P)	Principal Arterial - Urban (P1P)	Principal Arterial - Urban (P1P)	Principal Arterial - Urban (P1P)	Principal Arterial	Principal Arterial - Urban (P1P)	Principal Arterial - Urban (P1P)	Principal Arterial	Principal Arterial	Principal Arterial - Urban (P1P)
National Highway System (NHS) (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Freeway/Expressway System (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regionally Significant (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
STRAHNET (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lifeline (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IRRS (Yes: HE=High Emphasis, F=Focus, G=Gateway or No)	HE, F & G	HE, F & G	HE, F & G	HE, F & G	HE, F & G	HE, F & G	HE, F & G	HE, F & G	HE, F & G	HE, F & G	HE, F & G	HE, F & G
TRUCK NETWORK, STAA: (NN=National Network, TA=Terminal Access, CL= California Legal, R= Special Restrictions, or A=Advisory)	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
Scenic (Yes: Officially Designated, Eligible or No)	No	No	No	No	No	No	No	No	No	No	No	No
ICES (Intermodal Corridor of Economic Significance) (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
General Plan/RTP LOS Standard	City of Fresno General Plan LOS D	City of Fresno General Plan LOS D	City of Fresno General Plan LOS D	City of Fresno General Plan LOS D	City of Fresno General Plan LOS D	City of Fresno General Plan LOS D	Madera County RTP: LOS C	City of Madera General Plan: LOS D	City of Madera General Plan: LOS D	City of Madera General Plan: LOS D	Madera County RTP: LOS C	Madera County RTP: LOS C
General Plan/RTP Standard Highway Classification	Freeway	Freeway	Freeway	Freeway	Freeway	Freeway	State Hwy/Fwy	State Hwy/Fwy	State Hwy/Fwy	State Hwy/Fwy	State Hwy/Exy	State Hwy/Fwy
Passing Lanes (Y/N)	No	No	No	No	No	No	No	No	No	No	No	No
Bike Use Allowed (Y/N)	No	No	No	No	No	No	No	No	No	No	No	No
Rural / Urban	Urban	Urban	Urban	Urban	Urban	Urban	Rural	Urban	Urban	Urban	Rural	Urban
Terrain	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat	Flat
Median Range (FT)	46 / 46	46 / 46	16 / 16	16 / 16	16 / 36	36 / 60	32 / 46	32 / 40	32 / 80	46 / 94	46 / 46	39 / 46
Shoulder Range (FT) - Treated	2 / 8	5 / 10	5 / 10	2 / 10	2 / 17	2 / 17	2 / 10	2 / 10	2 / 10	2 / 10	2 / 10	4 / 10
Lane Width (FT)	12	12	12	12	12	12	12	12	12	12	12	12

3. Characteristics

a) Interstate Status

Route 99 is an important interregional route, bearing a number of different classifications, indicating its significance (see Page 4, Description of the Corridor). In August 2005, legislation was enacted that designated the section of Route 99 from Bakersfield to Sacramento as a future interstate. The statutory language was contained in Section 1304 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). Proponents believe that inclusion of Route 99 in the Interstate system will make the area more attractive to new employers, resulting in more and better jobs for the region and that funding for Route 99 will increase. While Interstate designation would allow Route 99 to be eligible for funding from additional programs, it would not increase the total federal transportation dollars to the State.

There is a significant cost associated with upgrading to Interstate standards, a condition of the change in designation, as high as $14 to $19 billion (2005/06 fiscal year dollars). In the Cities, closure of local road interchanges due to non-standard spacing would require the construction of a local frontage road system to accommodate the change in local circulation. This would also represent a significant cost. The statutory language does not require meeting Interstate standards within any set time period, and waivers to these standards may be possible. An economic study to evaluate the benefits of Interstate designation is underway.

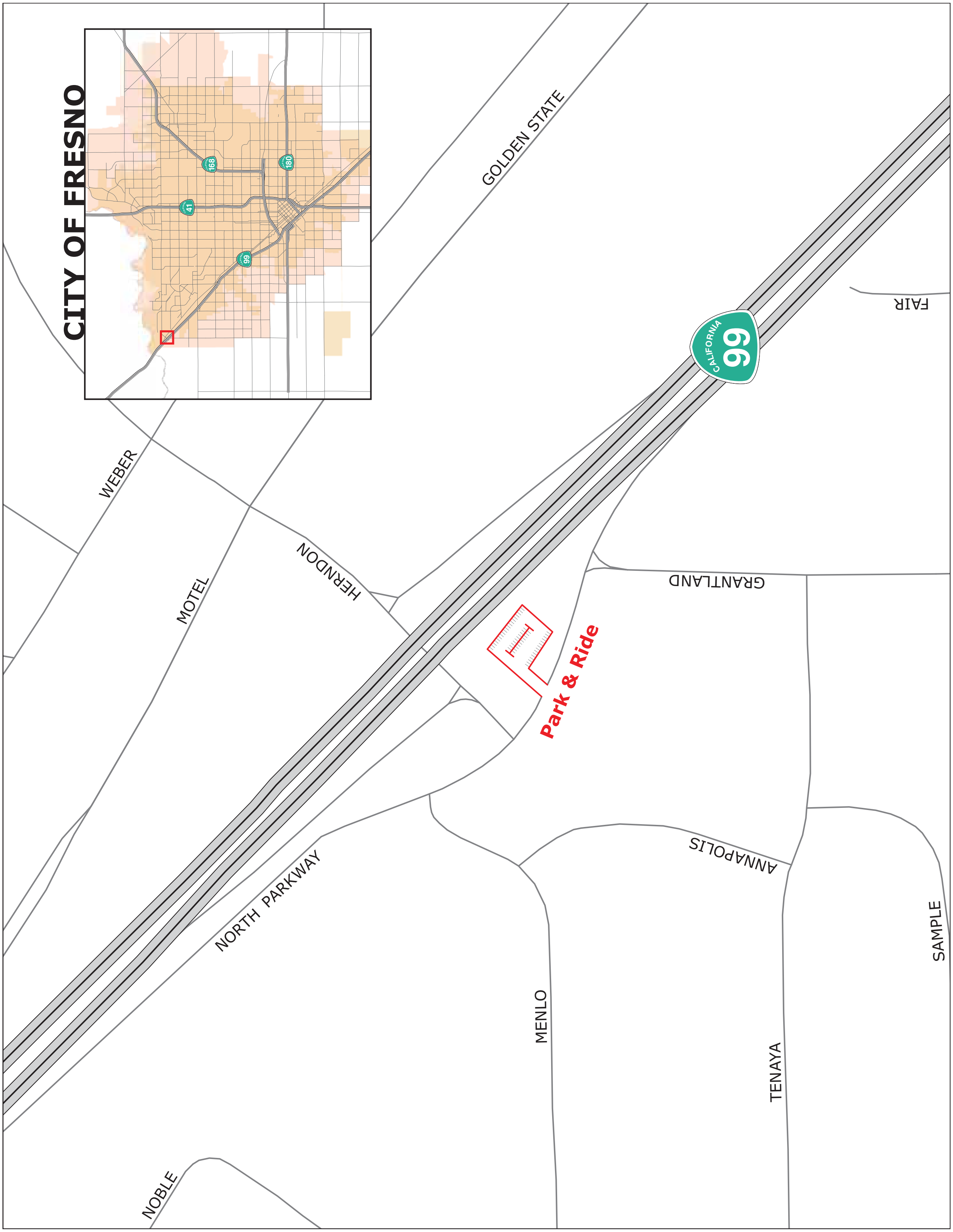
b) Park and Ride lots

The City of Fresno has been awarded funds through the Congestion Mitigation and Air Quality (CMAQ) Improvement Program for a park and ride lot on the west side of Route 99, just south of the Herndon Avenue interchange (see Map #2, Page 15). The CMAQ program provides funding for projects that contribute to an improvement in air quality and that reduce congestion. The CMAQ program is a source of funding to implement Transportation Control Measure (TCM) strategies. Examples of transportation control measures include, but are not limited to:

- Improved public transit;
- Traffic flow improvements and high-occupancy vehicle lanes;
- Shared-ride services;
- Bicycle/pedestrian facilities; and
- Flexible work schedules.

A park and ride falls within the category of shared-ride services. Strategies such as park and rides will be essential to maximize the efficiency of the corridor, and the City's efforts to establish this facility is an example of alternative approaches to improve congestion.

Map #2


CITY OF FRESNO
168
180
41
99
GOLDEN STATE
FAIR
99
CALIFORNIA
WEBER
HERNDON
GRANTLAND
MOTEL
Park & Ride
ANNAPOLIS
NORTH PARKWAY
SAMPLE
MENLO
TENAYA
NOBLE

c) Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems (ITS) consists of the electronics, communications, or information technology processing that communicates information to the traveler, improving safety and efficiency. ITS elements include detection, traffic control, incident management, advanced traveler information systems, transportation management centers, traffic signals, closed-circuit televisions, changeable message signs, ramp meters, weigh-in-motion devices, roadway service patrols, weather stations, and highway advisory radio stations. Also included is the centralization of controls for many of these components at traffic or transit management centers. Traveler information broadcast systems, traffic signal priority for emergency or transit vehicles, ITS data archive management, and vehicle safety warning systems are all a part of ITS. These elements are further explained in detail in Appendix B, Pages 50 – 53. Numerous applications of ITS exist throughout the Route 99 corridor. Please see Table 3, Page 17, for a list the existing elements.

Transmitting ITS data requires an integrated fiber optic network planned along Route 99 and other corridors in the urbanized area. With such a fiber optic network in place, the Caltrans Central Valley Traffic Management Center (TMC) at the District Office in Fresno would be able to relay this data, monitor conditions, and provide for rapid response when conditions deteriorate.

Deployment of ITS technology will enhance traveler information services, as well as the operational and safety efficiency of the Route by informing motorists of traffic congestion, inclement weather such as fog, dust, highway construction and/or closings. System monitoring and evaluation are the foundations for sound management of the corridor. Monitoring and evaluation will help to identify the optimum strategies to improve the transportation corridor. Strategies range from maintenance and preservation to system expansion, but will focus on optimization of the existing system by fully incorporating operational strategies into the management plan. Implementation of ITS strategies will complement other improvements, including those improvements that may be implemented by our partner agencies such as transit, light rail, and improvements on the local road system. The goal is that the transportation system, as a whole, including highways, local roads, and alternative modes of transportation, operate as one seamless network.

Several ITS elements will be constructed along the corridor within the limits of the Proposition 1B projects. These are presented in Table 4, Page 18. In addition, the Ten- and Twenty-Year Plans include ITS in the corridor. These are presented in Tables 9, 10, and 11, on Pages 37, 39, and 40, respectively.

4. Parallel Roadways

The CSMP Development Guidance document includes identifying parallel roadways. The corridor within this CSMP area includes numerous local roads within the immediate corridor area.

While there are numerous local roads within the Route 99 corridor, the PDT identified a river crossing as being an essential component for a parallel roadway, and, at this time, the corridor itself does not include another road system with a river crossing. Therefore, this CSMP will not analyze a parallel roadway.

TABLE 3
EXISTING ITS ELEMENTS IN THE CSMP AREA

FRE 99 – PM	LOCATION	TYPE OF ITS
14.5 – 19.3	American Ave to Route 41	Changeable Message Signs
16.9	Cedar Ave	Changeable Message Signs
19.3	Route 41	Closed Circuit Television
19.3 – 20.9	Route 41 to Route 180	Traffic Monitoring Station
19.9	California Ave	Closed Circuit Television
20.5 & 21.0	Kern and Stanislaus Streets	Traffic Monitoring Station
20.9 – 23.3	Route 180 to Olive Ave	Traffic Monitoring Station
20.9 – 23.3	Route 180 to Olive Ave	Closed Circuit Television
20.9 – 23.3	Route 180 to Olive Ave	Ramp Meters
22.7	Belmont Ave	Ramp Meters
22.7	Belmont Ave	Traffic Monitoring Station
22.7	Belmont Ave	Closed Circuit Television
23.3 – 26.5	Olive Ave to Ashlan Ave	Changeable Message Signs
23.3 – 26.5	Olive Ave to Ashlan Ave	Traffic Monitoring Station
23.8	McKinley Ave	Changeable Message Signs
23.8	McKinley Ave	Traffic Monitoring Station
26.5 – 31.6	Ashlan Ave to Madera Co. Line	Changeable Message Signs
26.5	Ashlan Ave	Traffic Monitoring Station
28.4	Near Barstow Ave	Changeable Message Signs
MAD 99 – PM		
0.0 – 2.2	San Joaquin Bridge to Ave 8	Changeable Message Signs
0.0 – 8.7	Madera Co. Line to Ave 13	Traffic Monitoring Station
0.0 – 8.7	Madera Co. Line to Ave 13	Changeable Message Signs
1.0	Ave 7	Highway Advisory Radio
2.2 & 7.5	Ave 8 & Ave 12	Traffic Monitoring Station
10.3 – 14.2	Route 145 to Ave 7	Closed Circuit Television
11.6	Fresno River Bridge	Remote Weather Info. Station
12.1	Cleveland Ave	Closed Circuit Television
22.7	Route 152	Highway Advisory Radio

a) Fresno County

Golden State Boulevard begins in Selma, south of this CSMP area, and parallels the freeway all the way to Ventura Street in downtown Fresno, where it ends in a connection with Route 99. There are two local through-streets that parallel the freeway within the City of Fresno; G and E Streets. Neither extends outside of the downtown core. "H" Street parallels the Freeway from just south of Monterey Street in downtown Fresno to Belmont Avenue, at which point it is renamed Weber Avenue. Weber Avenue parallels the freeway from Belmont to Ashlan. Golden State Boulevard picks up where Weber leaves off, beginning just south of Ashlan Avenue and extending to just south of the river crossing.

TABLE 4
ITS ELEMENTS INCLUDED WITHIN THE LIMITS OF THE PROP 1B BOND PROGRAMMED PROJECTS

Post Mile	Location	Description	2008 Estimated Cost	Funding Source	Est. Const. Year
FRE - 27.5	Gettysburg Avenue	Traffic Monitoring Stations	$20,000	SHOPP	2011
FRE - 28.1	Shaw Avenue	Traffic Monitoring Stations	$20,000	SHOPP	2011
FRE - 28.1	Shaw Avenue	CCTV	$150,000	SHOPP	2015
FRE -28.8	Barstow Avenue	Traffic Monitoring Stations	$20,000	SHOPP	2011
FRE -28.8	Barstow Avenue Herndon Avenue	Permanent CMS	$300,000	SHOPP	2009
FRE - 30.9	Herndon Avenue	Traffic Monitoring Stations	$20,000	SHOPP	2011
FRE - 30.9	San Joaquin River Bridge	CCTV	$150,000	SHOPP	2015
MAD - 0.2	San Joaquin River Bridge	Traffic Monitoring Stations	$20,000	SHOPP	2015
MAD - 1.0	Avenue 7	Traffic Monitoring Stations	$20,000	SHOPP	2015
MAD - 1.0	Avenue 7	CCTV	$150,000	SHOPP	2015

b) Madera County

Parallel roadways in Madera County are intermittent. Going north to south, Golden State Boulevard starts and stops from just north of the river crossing to just south of Avenue 21. No single stretch of the roadway is of significant length. In the City of Madera, the local street, North Gateway, runs from just south of Olive Avenue to Avenue 16. Fairmead Avenue provides a potential alternative route for local traffic, running from just south of Avenue 20 to Avenue 24, just beyond the limits of this CSMP.

c) Alternatives to Route 99

Local roads are available for use as alternatives to Route 99 when portions of the freeway are blocked due to congestion and/or accidents. The Central Valley Traffic Management Center, located in Fresno, has a number of established routes utilizing these local roads for incident management. These routes are discussed in more detail in the section on Incident Management, Page 23, and maps of the local roads are included in Appendix C Pages 54 – 62. Alternative State Highways are presented in Appendix D, Page 63.

d) Alternative Transportation Considerations

The CSMP is not intended to impose new requirements for the cities and counties to collect data or make road improvements. The local jurisdictions or the regional planning agency should already be collecting traffic information on the local roads when developing the Regional Transportation Plan, the regional transportation improvement program, and the circulation elements of local general plans. It may be necessary, in the future, to consider a parallel route, based on a number of planning concepts currently under consideration. These proposals could provide a suitable location for a new river crossing. These studies include:

i. Route 99 Bypass. This would be a new facility, constructed west of the existing Route 99. The existing Route 99 through a section of both Fresno and Madera Counties would then become a business route. This idea is only in the earliest conceptual stages.

ii. Metro Rural Loop. Through grants from the California Partnership for the San Joaquin Valley and the Caltrans Transportation Planning Grants program, the five counties area of Fresno, Madera, Kings, and Tulare are studying a 2110 Metro Rural Loop concept. As part of the San Joaquin Valley Regional Blueprint, the form the region envisions is a system of high capacity multi-modal transportation corridors that interconnect the metro area with rural areas and the state. The Metro Rural Loop concept would be a regional development approach that envisions a multi-modal, multi-city, and multi-county transit-oriented transportation corridor system that would directly link the development of cities and counties. The Metro Rural Loop project includes representatives from local, regional and state jurisdictions, business, agriculture, environmental, and civic organizations in the region.

Caltrans will be participating in the discussions with the local and regional agencies on a proposed Metro Rural Loop being considered to potentially service the five counties. The Metro-Rural Loop also would provide connections to the existing State Highway System, and possibly with the proposed extension of Route 65 to the east.

iii. **San Joaquin River Study.** This is a planning-level analysis of the regional transportation network within the major metropolitan areas of Fresno, Clovis, Madera, and the counties of Fresno and Madera. Several river crossings are being evaluated as part of the overall effort to improve the regional circulation.

None of these concepts include funding for Project Study Report development or for construction, but have promise as future alternatives to this section of Route 99.

III. COMPREHENSIVE CORRIDOR PERFORMANCE ASSESSMENT

A. Choosing Performance Measures

Appropriate performance measures and analysis tools must be selected for the Corridor, based in large part on the quantity and quality of data available. The following performance measures have been chosen for this Corridor, as the technology for implementing them is available. These are also the same measures included within the "Freeway Performance Initiative Traffic Analysis" report prepared for Metropolitan Transportation Commission (MTC), ensuring consistency across all corridors and different transportation modes. The measures will provide a means to demonstrate that the mobility gains of any urban corridor capacity improvements have been maintained after those improvements are in place. The recommended performance measures may undergo additions/changes as Caltrans District 6 enhances detection within the corridor.

B. Existing Conditions

Current AADT, Level of Service, % Trucks, Peak-Hour AADT, 10 and 20-year AADT forecasts, by segment of the Route 99 Corridor, are presented in Table 1, Page 5.

The information necessary to understand existing traffic conditions in the study area, and identify specific causes of problems, has been collected. This information includes traffic counts, Tachnograph runs, pavement condition, accident data, and FREQ modeling. These are discussed in more detail in the section on Operations Assessment.

C. Develop Mitigation Strategies and Projects

Viable measures, ranging from system management strategies to maximize the efficient use of existing Corridor capacity, to more traditional capital improvement projects that will increase corridor capacity, will be evaluated. This evaluation will be accomplished by using two approaches: a "Benefit/Cost (B/C) ratio" and microsimulation modeling.

The B/C Ratio is a systematic process for calculating and comparing benefits and costs to determine if the proposed project is a sound investment (justification/feasibility), and to see how it compares with other proposed projects (ranking/priority assignment). Benefit-Cost Analysis works by first defining the project and any alternatives; then identifying, measuring, and valuing the benefits and costs of each.

A portion of the existing corridor has been evaluated with microsimulation modeling using Paramics Software V5.1, short for Parallel Microscopic Simulation. Microsimulation has not been applied to the entire corridor limits. The microsimulation model limits were from Clinton Avenue in the City of Fresno to Gateway Avenue in Madera County.

In order to conduct the assessment and future improvement testing, the microsimulation of the corridor was divided into two phases. The first phase was the development, calibration, and validation of a base model. The second included the development of a year 2030 model of the corridor. This was accomplished by adding the fiscally-constrained improvements for the facility. These included:

- The addition of an extra lane to the mainline to convert this section to a six lanes;
- The modification of several interchanges;
- A new interchange, Veterans Boulevard, added to the model between the Shaw Avenue and the Herndon Avenue interchanges;
- Adding ramp metering for the northbound and southbound ramps at Ashlan Avenue, Shaw Avenue, Veterans Boulevard, and Herndon Avenue interchanges in Fresno County and in Madera County the southbound on ramp at Avenue 7 and the northbound on ramp at Avenue 12 interchanges; and
- New signal cycle lengths on the signalized intersections;

Average Vehicle Speed, Vehicle Miles Traveled (VMT), and Vehicle Hours Traveled (VHT) were extracted from each model run to serve as measures of effectiveness and as performance measures to demonstrate that the model was running reasonably. Other results obtained included average speeds, average journey times, average delay, and speed contour.

Results showed that AM and PM congestion was present in the future model at several locations of the corridor despite the addition of capacity improvements and the addition of ramp metering. This congestion resulted in lower speeds in the neighborhood of these congested locations, increased travel time, and also an increase in delay to traverse the corridor. The full microsimulation report is included as Appendix E, Pages 64 – 131.

1. Safety-Assessment and Performance Measure (Accident Rates)

The accident pattern on Route 99 shows a steady increase over the last ten years in the number of accidents per Million Vehicle Miles (MVM, see Table 5, Page 22, for the accident data). This trend indicates that not only is the overall number of accidents increasing as AADT increases, the accidents per mile traveled are also increasing. The increase appears to be primarily related to the high traffic numbers, high percentage of truck traffic, and non-standard interchange spacing. Non-standard interchange spacing can cause traffic weaving and slowing speeds, leading to accidents. In winter months, fog is frequently a cause of accidents and delay, occasionally requiring the use of CHP pace cars.

The number of accidents and accident rates from the Caltrans Traffic Accident Surveillance and Analysis System (TASAS) was input into Caltrans' Benefit/Cost ratio (B/C Ratio) calculation to evaluate the merits of the projects within this corridor that are funded by

Proposition 1B funds. The initial evaluations have indicated that construction of the improvement projects would reduce the accident rate in the area of the project. The

TABLE 5
ACCIDENTS PER MILLION VEHICLE MILES

		Actual			Average – Statewide		
FRE 99 – PM	**Location**	**Total***	**F & I****	**Fatal**	**Total**	**F & I**	**Fatal**
03.4 – 04.2	S of Mt View – N of Mt View	1.09	0.43	0.00	0.60	0.26	0.02
04.2 – 06.9	N. of Mt View – Route 43	1.14	0.37	0.00	0.76	0.26	0.01
06.9 – 09.7	Route 43 – N of Manning	0.95	0.25	0.00	0.67	0.28	0.01
09.7 – 21.2	N of Manning – Stanislaus	0.74	0.22	0.01	0.80	0.25	0.00
21.2 – 22.0	Stanislaus – Route 180	0.74	0.23	0.00	0.83	0.26	0.00
22.0 – 23.2	Route 180 – Olive Ave	1.51	0.45	0.01	1.04	0.34	0.01
23.2 – 24.9	Olive Ave – Shields Ave	1.02	0.32	0.01	0.92	0.29	0.01
24.9 – 27.0	Shields Ave – Ashlan	1.20	0.32	0.01	0.66	0.23	0.01
27.0 – 28.6	Ashlan – N of Herndon Canal	1.32	0.48	0.03	0.72	0.27	0.01
28.6 – 31.6	N of Herndon Canal – End of Co	1.00	0.29	0.00	0.72	0.27	0.01
MAD 99 – PM							
0.0 – 1.5	Beg of County – S of Ave 8	0.50	0.12	0.01	0.62	0.27	0.02
1.5 – 10.8	S of Ave 8 – Sixth Street	0.52	0.19	0.01	0.90	0.33	0.01
10.8 – 11.1	Sixth Street – Madera UP	0.69	0.16	0.00	1.06	0.39	0.01
11.1 – 11.7	Madera UP – Fresno River	0.83	0.83	0.02	1.07	0.39	0.01
11.7 – 12.6	Fresno River – Ave 15-1/2	0.78	0.24	0.00	1.04	0.38	0.01
12.6 – 23.4	Ave 15-1/2 – Route 152	0.72	0.30	0.02	0.76	0.28	0.01
CSMP Limits		0.31	0.22	0.01	0.76	0.28	0.01

*Total = Fatal + Injury + Non-Injury; **F + I = Fatal + Injury

TABLE 6
ISLAND PARK 6-LANE (NOW ISLAND PARK 6-LANE AND NORTH FRESNO 6-LANE)
BENEFIT – COST RATIO SUMMARY

Life-Cycle Costs (mil. $)	$82.1	**ITEMIZED BENEFITS (mil. $)**	**Average Annual**	**Total Over 20 Years**
Life-Cycle Benefits (mil. $)	$178.0	Travel Time Savings	$3.1	$61.5
Net Present Value (mil. $)	$95.9	Veh. Op. Cost Savings	-$0.1	-$1.4
Benefit / Cost Ratio:	2.2	Accident Cost Savings	$5.9	$117.9
Rate of Return on Investment:	36.1%	Emission Cost Savings	$0.0	$0.0
Payback Period:	10 yrs%	TOTAL BENEFITS	$8.9	$178.0
		Person Hours of Delay Saved	540,454	10,809,083

TABLE 7

RECONSTRUCT AVENUE 12 INTERCHANGE
BENEFIT – COST RATIO SUMMARY

			Average Annual	Total Over 20 Years
Life-Cycle Costs (mil. $)	$61.2	**ITEMIZED BENEFITS (mil. $)**		
Life-Cycle Benefits (mil. $)	$72.6	Travel Time Savings	$0.6	$12.8
Net Present Value (mil. $)	$11.5	Veh. Op. Cost Savings	-$0.0	-$0.2
Benefit / Cost Ratio:	1.2	Accident Cost Savings	$3.0	$60.0
Rate of Return on Investment:	19.6%	Emission Cost Savings	$0.0	$0.0
Payback Period:	13 yrs	TOTAL BENEFITS	$3.6	$72.6
		Person Hours of Delay Saved	95,555	1,911,094

evaluations determined that for the "Island Park 6-Lane", since divided into two projects: the "Island Park 6-Lane" and "North Fresno 6-Lane" projects, the resulting average annual accident cost savings would be $5.9 million, with a total of $117.9 million in accident cost savings over 20 years. The same analysis for the "Reconstruct Avenue 12 Interchange" project provided the same reduction in the accident rate, resulting in an annual accident cost savings of $3 million dollars, and a total of $12.8 million in accident cost savings over 20 years. The B/C Ratio will continue to be used to evaluate the degree to which the strategies within the CSMP improve safety within the corridor. The summary pages from the analyses of the projects are presented in Table 6 and Table 7, Pages 22 and 23.

2. Incident management

The goal of incident management is to clear the incident as quickly as possible, thereby reducing congestion and delay. This is discussed in more depth in the section on ITS, 3.c, Page 16. As a part of the management process, local streets may be used to move traffic around an incident. The Central Valley Traffic Management Center, located in Fresno, has a number of established routes identified for use in incident management. The alternatives are presented in Appendix C, Pages 54 – 62.

If there is a major incident, and closure of a large section of the Route becomes necessary, available detours outside of the immediate corridor area exist. One possible detour would be Interstate 5 (I-5), west of Route 99 that also runs generally north-south. Traffic traveling southbound on Route 99 could be diverted to Route 152, which intersects with I-5 to the west. Northbound traffic could be diverted at Route 198 in Kings County, which also intersects with I-5 west of Route 99. Another facility available as a possible detour would be Route 41. Traffic could be diverted at the Route 99/Route 41 freeway-to-freeway interchange, or further north at the Route 99/Route 180 freeway-to-freeway interchange. I-5 and Route 41 are not within the area encompassed by this CSMP, and cannot be considered parallel routes, but would be available in the case of a major incident. Changeable Message Signs and/or CHP cars could direct the traveling public to the detour. Please see Appendix D, Page 63, for the locations of these alternate State Routes.

The Central Valley Traffic Management Center is dedicated to improving the time required to clear incidents from Route 99. One step in achieving this has been the use of closed circuit television cameras (CCTV) at points where drivers must make a decision to stay on the mainline, merge to access another freeway, or to get on or off the freeway. These are areas where accidents are most likely to occur. CCTV have proven to reduce the delay in mobilizing State forces responding to an incident. Caltrans has a Project Study Report that identifies a preferred alternative of installing eleven CCTV cameras on Route 99 in Fresno County. The cameras would provide valuable information to the Central Valley Transportation Management Center on a real-time basis.

A California Highway Incident Management Summit was held in April 2007 with partners to discuss the goal of clearing highway incidents within 90 minutes. Some of the solutions were to implement technical interoperable communications systems, establish Caltrans/CHP communication centers, train with consistent terminology within departments, and revisions of laws to allow quick clearing activities. Should these solutions be implemented, an obvious performance measure would be the time to clear an incident.

3. Operations Assessment

The operations assessment is presented in Table 1, Page 5, and includes the current AADT, Level of Service, % Trucks, Peak-Hour AADT, 10 and 20-year AADT forecasts, by segment.

a) Level of Service (LOS)

An improvement in Level of Service (LOS), or maintaining the existing LOS under conditions of an increase in AADT, would be a valid performance measure for evaluating improvement in operations.

The LOS describes the operating conditions on a roadway. LOS is defined in categories ranging from A-F, with A representing the best traffic flow and F representing the worst. As a general rule, Caltrans uses a target of LOS C or D as this provides the highest traffic throughput with the least traveler disruption. Without any project improvements, the LOS along this section of the corridor would deteriorate to predominately LOS E or F by the year 2030. However, implementation of the 2030 concept facility would improve this to LOS D or C (see Table 1, Page 5), providing a measurable improvement in performance.

b) Congestion

The degree of congestion can also provide an assessment of operations on the Route. Caltrans' definition of congestion is vehicular speeds dropping below 35 mph for 15 minutes or more on a typical, incident-free, weekday peak commute period. If vehicular speeds dip below this threshold, the roadway is considered congested. Caltrans District 6 Traffic Operations conducted an analysis of congestion within the CSMP limits of this portion of Route 99 using Tachometer runs (Tach runs). A Tach run is a field survey conducted by Caltrans staff driving the route segments to document travel speed, travel time, and delay to determine if there is any congestion along the corridor. The Tachometer run for this section of Route 99 occurred on September 18, 2007, between 6:00 and 9:00 AM, and on October 9, 2007, between 3:00 and 6:00 PM; hours anticipated to be the peak traffic times. During these operations, vehicular speeds never dipped below 40 mph. From the information gathered, there were no areas that met the Caltrans definition of congestion. While this definition was not met, traffic demands can exceed capacity at some bottleneck locations resulting in traffic speeds dropping below the posted speed or the free-flow speed. The traveling public experiences this as congestion, even if speeds are above 35 mph.

Reduced speeds and bottlenecks indicate that the current capacity of Route 99 is no longer adequate to handle the traffic demand. Additional demand is anticipated with the planned growth in the area. Some additional lanes have been added to the Route, but speeds below the posted or free flow speed still persist. This is due to increases in AADT, increases in traffic merging on and off the freeway, and the large percentage of truck traffic during the AM and PM peak periods. A variety of things can impact capacity, such as the number and width of lanes; the location, spacing, and type of interchanges; the presence and width of shoulders; and the condition of the pavement. Increasing capacity could be achieved by widening the Route; however, the ability to widen the Route is hampered by available right-of-way and adjacent development. Inadequate spacing between interchanges can also impact traffic flow. Insufficient distances for vehicles to safely and efficiently merge on and off the highway may lead to congestion and a subsequent increase in accidents. Where substandard spacing exists, interchange spacing should be increased, auxiliary lanes added, or other operational solutions constructed to decrease the merging conflicts and improve operations. This may result in closing some interchanges. Caltrans has considered closing both the Belmont interchange and the partial interchange at Princeton within this CSMP area.

A FREQ (Freeway Queue) can be used to determine the existence of bottlenecks. FREQ is a PC-based macroscopic freeway corridor simulation model. It models the movement of groups of vehicles, or the average behavior of all vehicles, on a given section of a facility for a given time period. FREQ can analyze a one-directional freeway corridor that can include an arterial or group of "bundled" arterials, and weaving sections by reducing the capacity of the corridor. It can analyze a variety of freeway conditions, including HOV facilities, ramp control optimization, normal and priority entry control, time-varying reconstruction activities, freeway incidents, geometric changes, freeway-arterial diversion, future growth scenarios, and Advanced Transportation Management Information Systems (ATMIS) combinations. FREQ can be used to evaluate alternatives for enhancing operations on the Route as well.

Caltrans District 6 Traffic Operations prepared a FREQ analysis of both the northbound and southbound sections of Route 99 from the Orange Avenue overcrossing to the Herndon Avenue interchange (Appendix F, Pages 131 - 141). The data indicates that the existing conditions on the Route 99 northbound section are near capacity during the hours of 3:00 PM to 4:30 PM at the freeway-to-freeway interchange with Route 180/Route 99. While this is not a bottleneck, it has the potential to develop into one. FREQ predicts that, in 2030 (without any improvements to the facility) that a bottleneck will exist on the northbound section of Route 99 from 2:00 PM to 7:00 PM at the interchange with McKinley Avenue, causing congested conditions on the mainline that will extend south past the Orange Avenue overcrossing. The existing conditions for Route 99 in the southbound direction indicate a bottleneck at the freeway-to-freeway Route 180/Route 99 interchange during the hours of 3:00 PM to 5:00 PM, causing congested conditions that extend north to the Dakota Avenue interchange. The 2030 conditions indicate a bottleneck at the Olive Avenue interchange, a bottleneck at the Clinton Avenue interchange, and a bottleneck at the Ashlan Avenue interchange. These three bottlenecks will cause congested conditions during the hours of 7:30 AM to 11:00 AM that are predicted to extend north past Herndon Avenue.

Caltrans will continue to monitor congestion, initially with Tach runs, but with more reliance on automated detection as Caltrans District 6 continues to increase the amount of such detection units along the corridor. Caltrans will also continue to use FREQ to determine bottlenecks, and also to evaluate which improvements will best improve operations.

c) Mobility

Mobility describes how well the corridor moves people and freight. The mobility performance measures are readily measurable and straightforward for documenting current conditions, but they are also easily forecasted, making them useful for comparing future conditions with and without improvements. Travel time and delay are typically used to quantify mobility. There are other measures that are used as well, such as volume-based measures derived from distance and travel times. Examples of these are Vehicle Miles Traveled (VMT), Person Miles Traveled (PMT), Vehicle Hours Traveled (VHT), and Person Hours Traveled (PHT).

i. Travel Time

Travel time is a measurement of the time it takes for a vehicle to traverse between two points on a corridor. This may be defined as the time to travel the entire study corridor, or a measurement of the time between intermediate starting and ending points. The freeflow and maximum travel times should be collected.

Travel time can be obtained using the Tachometer run method, Performance Measurement System (PeMS), or the 511 Traveler Information Broadcast System. There are benefits and disadvantages to each of these approaches. While the PeMS system can automatically compute travel times using speed data from freeway detectors, many places, including most of this section of the Route 99 corridor, do not have sufficient working detection units. Because of this, Caltrans District 6 has primarily relied on Tach runs for collecting the data needed to analyze existing conditions. Tach runs provide the most direct measurement of speeds and travel times; however, they are resource-intensive. The number of samples for a given corridor will therefore be lower with an automated system. Also, Tach runs occur on a schedule of every 10 to 30 minutes, while PeMS continuously collects data at 30-second intervals. On the other hand, PeMS sensors are located at specific points along the freeway, and segment speeds between the sensors are estimated based on the speeds at the sensor locations. Tachometer run measurements do not have these gaps. With any of the measurement systems, consideration must be given for the exclusion of data collected when unusual conditions occurred (e.g., accidents, weather, and special events). The 511 Traveler Information Broadcast System is not currently available in the Central Valley. The local Regional Transportation Planning Agencies are working to bring an initial “start-up” system to the Valley, with hopes of future expansion. As these other systems are not widely available, Caltrans District 6 will continue to use Tach runs. However, because of the ease of collecting information using an automated data collection system, Caltrans District 6 has committed to adding detection units to the system as quickly as possible. In the future, it will be possible to measure Travel Time using the PeMS system almost exclusively, and potentially to also incorporate data from the 511 Traveler Information Broadcast System.

Caltrans District 6 conducted Tach runs during the AM and PM peak periods along the corridor. The Tach runs determined that there are slow downs during the peak hour, resulting in an increase in travel time, but speeds generally remained over 60 mph, with only an occasional drop to 50 mph at a few locations at a few time periods.

Caltrans’ Benefit/Cost ratio (B/C Ratio) calculation was also used to evaluate the projected improvements in travel time created by construction of the projects within this corridor that are funded by Prop 1B funds. The evaluation determined that the “Island Park 6-Lane” project (which has since been divided into two projects, the “Island Park 6-Lane” and the “North Fresno 6-Lane”) would result in an estimated $3.1 million in average annual travel time savings, with a total savings over 20 years of $61.5 million (see Table 6, Page 22). The same analysis for the “Reconstruct Avenue 12 Interchange” project determined that the construction project would result in an average annual travel time savings of $0.6 million; with a total of $12.8 million over 20 years (see Table 7, Page 23). The B/C Ratios will continue to be used to evaluate the degree to which the strategies within the CSMP improve travel time within the corridor, offering a means of determining which projects will be the most cost effective.

ii. Delay

Delay can be defined as the difference in travel time between actual congested conditions and the free-flow speed at the freeway speed limit and is reported as vehicle-hours of delay. Caltrans defines the congested speed threshold as 35 mph for 15 minutes or more on a typical, incident-free, weekday peak commute period. This is the speed range at which traffic flow becomes stop and go. Speeds above 35 mph are not considered delay. The recommended process for determining existing delay is to calculate this performance measure from actual data sources.

There are two types of delay: recurrent and nonrecurrent.

- Recurrent delay occurs when travel demand exceeds freeway design capacity, and speeds are 35 mph or less during peak-commute periods on a typical incident-free weekday. The delay condition must last for 15 minutes or longer.
- Nonrecurrent delay is caused by irregular events, such as accidents, events, maintenance, or short-term construction.

In the case of this section of Route 99, delay was evaluated using Tach runs, conducted during the AM and PM peak periods. The Tachnograph runs measured the actual traffic speeds and it was determined that this section of Route 99 is not currently experiencing delay, using the definition specified above. Caltrans will continue to monitor this, relying more heavily on automated detection as addition detection is added to the corridor.

Caltrans' Benefit/Cost ratio (B/C Ratio) calculation was also used to evaluate projected improvements in delay created by construction of the projects within this corridor that are funded by Prop 1B funds. The evaluation determined that the "Island Park 6-Lane" project (which has since been divided into two projects, the Island Park 6-Lane and the North Fresno 6-Lane) would result in an average annual person hours of delay saved of 540,454, and a total savings over 20 years of 10,809,083 person hours of delay (Table 6, Page 22). The same analysis for the "Reconstruct Avenue 12 Interchange" project also provided an improvement in delay. The evaluation determined that the "Reconstruct Avenue 12 Interchange" project would result in an average annual person hours of delay saved of 95,555 and a total savings over 20 years of a total of 1,911,094 person hours of delay (Table 7, Page 23). The B/C Ration will continue to be used to evaluate the degree to which the strategies within the CSMP improve delay within the corridor.

Future delay can also be obtained from modeling/analysis techniques. Caltrans has completed microsimulation modeling of the existing and future conditions for a section of the CSMP area.

d) Reliability

Reliability is a measure of the relative predictability of travel time. The focus of reliability is on how much mobility varies from day to day. The recommended method of estimating reliability is the "buffer index," defined as the extra time that travelers must add to their average travel time to ensure on-time arrival. The buffer index is an easy concept to communicate to the general public. It is presented as a percentage, making it easy to compare reliability among the different corridors and modes. For example, a buffer index of 40 percent means that, for a trip that usually takes 20 minutes, a traveler will need to allow an additional 8 minutes to ensure on-time arrival (Average travel time = 20 minutes, Buffer index = 40 percent, Buffer time = 20 minutes × 0.40 = 8 minutes). If PeMS or 511 Traveler Information Broadcast System data are not available, the buffer index can be estimated by data collection from Tach runs. A full year of data is considered optimal for calculating the buffer index. Caltrans District 6 is committed to increasing the automated detection along this section of the corridor. This will make future analysis based on this performance measure easier to determine.

e) Productivity

Productivity is a system efficiency measure. Freeway productivity is defined as the total number of vehicles (and the people inside) served per hour at a given location. Freeway productivity actually diminishes when demand is highest.

Recent analysis suggests that almost half of California's urban freeway system provides 25 to 35 percent less productivity than the planned capacity during peak congested periods. One approach to measuring this loss is to calculate loss as a percentage of threshold capacity and convert this lost productivity into "equivalent lost lane-miles." Lost lane-miles provide a theoretical measure of the level of capacity that would need to be added to achieve maximum productivity.

$$\text{Lost Lane Miles} = \left[1 - \frac{\text{Observed Lane Throughput}}{\text{2,000 vphpl}}\right] \times \text{Lanes} \times \text{Congested Distance}$$

There are solutions to restore part, if not all, of this lost productivity. An in-depth understanding of current and projected system performance is needed, as well as the ability to leverage new technologies and tools to improve productivity. Improvements to productivity can be achieved by implementing the concepts of the Transportation Management System (TMS). The Department has focused on three core TMS processes. These include traffic control and management systems, incident management systems, and advanced traveler information systems, discussed elsewhere in this document. Regardless of the approach taken to determine productivity, productivity calculations typically require that adequate detection be in place along the corridor, or significant field data collection be conducted using such methods as Tach runs. Travel demand models do not generally project capacity loss for highways and are therefore not as useful. Detailed microsimulation tools will be needed to forecast productivity and determine if a given alternative will provide the results anticipated. Caltrans has prepared microsimulation modeling for the existing conditions and future scenarios for a portion of the corridor, and hope to be able to use this tool in the future for determining productivity.

4. Maintenance and Preservation

a) Maintenance

Maintenance costs, including roadsides, pavement, bridges, guardrail, median barrier, signs, and delineation, have increased an average of 4 percent per year over the last five years. Maintaining adequate appearance and condition ratings is becoming increasingly difficult. The 10-year State Highway Operations and Protection Program (SHOPP) includes investments in projects in both the rehabilitation and preventive maintenance categories.

The current rehabilitation strategy is to maintain and rehabilitate the existing facility with plans to improve various interchanges and widen the roadway where feasible. Projects from the SHOPP maintain or improve the condition, safety, and operation of the highway, and protect the investment that has been made on the facility. The SHOPP program includes six types of projects that would affect Route 99:

- Collision Reduction;
- Roadway Preservation;
- Bridge Preservation;
- Roadside Preservation;
- Mobility Improvements; and
- Mandates (storm water requirements and emergency type projects).

Nominated projects for each category compete for available dollars with other projects on a statewide basis. Safety improvements that meet certain thresholds of cost-benefit criteria are funded off the top of the SHOPP before other needs are addressed. They do not need to compete for funding on a statewide basis.

Maintenance costs including roadsides, pavement, bridges, guardrail, median barrier, signs, and delineation, have increased an average of 4 percent per year over the last five years. Maintaining adequate appearance and condition ratings is becoming increasingly difficult. The 10-year SHOPP includes investments in projects in both the rehabilitation and preventive maintenance categories. This investment is expected to provide highway appearance and condition ratings similar to current conditions. These conditions are less than Caltrans performance targets and less than desired by the communities served by Route 99.

i. Pavement Condition

The pavement condition for this section of Route 99 is in various state of pavement distress ranging from no priority distress areas (0%) to a section with a priority distress percentage of 19%. The distressed areas average approximately 7% of the total pavement area for the section of Route 99 included within this CSMP area. Percentages shown below are averages for each segment.

The 2007 Pavement Asset Management document indicates that the overall State of California goal is to maintain the existing level of pavement distress, which is 12,998 lane miles or 26% of the system. The overall average for this section of Route 99 does not exceed the State average (26%). Please see Table 8, Page 31, for the Pavement Condition Data within this CSMP area. We will continue to monitor the pavement condition, and plan projects to improve distress as conditions warrant.

TABLE 8
PAVEMENT CONDITION DATA

FRE 99 – POSTMILE	LOCATION	PRIORITY DISTRESSED AREAS[1]
14.2 – 18.5	S of American Ave – Jensen Ave	0%
18.5 – 19.7	Jensen Ave – Route 41	0%
19.7 – 22.2	Route 41 – Route 180	0%
22.2 – 23.8	Route 180 – McKinley Ave	0%
23.8 – 27.0	McKinley Ave – N of Ashlan	0%
27.0 – 31.2	N of Ashlan – Motel Dr/Herndon	2%
31.2 – 31.6	Motel Dr/Herndon – End of County	4%
MAD 99 – POSTMILE		
0.0 – 9.0	Beg of County – N of Ave 13	19%
9.0 – 10.5	N of Ave 13 – Route 145	16%
10.5 – 14.5	Route 145 – Ave 17	17%
14.5 – 20.0	Ave 17 – Ave 21-1/2	0%
20.0 – 23.1	Ave 21-1/2 – S of Route 152	17%
23.1 – 23.5	S of Route 152 – Ave 24	16%
	Cumulative:	7%

Note[1]: Percent of roadway with major structural distress, minor structural distress, or poor ride quality.

b) Preservation. Identification of the Ultimate Transportation Corridor (UTC) and subsequent preservation will ensure adequate right-of-way (ROW) to accommodate facility improvement projects beyond 2030. The 2030 concept for this segment of Route 99 is a 6-lane freeway with auxiliary lanes from the beginning of this CSMP area to the Madera County line, then a 6-lane freeway north through the remaining CSMP area. The Ultimate Transportation Concept (UTC) is an 8-lane freeway through the entire section of the corridor, with auxiliary lanes in the CSMP section in Fresno County. For 8 lanes plus auxiliary lanes, Caltrans would seek to obtain 275 feet of ROW. The existing right-of-way in this CSMP area has considerable variability; actual ROW needs would be determined at the Design phase for each project to be considered.

There are challenges in preserving right-of-way for future expansion. The Union Pacific Railroad (UPRR) tracks run along the east side of Route 99 within the limits of this CSMP corridor. Sections of the track are adjacent; others are further from the freeway right-of-way. There could be constraints to expanding the facility, including the interchanges, for those sections of the freeway that are in close proximity to the UPRR.

An additional challenge may be encountered if there is a need to widen the river crossing. There may be environmental issues associated with construction along the San Joaquin River.

Caltrans goal for the future is to work with local agencies and the regional planning partners to develop conceptual alignments of corridors and footprints for interchanges that are believed to require expansion in the future. If these conceptual plans were to be adopted into the local jurisdictions' General Plans, those jurisdictions could use their land-use authority to preserve the necessary ROW for the corridor. Caltrans has also been requesting mitigation from development in the form of irrevocable offers of dedication of ROW through the Intergovernmental Review process. This will also help to preserve the needed ROW. Preservation would accelerate the necessary environmental clearances, reducing both time and costs. Preserving and protecting the needed right-of-way for future expansion of State facilities will greatly benefit the State, local communities, and the public by providing a logical and orderly process for subsequent project delivery in terms of reducing time and cost savings.

5. Management and Agreements

Caltrans District 6 entered into a Memorandum of Understanding (MOU) with the Council of Fresno County Governments and the Madera County Transportation Commission for the preparation of this CSMP. The purpose of the MOU was to document the commitment of all parties to manage the corridor through applying principles and practices of system and corridor management and performance measurement for sustained corridor performance. Please refer to the approved MOU Appendix A, Pages 44 - 49. The transportation partners will meet on a regular basis for the following activities and decisions:

- Agreement to work plan, time line, roles, and responsibilities for development of the CSMP, including resources.
- Review draft products, including initial performance assessments and technical documents.
- Coordinate corridor planning and evaluation efforts and share information on related topics to corridor performance measurement and improvement.

- Identify opportunities for heightened understanding by local jurisdictions and the public on the mobility benefits of system and corridor management.

Traditional capacity-enhancing improvement projects are funded from the State Transportation Improvement Program (STIP), of which the local agencies receive 75% and Caltrans 25%. It is therefore necessary to manage the Route 99 corridor in coordination with the local Metropolitan Planning Organizations in order to maximize the limited transportation funds. However, other sources of funding are also available. This section of the Route 99 corridor is in both Madera and Fresno Counties, and both Counties have local sales tax measures that help to fund transportation projects. Some projects along Route 99 are slated to receive funding from these sources (see Tables 9, 10, and 11, on Pages 37, 39, and 40, respectively).

Collectively, Caltrans, local agencies, community groups, and business interests have prepared a number of planning documents intended to improve the capacity and efficiency of the freeway corridor as well as its aesthetics. Additional emphasis has been placed on creating a "sense of place," a means of distinguishing one community along Route 99 from another, above and beyond the more standard type of planned projects. These documents include the Route 99 Business Plan, the Route 99 Corridor Enhancement Plan, and the Highway 99 Beautification Plan.

Caltrans Districts 6 and 10 developed the Route 99 Business Plan, which identified needed improvements along the corridor between San Joaquin County in the north and Kern County in the south. Tier One projects focused on bringing Route 99 to a 6-lane freeway facility through the length of the corridor.

Efforts at data collection and long-range planning have proceeded along the usual avenues, but have also included a State Partnership Planning Grant-funded Phase Two Freeway Interchange Deficiency Study that identified existing and future deficiencies at State highway interchanges. Future deficiencies at interchanges were projected based on travel patterns and general plan build-out. The Study identified solutions for these projected deficiencies, as well as cost estimates for implementation. This is intended to lay the groundwork for a Traffic Impact Fee program to mitigate for the traffic impacts created by development. The Study has been a collaborative effort between Caltrans and our local partners. In addition, the local sales tax measures in both Counties include provisions for the collection of mitigation from development for impacts to transportation facilities. Some of this mitigation will likely go toward improvements on the Route 99 corridor.

Infrastructure expansion, although still an important and viable strategy, cannot be the only strategy for addressing the mobility needs of Californians. System management is needed to optimize the corridor. Corridor productivity can only be restored and maintained through a coordinated planning and management effort of all transportation partners. This CSMP identifies a number of elements essential to this goal. The "System Management Pyramid," Figure 1, Page 41, provides a visual representation of these elements.

One method of evaluating the success of corridor management will be the implementation of improvement projects that provide the most benefit for the least cost. Benefit can be in the areas of reduced congestion, delay, travel time, or accident reduction, and can be measured by Caltrans Benefit/Cost Ratio. This evaluation can assist in determining which projects to implement first.

Another measure is the degree to which one unified vision for Route 99, across all jurisdictions, can be implemented. With the planning documents already adopted and/or accepted, the necessary collaboration is well underway.

6. Alternatives To Improve Performance

Over the next twenty-five years and beyond, Caltrans and local agencies will need to balance the question of expanding Route 99 to add more capacity with the impacts on the environment and local communities. This will include consideration of alternate parallel highway routes, such as whether a potential new Route 65 (metro rural loop project) to the east will be adequate to divert traffic, as well as the northward expansion of Route 65 that could provide a third river crossing. The proposed High Speed Rail Corridor will be another consideration as would the diversion of goods movement through bypasses, particularly around the urban areas. Measures to increase efficiency, as outlined in the section on ITS, will be an important part of improving performance on the freeway. Performance measures will need to be identified for each alternative when proposed.

IV. FUTURE CORRIDOR PERFORMANCE

A. Ten and Twenty Year Corridor Performance

Current AADT, Level of Service, % Trucks, Peak-Hour AADT, 10 and 20-year AADT forecasts are all presented in Table 1, Page 5.

The plan for the Urban Route 99 corridor is to convert the existing four-lane and five-lane freeway into a six-lane freeway throughout the corridor contained within this CSMP. The ultimate facility for rural Route 99 is an eight-lane freeway with auxiliary lanes in the section in Fresno County. These improvements and others through the year 2030 will be funded through a variety of sources. These sources include the State Transportation Improvement Program (STIP), Interregional Improvement Program (IIP), Regional Improvement Program (RIP) funds, Proposition 1B - State Route 99 Bond funds, State Highway Operations Protection Program (SHOPP) funds, Measure C and Measure T funds, and local development contributions. Additional funding, from local/State/Federal sources, may be available.

Clearly identifying the long-term goals for the Corridor and developing a corresponding list of priority projects to achieve those goals will make the funding decisions much easier and will ensure that improvements proceed in a logical and efficient manner. This approach will also reduce overall costs and time in the project development process. The CSMP will identify the projects most needed along the corridor to improve safety, reduce congestion, and facilitate efficient goods movement. The first step in developing the priority lists was to look at those projects that have identified funding and their estimated construction years. The next step was to develop lists of other projects that are included in the Regional Transportation Plans or that Caltrans knows will be needed in the future. These are shown as 10-Year, 20-Year, and Beyond Twenty-Year Improvement Plans (Tables 9, 10, and 11, on Pages 37, 39, and 40, respectively).

B. Ten Year Improvement Plan

Table 9, Page 37 presents a ten-year list of the improvement projects chosen for this section of the corridor. The list is flexible, allowing for adjustments when a project is determined to be more important than originally determined, or for changes in the transportation funding situation.

1. Corridor Projects

Included within this 10-year Improvement Plan are three capacity-enhancing projects, all funded by Proposition 1B:

a) North Fresno 6-Lane (99 Bond Program)

In the City of Fresno, from the Ashlan Avenue Overcrossing to 0.2 mile north of the Grantland Avenue Undercrossing, Route 99 will be widened from a 4-lane freeway to 6-lane freeway. Roadway and Structure widening will occur within the median. With the project improvements, there will be a savings in Daily Vehicle Hours and in Daily Peak Duration Person-Minutes. There will also be a reduction in accident rate. The post construction statewide average accident rate is 0.58 per MVM. Accident rate is expressed in the number of accidents per million vehicle miles traveled over a 3-year period.

b) Island Park 6-Lane (99 Bond Program)

In the City of Fresno and within Madera County, from 0.2 mile south of the Grantland Avenue Undercrossing to 0.6 mile north of the Avenue 7 Overcroassing, Route 99 will be widened from a 4-lane freeway to 6-lane freeway. Roadway and structure widening will occur within the median with the exception of the San Joaquin River Bridge widening. The existing San Joaquin River Bridges will be replaced with a new alignment shifted to the west which will require additional Right-of-Way. With the project improvements, there will be a savings in Daily Vehicle Hours and in Daily Peak Duration Person-Minutes. There will also be a reduction in accident rate. The post construction statewide average accident rate is 0.58 per MVM. Accident rate is expressed in the number of accidents per million vehicle miles traveled over a 3-year period.

c) Reconstruct Interchange at Avenue 12 (99 Bond Program): The project is on Route 99 in Madera County at Avenue 12. Two Build-Alternatives (Minimum and Ultimate) are proposed:

Minimum Build-Alternative: Minimum Build-Alternative: This alternative would widen Avenue 12 to four through-lanes and one left-turn lane for northbound State Route 99 traffic. A new overpass spanning Route 99, Cottonwood Creek, and the Southern Pacific Railroad would be constructed in place of the existing overpass. The section spanning Route 99 would allow for the 2025 Route Concept of six lanes. Avenue 12 would be elevated an average of three feet to allow vertical clearance over Route 99. Intersection improvements, signals, and the realignment of Road 29 east of its existing location to provide adequate intersection spacing would be included in this Build-Alternative.

Ultimate Build-Alternative: Avenue 12 would be widened to accommodate six through-lanes and two left-turn lanes for northbound Route 99. Extensive local road and ramp improvements would be incorporated into this Build-Alternative. Road 29 on the east and west sides of Route 99 would be realigned. Golden State Boulevard would be realigned to intersect with Avenue 12 approximately 800-feet west of its existing location and outside of the southbound ramp operations. The southbound ramps would be modified and a southbound slip ramp would be constructed for eastbound Avenue 12 traffic. A new overpass spanning Route 99, Cottonwood Creek, and the Southern Pacific Railroad would be constructed in place of the existing overpass. The section spanning Route 99 would allow for eight lanes. Avenue 12 would be elevated an average of six to nine feet to allow vertical clearance over Route 99. The elevation change would remove direct access to some businesses located on Avenue 12. As with the Minimum Build-Alternative, intersection improvements, signals, and the realignment of Road 29 east of its existing location to provide adequate intersection spacing would be included in this Build-Alternative. With this Build-Alternative, Road 29 would also be realigned on the west side of Route 99 and Golden Sate Boulevard would be realigned west of its current location outside of the southbound ramp operations. This Build-Alternative would use a combination of compact diamond ramps for the northbound lanes and partial cloverleaf ramps for the southbound lanes.

The Madera General Plan projects commercial and residential growth within the corridor and recognizes the need to upgrade the interchange. TASAS data indicates that both the northbound on and off ramps, as well as the Route 99 mainline, have above-average accident rates, although most are non-injury.

With the project, the Daily Vehicle Hours of Delay saved is 1,795 hours, and the Daily Peak Duration Person-Minutes saved is 42,881 minutes. Construction of the project would reduce congestion on local streets, improve traffic flow, reduce travel time, and increase safety for motorists. The actual accident rate is 1.17 MVM. Post-construction statewide average accident rates are typically 0.56 MVM. The accident rate is expressed in the number of accidents per million vehicle miles traveled over a 3-year period.

TABLE 9
TEN-YEAR IMPROVEMENT PLAN

Post Mile	Location	Description	2008 Estimated Cost	Funding Source	Est. Const. Year
FRE - 24.7	In Fresno at Princeton Ave	Remove Interchange	$360,000	Local	ND
FRE - 26.6/30.7	Ashlan Ave to Grantland	4F to 6F	$38.3 mil	Route 99 Bond	2012
FRE - 27.5/28.1/ 28.8/30.9	Gettysburg/Shaw/Barstow /Herndon Ave	Traffic Monitoring Stations	$20,000 each	SHOPP	2011
FRE - 28.1/30.9	Shaw Ave/Herndon Ave	CCTV	$150,000 each	SHOPP	2015
FRE - 28.8	Barstow Ave	Permanent CMS	$300,000	SHOPP	2009
New Alignment	Grantland Diagonal/ Veterans Blvd	New Interchange	$89 mil	Local - Measure C	ND
FRE/MAD - 30.3 - 31.6/0.0 – 1.7	Grantland Ave to Ave 7	4F to 6F	$54.6 mil	Route 99 Bond	2016
MAD - 0.25	San Joaquin River Bridge	Traffic Monitoring Stations	$20,000	SHOPP	2015
MAD - 1.0	Avenue 7	Traffic Monitoring Stations, CCTV, Ramp Metering	$670,000	SHOPP	2015
MAD - 7.5	Avenue 12	Improve Interchange	$68 mil	Route 99 Bond & Local - Measure T	2016
MAD – 10.2	SR 145	Improve Interchange	$6.1 mil	STIP	2009
MAD 10.7 – 11.2	Fourth Street	Interchange Improvements	$11 mil	Measure T	ND
MAD - 14.2	Ellis St	Construct Interchange	$107 mil	Local	ND

ND = Not Determined

2. SHOPP

The SHOPP projects would be completed as warranted throughout this section of Route 99. Given historical trends, it is anticipated that up to one-third of the planned improvements may be completed within 10 years. SHOPP funding limits may reduce the percentage of projects completed within the ten-year time frame; projects will be implemented as funding becomes available. The SHOPP projects not completed within the 10-year horizon will likely be constructed within the 20-year planning horizon of the CSMP.

3. ITS

ITS elements planned for this segment included installing Traffic Monitoring Systems (TMS), Changeable Message Signs (CMS), Road Weather Information System (RWIS), Closed Circuit Television (CCTV) system, ramp metering, and Highway Advisory Radio (HAR). These elements will help keep motorists apprised of incidents and inclement weather as well as improve performance along the corridor. The SHOPP/ITS projects may be funded and completed in conjunction with the completion of the 6-lane freeway projects and/or local development projects. Please refer to Table 9, Page 37, for proposed ITS projects planned for the next ten years.

C. Twenty Year Improvement Plan

The 20-Year improvement plan would also be comprised of funding from a diversity of funding sources. These are presented in Table 10, Page 39. There are additional improvements for preservation, safety and operations that are proposed for Route 99 in this period. Most of the SHOPP/ITS projects should be completed within 20 years.

In addition, developers may provide the funding to complete project improvements as warranted by local development.

D. Beyond Twenty Year Improvement Plan

The Beyond 20-Year improvement plan consists of projects that Caltrans has identified as necessary, based on a continuation of the past pattern and direction of development. The Regional Transportation Plans of our local partners have also identified some potential improvements for this section of the corridor. These improvements are presented in Table 11, Page 40.

The projects listed as being beyond twenty-years are unconstrained. Projects identified in this Table will be subject to change, with modifications to cost inevitable and modifications in scope possible. New priorities may emerge that will cause these projects to be delayed, or to be advanced, in order to meet demands.

TABLE 10
TWENTY-YEAR IMPROVEMENT PLAN

POSTMILE	LOCATION	DESCRIPTION	EST. COST	FUNDING	EST. CONST. DATE
FRE – 14.7/15.5/15.9	American/Chestnut/Central	Improve Interchange	ND	Local	>2018
FRE - 15.5	Chestnut	CCTV	$150,000	SHOPP	>2018
FRE - 15.9/19.5/25	Central/SR 41/Shields	TMS, Ramp Metering	$520,000 each	SHOPP	>2018
FRE - 16.9/31.6	Cedar to Ventura; Clinton to Madera Co Line	Fiber Optic System	6.9 mil	SHOPP	>2018
FRE - 16.9/17.6/ 19.9/ 20.5/21.1/22.4/25.8	Cedar/Orange/Church/Kern /Tuolumne/Pacific C/Dakota	TMS	$20,000 each	SHOPP	>2018
FRE - 16.9/17.2	Cedar & North	Improve Interchanges	ND	Local – Measure C	>2018
FRE - 17.2/20.3/23.72/ 26.1	North/Golden State/Ventura/ McKinley/Motel Drive (Old 99)	Ramp Metering	$500,000 each	SHOPP	>2018
FRE – 19.5	Monterey Street	Bridge & Ramp Improvements	ND	Local – Measure C	>2018
FRE - 17.8	South of SR 180	Permanent CMS	$300,000	SHOPP	>2018
FRE - 18.5/20.3/20.7/ 21.5/22.7/24.4	Jensen/Ventura/Fresno/ SR 180/Belmont/Clinton	TMS, Ramp Metering, & CCTV	$670,000	SHOPP	>2018
FRE - 21.1/26.6	Stanislaus/Ashlan	Ramp Metering, CCTV	$300,000	SHOPP	>2018
FRE - 23.3	Olive Ave	TMS, CCTV, CMS	$470,000	SHOPP	>2018
FRE - 23.3/24.4	Olive to Shields	Auxiliary Lane (interim improve.)	ND	SHOPP	>2018
FRE – 26.6	Ashlan Ave	Improve Interchange	ND	Local	>2018
FRE – 27.3/28.1	Shaw Ave.	Improve Interchange (interim improve.)	ND	Local	>2018
MAD - 0.0/R7.5	Fresno Co Line to Ave 12	Rehabilitate Road	1.9 mil	SHOPP	>2018
MAD – 1.7/7.5	Avenue 7 to Avenue 12	4F to 6F	$184 mil	STIP/IIP	>2018
MAD - 2.2/9.5/10.2	Ave 8/Gateway/SR 145 (Yosemite Ave)	TMS, CCTV	$170,000	SHOPP	>2018
MAD - 3.7/4.9/6.2/10.7/ 11.4/12.1/12.8/13.5/14.5	Ave 9/Ave 10/Ave 11/Ave 13/ Central/Cleveland (Ave 15½)/Ave 16/Boles/Ave 17	TMS	$20,000 each	SHOPP	>2018
MAD - 7.5	Ave 12	TMS, CMS	$320,000	SHOPP	>2018
MAD - 8.2	Ave 13	CCTV, CMS	$450,000	SHOPP	>2018
MAD - 9.2/10.1	North & South of SR 145	CMS	$300,000	SHOPP	>2018
MAD - 9.5/13.1	Gateway to North of Ave 16	Rehabilitate Road	$3.3 mil	SHOPP	>2018
MAD - 14.5/22.5	Avenue 17 to SR 152	4F to 6F; Interchange at Ave 22	$70.6 mil	IIP	>2018
MAD 26.3 – 26.8	Route 99/233 Interchange	Improve Interchange	$38.5 mil	RIP	>2018

ND = Not Determined

TABLE 11
BEYOND TWENTY-YEAR IMPROVEMENT PLAN

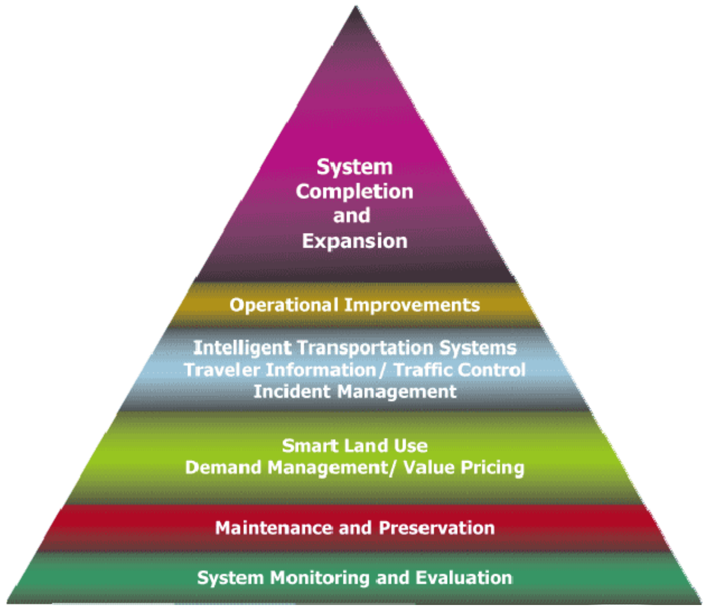
PostMile	Location	Description	Est. Cost	Funding Source	Est. Const. Year
FRE - 15.9/18.5	Central/Jensen/41	6F to 8F	ND	IIP	>2030
FRE - 18.5/20.7	Jensen/SR 41/Clinton	6F to 8F w/ Auxiliary Lanes	ND	IIP	>2030
FRE - 20.3/21.1	Ventura/Stanislaus/Tuolumne	Improve Interchanges	ND	Local	>2030
FRE - 24.4/26.6	Clinton to Ashlan	6F to 8F	ND	IIP	>2030
FRE - 24.4/25/25.8	Clinton Ave/ Shields/Dakota	Improve Interchange	ND	Local	>2030
MAD - 0.0/20.2	Fresno Co Line to Merced Co Line	Construct Concrete Barrier	ND	SHOPP	>2030
MAD - 1.0	Ave 7	Improve Interchange	ND	Local	>2030
MAD - 7.5/14.5	Ave 12 to Ave 17	4F & 6F w/ Aux Lanes	ND	IIP	>2030
MAD – 12.1	Cleveland Ave	Improve Interchange	ND	Local	>2030
MAD - 12.8	Avenue 16	Reconfigure Existing Intersection	ND	Minor	>2030
MAD - 14.5	Avenue 17	Improve Interchange	ND	Local	>2030
MAD - 22.5	SR 152	Construct Interchange & Rail Crossing	ND	IIP	>2030
MAD - 22.5	SR 152	Remote Weather Information Station	ND	SHOPP	>2030

ND = Not Determined

V. CONCLUSION

Corridor productivity can only be restored and maintained through a coordinated planning and management effort of all transportation partners. Governor Swarzenegger's Strategic Growth Plan includes system management strategies. These strategies contribute to the successful management of the corridor. This comprehensive plan is best visualized by the "System Management Pyramid." Each element on the pyramid, while represented separately, works as an essential part of the whole. The elements may be summarized as shown in Figure 1, Page 41.

FIGURE 1
THE SYSTEM MANAGEMENT PYRAMID



A. System Monitoring and Evaluation

The basic foundation of successful system management is System Monitoring and Evaluation. This is accomplished through comprehensive performance assessment and analysis. Understanding how a corridor performs and why it performs the way it does is critical to developing appropriate strategies.

The first step in this effort is to analyze the system that we now have. This will include the identification of recurrent bottlenecks, their causes, and the impact that these individual bottlenecks have on the whole of the corridor. This has been done using Tach runs, FREQ modeling, and microsimulation modeling. Analysis of the accident history will also provide a means of understanding the current system.

Part of monitoring and evaluating the system is to measure the effectiveness of an improvement project using performance measures. A list of performance measures is included in this document. These performance measures represent the best measurement of system performance for this individual section of the corridor with its unique characteristics and challenges. The current technology available to make a determination of performance was a factor in the choice of which measures would be used. Most advanced performance measures require that adequate detection be in place. The current detection system is sparse, but Caltrans has future plans to expand the detection network. This is a critical step to optimizing our ability to measure performance. District 6 has made a commitment to installing detection systems at the first available opportunity. Funding is limited, but detection is often included as part of improvement projects and with wireless radar detectors the detection system can be installed before the construction of the remainder of the project even begins. Caltrans believes this commitment will provide the technology necessary to fully monitor and evaluate the system.

B. Maintenance and Preservation

Maintaining the system in as optimum a condition as possible will require all partners' participation. The corridor does not operate in isolation, but is part of an overall network. Caltrans must work together to determine the best strategies to maximize operations of the entire system. Basic maintenance strategies have been presented earlier in this document as well as a list of planned and programmed SHOPP projects (Tables 9, 10, and 11, Pages 37, 39, and 40, respectively).

C. Smart Land Use, Demand Management/Value Pricing

Land use decisions are the prerogative of local government, but these decisions impact the whole of the transportation system. Appropriate planning can reduce this impact. Preserving right-of-way to allow for future, planned, capacity-enhancing projects will reduce the time to deliver projects and the overall price. Approving only those developments that are compatible with an adjacent or nearby transportation system, be it a freeway, airport, or transit station, would also help to protect the system.

The extent of the usefulness of demand management strategies, and which ones will be most effective, is largely dependent on the current ITS components available on the system. Demand Management strategies may be more available along this corridor in the future, depending on the priority placed on implementing ITS strategies. Existing ITS elements are identified in Table 3, Page 17, and the planned ITS elements are listed in (Tables 4, 9, 10, and 11, Pages 18, 37, 39, and 40, respectively).

D. Intelligent Transportation Systems/Traveler Information/Traffic Control/Incident Management

The various components of Intelligent Transportation Systems, Traveler Information, Traffic Control, and Incident Management have been described elsewhere in this document. Some elements exist today along the corridor (Table 3, Page 17); others have been proposed and are listed in (Tables 4, 9, 10, and 11, Pages 18, 37, 39, and 40, respectively). All of these strategies offer a means of optimizing the performance of the system, without the need for capacity-enhancing construction projects, and for perhaps a greater return on investment.

E. Operational Elements

As discussed earlier in this document, the Level of Service (LOS) describes the operating conditions on a roadway. Without any project improvements, the LOS is projected to deteriorate to predominately LOS E or F by the year 2030. To counter this, numerous operational improvements have been proposed in this document, including capacity-enhancing projects and projects to maintain the condition of the system, including ITS elements Tables 4, 9, 10, and 11, Pages 18, 37, 39, and 40, respectively).

F. System Completion and Expansion

Projects planned for this CSMP area are of various types, some ITS, some maintenance, some capacity-enhancing. Caltrans and the partner agencies will need to work together, and be diligent and creative, in locating appropriate funding for the most critical projects. Table 9, Page 37, presents the 10-year improvement plan for this section of Route 99.

While this last item is at the top of the pyramid, the process of system management does not stop here. Effective system management will be an ongoing process, and may in fact begin all over again at the bottom of the pyramid. New needs will be identified; new technology available, and Caltrans and the local partners will need to remain flexible and responsive. The CSMP must also remain flexible and responsive, with updates as necessary; a living document.

Appendix A

SIGNATORIES

MEMORANDUM OF UNDERSTANDING
FOR
ROUTE 99 CORRIDOR
(FRE PM 14.5/31.609 and MAD PM 0/23.375)

8/27/07
Date

Malcolm X. Dougherty
California Department of Transportation, District 6
District Director
1352 West Olive Avenue
Fresno, CA 93728

8/20/07
Date

Barbara Goodwin
Council of Fresno County Governments
Executive Director
2035 Tulare Street, Suite 201
Fresno, CA 93721

8/6/07
Date

Patricia Taylor
Madera County Transportation Commission
Executive Director
1816 Howard Road, Suite 8
Madera, CA 93637

California Department of Transportation
District 6
Corridor System Management Plan (CSMP)

State Route 99
(FRE PM 14.5/31.609 through MAD 0/23.375)
Charter for Development and Implementation

The Development and Implementation of a Corridor System Management Plan (CSMP) for Route 99 between American Avenue in Fresno County to Route 152 in Madera County.

This Charter or MOU is between the California Department of Transportation, District 6 (hereinafter, District 6), Council of Fresno County Governments (COFCG), and the Madera County Transportation Commission (MCTC). This MOU constitutes solely as a guide to the respective obligations, intentions and policies of the partners and District 6 to identify the development and management of the Route 99 corridor between American Avenue in Fresno County and Route 152 in Madera County. This MOU addresses the principles and practices, system management process, roles and responsibilities and commitment of the responsible partners. This MOU is not designed to authorize funding for the project effort, nor is it a legally binding contract. It is the intent of this MOU to establish a mutual policy leading to a cooperative effort between District 6 and partners for the improvement of Route 99.

Purpose

The purpose of this charter is to document the commitment of all parties to manage the corridor through applying the principles and practices of system and corridor management and performance measurement for sustained corridor performance. The initial phase is development and implementation of a CSMP, across all jurisdictions and modes, for highest mobility benefits to travelers in the corridor. The CSMP will assess current performance, identify causal factors for congestion, and based on testing of alternative corridor management improvement scenarios (typically through micro or macro-simulation) propose the best mix of improvements, strategies and actions to restore throughput, improve travel times, reliability, safety, and preserve the corridor. The CSMP is a guide for managing the corridor among all partners.

Principles and Practices

The following principles and practices will guide development and implementation of the CSMP.

- Corridor productivity can only be restored and maintained through a coordinated planning and management effort of all transportation partners. Restoring productivity is vital to the state, regional and local economy and quality of life and safety for travelers.
- The department, regional agencies, local jurisdictions, and modal operators are partners in developing an effective CSMP to guide corridor management for highest productivity, reliability, safety and preservation based on performance assessment and measurement.
- Development of the CSMP is complementary to and consistent with federal provisions for a continuing, cooperative, and comprehensive planning process among transportation partners.
- Supports federal congestion management system requirements for Transportation Management Areas, state congestion management program provisions and SAFETEA-LU provisions for increased emphasis on system and corridor management and performance measurement in regional transportation plans as well as for real-time traveler information.
- Improvements identified in the CSMP to restore corridor productivity should be candidates for all categories of regional and local funding as applicable.

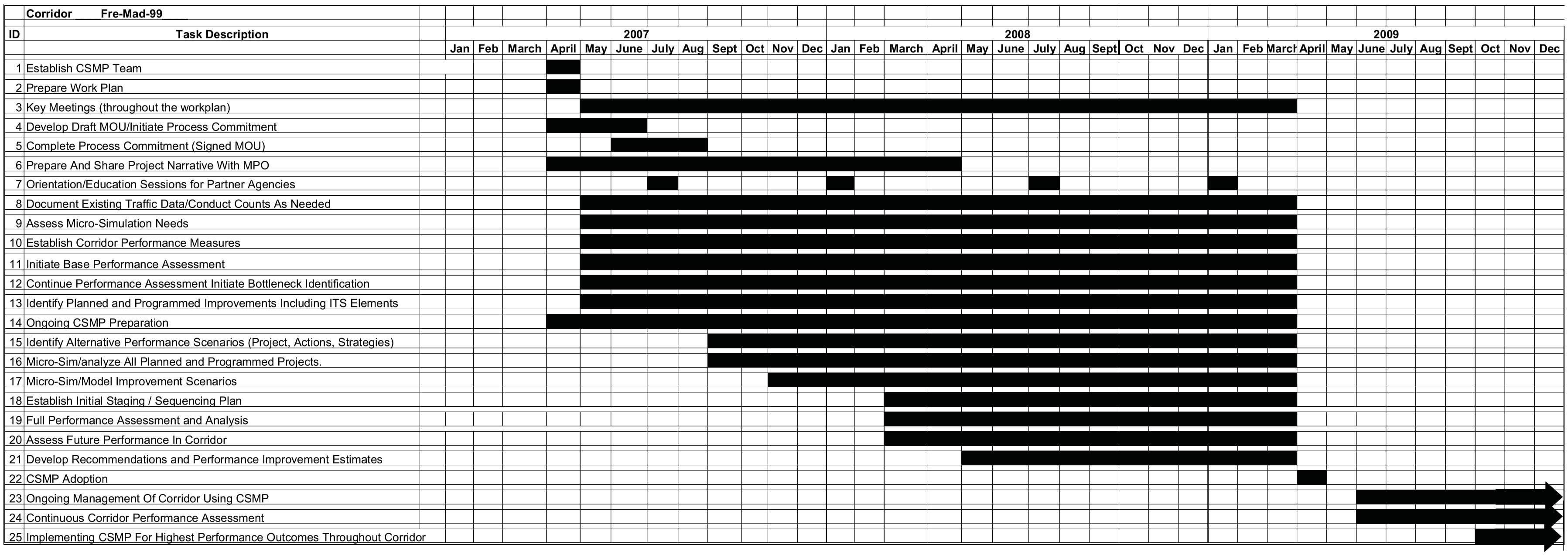
Roles and Responsibilities

The transportation partners (and other applicable partners) will meet on a regular basis for the following activities and decisions:

- Agreement to a work plan, time line, and roles and responsibilities for development of the CSMP, including resources.
- Review draft products, including initial performance assessments and technical documents.
- Coordinate corridor planning and evaluation efforts and share information on related topics to corridor performance measurement and improvement.
- Identify opportunities for heightened understanding by local jurisdictions and the public on the mobility benefits of system and corridor management.

Appendices:

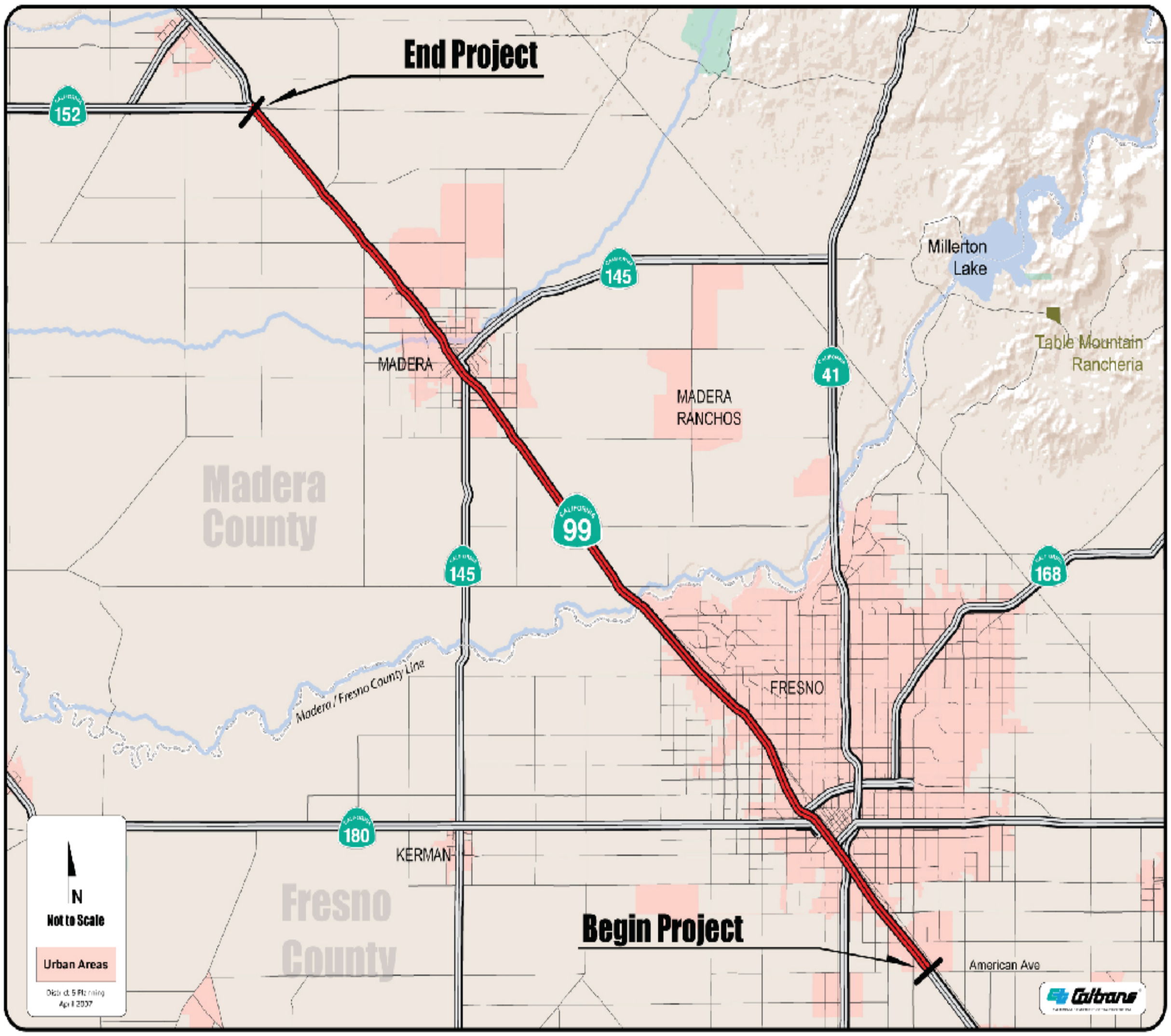
- Draft Work Plan (Attachment 1)
- Map of Route 99 corridor from Fresno Post Mile (PM) 14.5/31.609 to Madera (MAD) PM 0/23.375 (Attachment 2)



Executive Steering Committee
District 6 Director
District 6 Deputy Director, Planning and Local Programs
District 6 Deputy Director, Maintenance and Operations
District 6 Deputy Director, Program Project Management

CSMP Development Team
District 6 Northern Region Planning Staff
District 6 Technical Planning Staff
District 6 Program Project Managemement Staff
District 6 Traffic Operations Staff
District 6 Traffic Engineering Staff
District 6 Design (as needed)
Madera County Transportation Commission Staff
Council of Fresno County Governments Staff
Madera County Planning and Public Works Staff
Fresno County Planning and Public Works Staff
City of Madera Planning and Public Works Staff
City of Fresno Planning and Public Works Staff
San Joaquin Valley Air Pollution Control District Staff (as needed)
California Public Utilities Commission
Chaushilha Tribe
North Fork Rancheria Tribe
Picayune Rancheria of Chukchansi Indians

ATTACHMENT 2
MAP OF CORRIDOR



APPENDIX B
INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

ITS is any electronic transportation system that communicates information to the traveler that will improve safety and efficiency. ITS includes traffic signals, closed-circuit televisions, changeable message signs, ramp meters, weigh-in-motion devices, roadway service patrols, weather stations, highway advisory radio stations, and transportation management centers. Traveler Information Broadcast Systems, traffic signal priority for emergency or transit vehicles, ITS data archive management, and vehicle safety warning systems are all a part of ITS. Also included is centralizing the control of many of these components from traffic or transit management centers.

One Traveler Information Broadcast System is the "511" system. The 511 system is a new three-digit phone number program to access traveler information that is being implemented throughout various areas of the country. 511 is not available in our area at this time. However, some San Joaquin Valley Metropolitan Planning Organizations have committed to implementing a version of the 511 in some counties. This "Phase 1" version should be up and running in 2009.

Deployment of ITS technology will enhance traveler information services, as well as the operational and safety efficiency of the Route by informing motorists of traffic congestion, inclement weather such as fog, dust, highway construction and/or closings. Currently, there is a regional architecture in existence called the "San Joaquin Valley ITS." This architecture covers the 8 counties within the San Joaquin Valley (San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern). This Plan is available at: http://www.kimleyhorn.com/Caarchitecture/task9/sjintro.htm.

i. Detection

Detection is one of the most important components of ITS. Detection refers to the real-time measurement of transportation movements and conditions. In the past, measurements have been conducted periodically (such as once per year) and those measurements were used to determine the need for infrastructure expansion.

Optimizing management strategies will require accurate, on-going data collection be provided by detection systems placed throughout the corridor. Without detection systems, transportation agencies cannot implement advanced traffic control strategies, cannot inform the public about traffic conditions, expected delays and options, and cannot detect and react to incidents quickly enough to minimize the impacts created by those incidents. Route 198 within the limits of this CSMP does not currently include a sufficient detection system to fully optimize these strategies. Because of this, numerous projects to install these systems are proposed, and Caltrans District 6 has made a commitment to increasing the level of detection as quickly as possible. In addition, improvement projects are typically planned to include detection units as part of the construction. Caltrans commitment to the installation of detection units includes installing wireless radar units at the first available opportunity. Even though these wireless units are part of the project, they can be installed before construction, without the effort and cost of disturbing a more traditional system when the road construction begins.

ii. Traffic Control

Traffic control, another element of ITS, includes signal strategies for managing traffic flows on arterials as well as ramp metering on the freeway system. These strategies offer great promise to improve the productivity of the transportation system. There are, however, challenges for Caltrans in utilizing some of these options. Local agencies are often concerned that traffic control devices will cause additional traffic to choose local streets as an alternative. Caltrans will need to work with local partners to reach solutions that will be agreeable to all parties.

iii. Incident Management

Incident Management is a significant component of ITS. Most studies in the United States suggest that incidents such as accidents, special events, and severe weather conditions are responsible for about half of the delay on our freeway system.

Motorists are accustomed to normal delays. However, traffic incidents disrupt the motorist's normal routine, creating unplanned delays. Such delays can cause negative impacts to motorists. Unanticipated delays may also create frustration, aggressive driving, and the potential for "Road Rage." Such aggressive behavior poses a danger not only to other motorists but also to emergency response personnel. The goal of effective Traffic Incident Management (TIM) is to reduce the time it takes to clear traffic incidents from the roadway. The less time it takes to clear an incident, the less congestion and delay the motorist experiences. Safety for both the emergency response personnel and the traveling public is improved. Even small improvements in this process can yield significant benefits. Effective TIM relies on advanced technologies to allow for expedited incident detection, verification, coordination among necessary emergency response agencies, and the subsequent clearance of an incident as rapidly as possible.

Collision and/or natural causes will often require lane or road closures. Changeable Message Signs (CMS) systems are used to inform travelers of the road closure, and, if applicable, existing traffic control (such as one-way controlled traffic, CHP pace vehicles) and the estimated amount of delay. CMS systems are also used to warn of high winds and accidents.

iv. Advanced Traveler Information Systems

One of the more progressive components of ITS is the Advanced Traveler Information System (ATIS). Most commuters get information about traffic conditions from the media; for instance, radio stations. ATIS will provide modal-specific, time-of-day demand data that will allow travelers to get the most out of the transportation system. The system would allow travelers to manage their trips in the most efficient manner. Implementing advanced traveler information systems requires a partnership between transportation agencies and the public.

However, it is clear that the framework is not yet fully developed and that, at this time, current detection systems are not adequate for real-time, tailored information.

v. Traffic Management Centers

Effective ITS implementation requires coordination of all components. Traffic Management Centers (TMC) play an important role in day-to-day system management, providing coordinated incident responses, as well as integration of various systems. An example of integration would be the coordination of ramp metering and arterial signal management. Traveler information also requires sharing data with both public and private partners. Different agencies, such as Caltrans, the California Highway Patrol (CHP), and the media, play different roles and have different systems for incident management. The TMC integrates these roles and systems in one location to optimize performance. TMCs are used in emergencies, Amber Alerts, and provide an Emergency Operations Center function during natural disasters, such as earthquakes. TMCs also serve a security preparedness function; staff can monitor the urban freeway system, quickly activate response strategies (such as changeable message signs), or notify the proper authorities when security risks are identified.

Logical phasing for implementing the components of an effective Traffic Management System would be:

- Installing simple, adaptive-scheme ramp metering;
- Optimizing the meter rates;
- Implementing a corridor adaptive ramp-metering scheme within urbanized areas;
- Advanced arterial signal actuation strategies and improved incident management; and
- With all of these in place, a comprehensive traveler information system as the final goal.

Monitoring and evaluation are the foundations for sound management of the corridor and will help to identify the optimum strategies to improve the transportation corridor. Strategies range from maintenance and preservation to system expansion, but will focus on optimization of the existing system by fully incorporating operational strategies into the management plan. Implementation of ITS strategies will complement other improvements, including those improvements that may be implemented by partner agencies such as transit, light rail, and improvements on the local road system. The goal is that the whole of the transportation system, including highways, local roads, and alternative means of transportation, operate as one seamless network.

vi. Transportation Demand Management

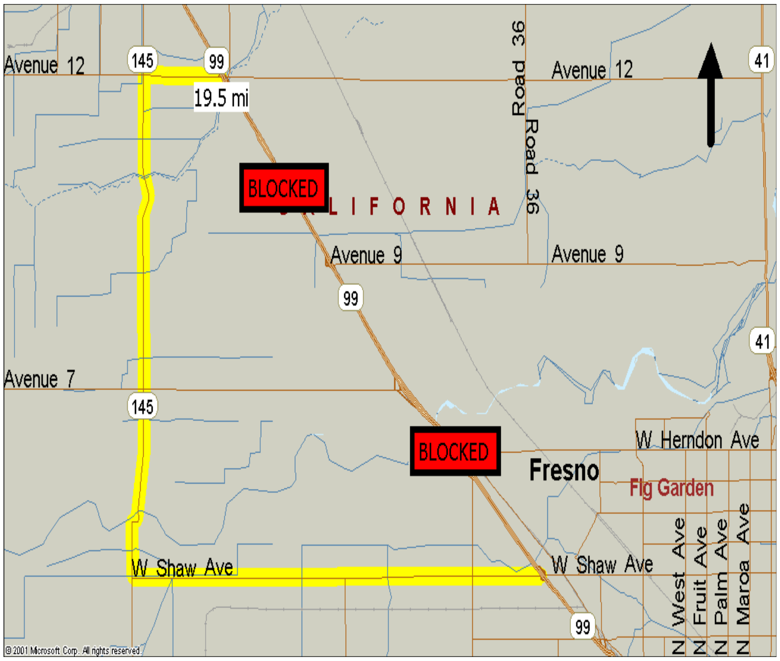
Transportation Demand Management is designed to reduce vehicle trips during peak hours. Transportation Demand Management is specifically targeted at the work force, as commuters generate the majority of peak hour traffic. Incorporating these strategies is a part of land use decisions, the prerogative of local government. Strategies include:

- Rideshare programs
- Transit usage
- Flex hours
- Vanpools
- Bicycling and walking
- Telecommuting
- Mixed land uses (jobs – housing balance)

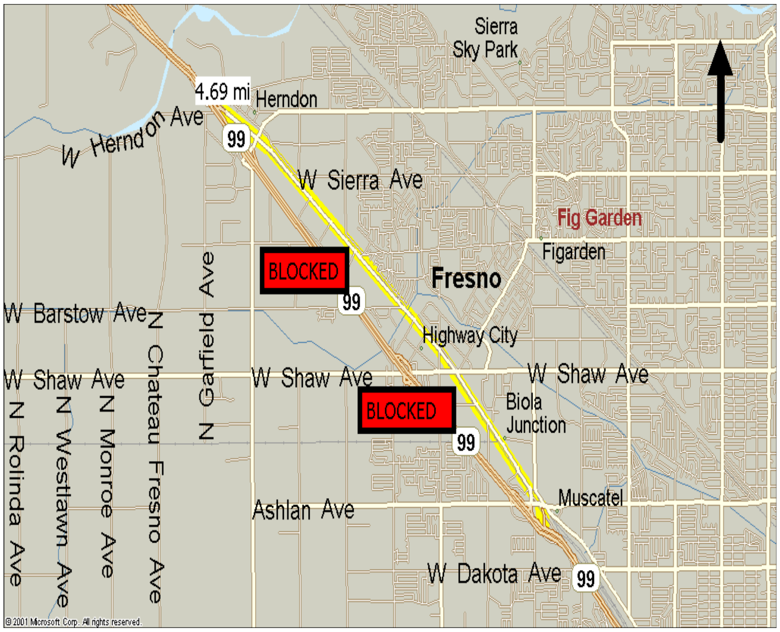
Transportation Demand Management programs could be required by local jurisdictions for any large commercial or office project and could be tied to incentives of some sort to encourage the development of such programs.

APPENDIX C
LOCAL ROADS FOR INCIDENT MANAGEMENT

Fresno 99, Maintenance Call Area 652: NB Traffic: Off at Shaw Ave., west to Hwy 145, north to Ave. 12, east to SR 99.
SB Traffic: Reverse.

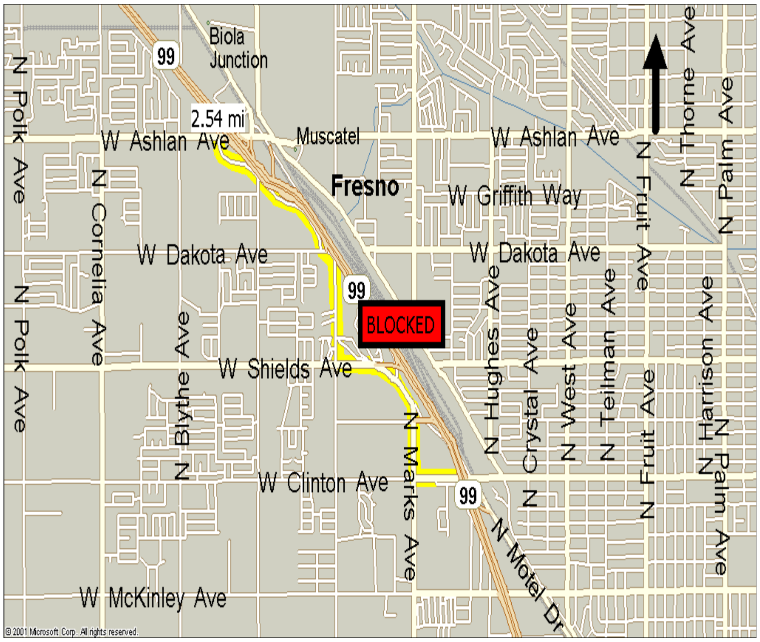


Fresno 99, Maintenance Call Area 652: NB Traffic: Off at Motel Dr. or Shaw Ave., east to Motel Dr., north to Shaw Ave., or Herndon Ave., west to SR 99.
SB Traffic: Reverse.

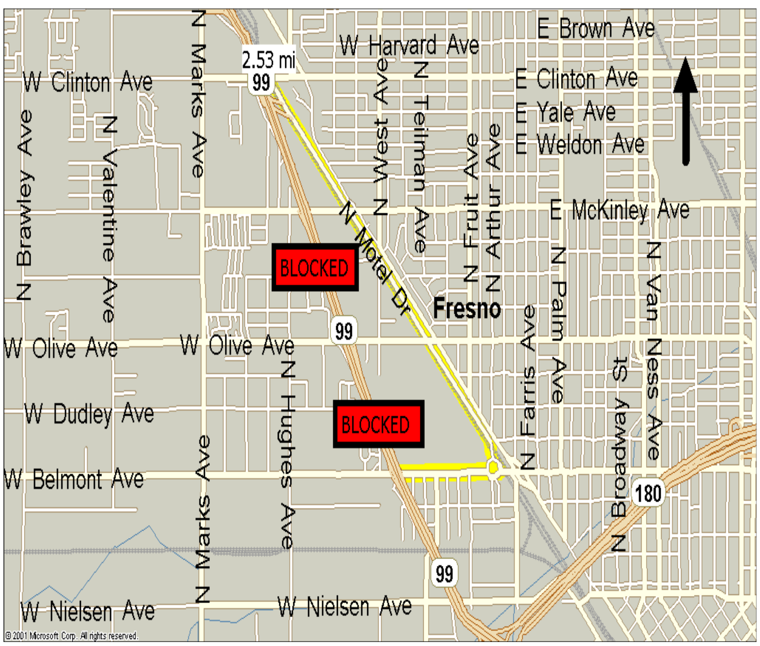


APPENDIX C, CONTINUED
LOCAL ROADS FOR INCIDENT MANAGEMENT

Fresno 99, Maintenance Call Area 652: NB Traffic: Off at Clinton Ave., west to Marks Ave., north on Marks Ave. to Parkway Dr., north to Ashlan Ave., east to SR 99.
SB Traffic: Reverse, SR 99 return from Shields Ave., or Princeton Ave., Clinton Ave. access from Vassar Ave. to Parkway Dr. south.



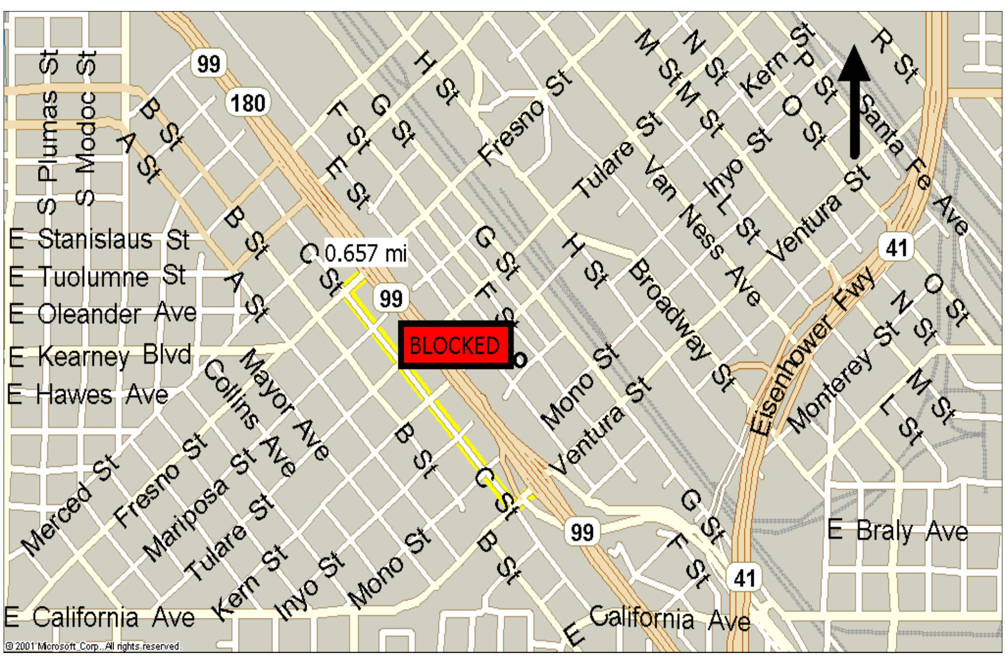
Fresno 99, Maintenance Call Area 652: NB Traffic: Off at Belmont Ave., east to N. Motel Dr., north on Motel Dr. to SR 99 or west on Olive Ave. to SR 99. SB Traffic: Reverse.



APPENDIX C, CONTINUED
LOCAL ROADS FOR INCIDENT MANAGEMENT

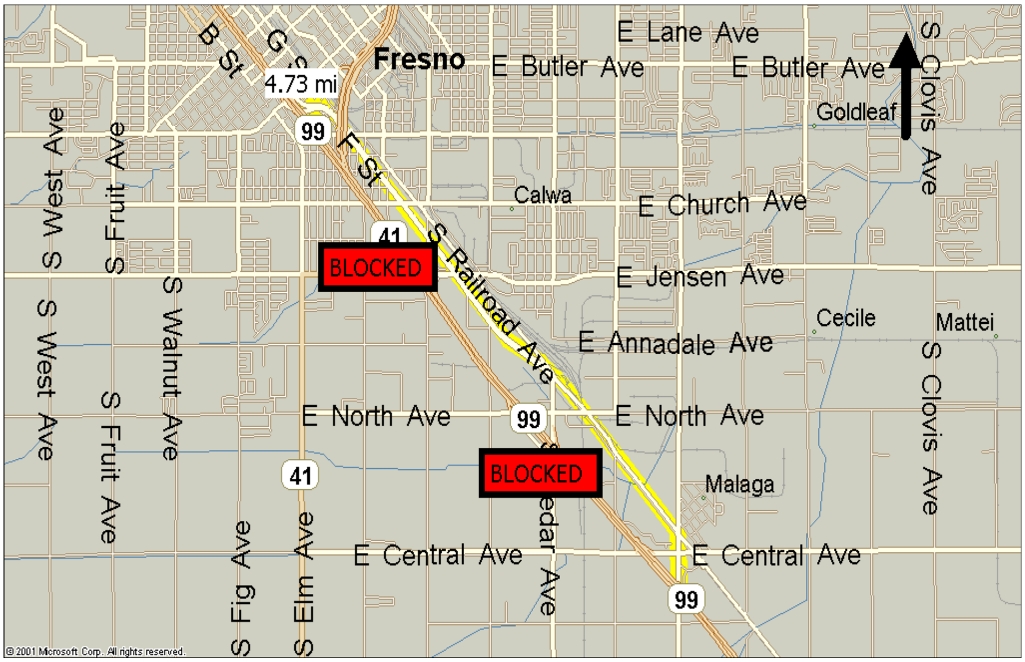
Fresno 99, Maintenance Call Area 652: NB Traffic: Off at Fresno St., to SR 180, west to Hughes Ave., north to Belmont Ave., east to SR 99. SB Traffic: Reverse.

Fresno 99, Maintenance Call Area 652: NB Traffic: Off at Ventura St., west to "C" St., north to Fresno St., east to SR 99.
SB Traffic: Reverse.



APPENDIX C, CONTINUED
LOCAL ROADS FOR INCIDENT MANAGEMENT

Fresno 99, Maintenance Call Area 652: NB Traffic: Off at Chestnut Ave., north to Golden State Blvd., north to SR 99. SB Traffic: Reverse using Ventura St/Golden State Blvd. Offramp.

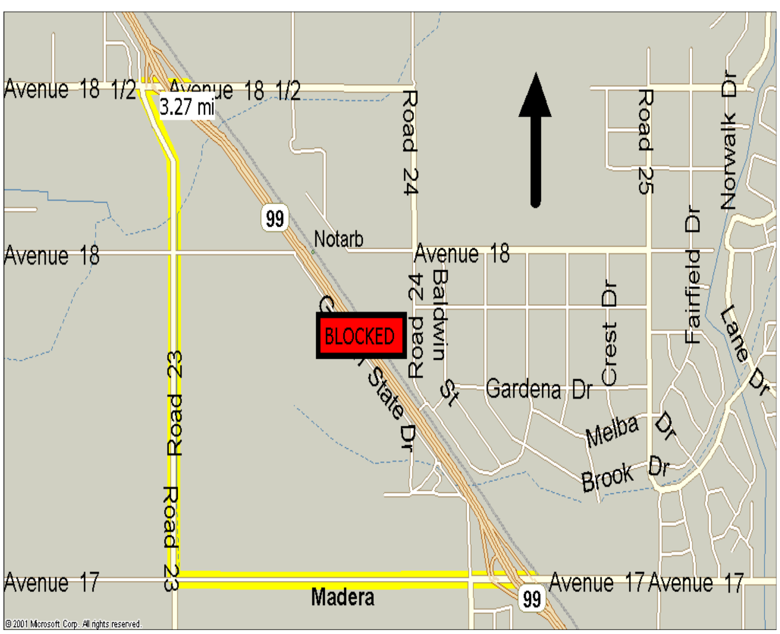


Madera 99, Maintenance Call Area 645: NB Traffic: Off at Ave 20 or 20 ½, east to Fairmead Blvd., north to Ave. 24, west to Hwy 99.
SB Traffic: Reverse

APPENDIX C, CONTINUED
LOCAL ROADS FOR INCIDENT MANAGEMENT

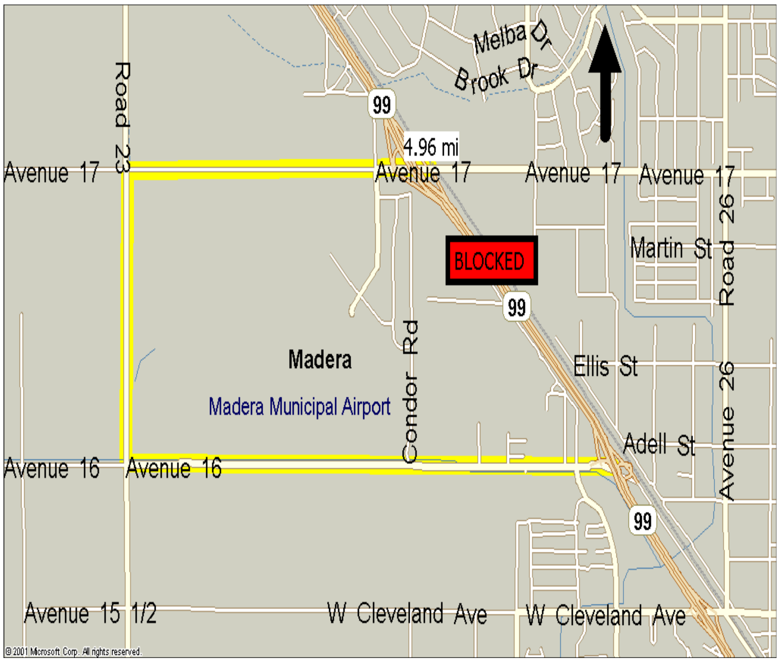
Madera 99, Maintenance Call Area: 645: NB Traffic: Off at Ave 18 ½, west to Golden State Dr., north to Ave. 20 ½, east to Hwy 99.
SB Traffic: Reverse

Madera 99, Maintenance Call Area: 645: NB Traffic: Off at Ave 17, west to Rd 23, north to Ave 18 ½ to Hwy 99. SB Traffic: Reverse

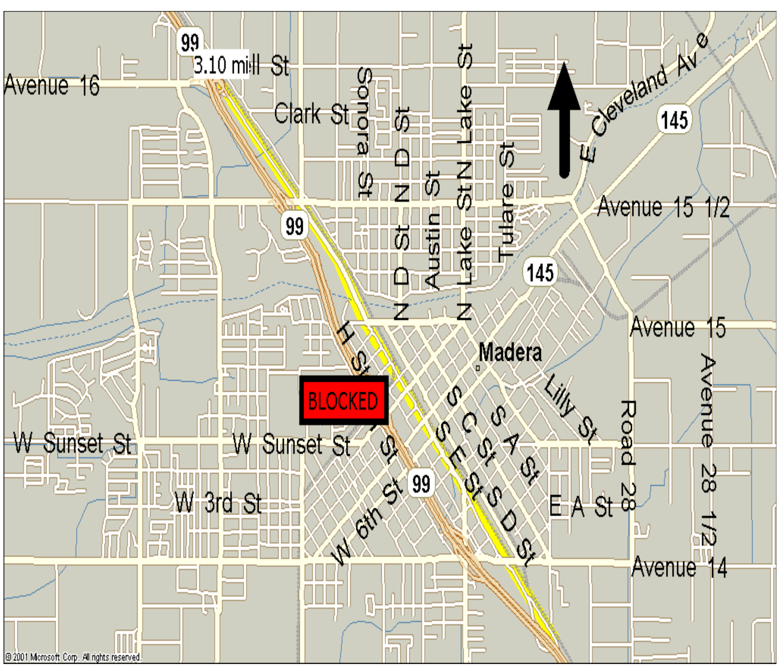


APPENDIX C, CONTINUED
LOCAL ROADS FOR INCIDENT MANAGEMENT

Madera 99, Maintenance Call Area 645: NB Traffic: Off at Ave 16, west to Rd 23, north to Ave. 17, east to SR 99. SB Traffic: Reverse

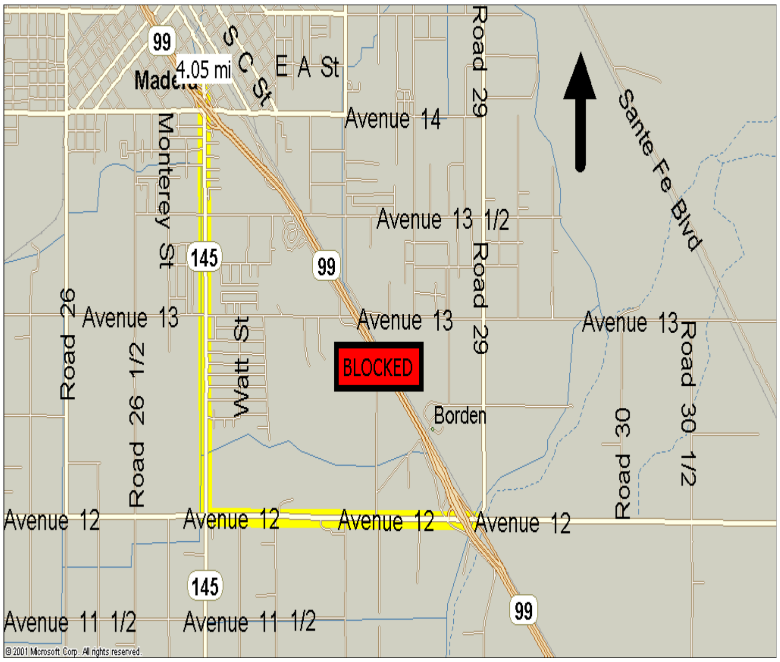


Madera 99, Maintenance Call Area 645: NB Traffic: Off at Gateway Dr., north to Ave 16 onramp. SB Traffic: Reverse

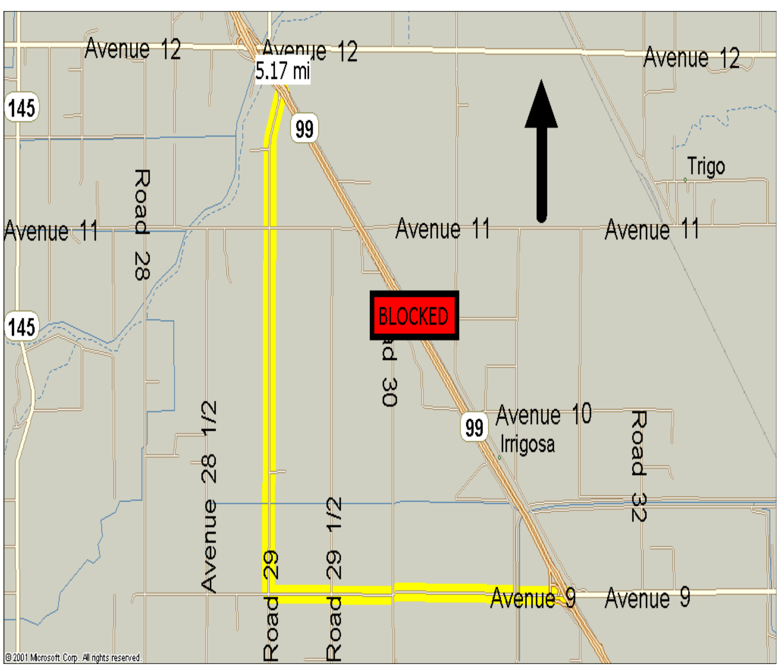


APPENDIX C, CONTINUED
LOCAL ROADS FOR INCIDENT MANAGEMENT

Madera 99, Maintenance Call Area 645: NB Traffic: Off at Ave 12, west to Hwy 145, north to Ave 14 onramp. SB Traffic: Reverse

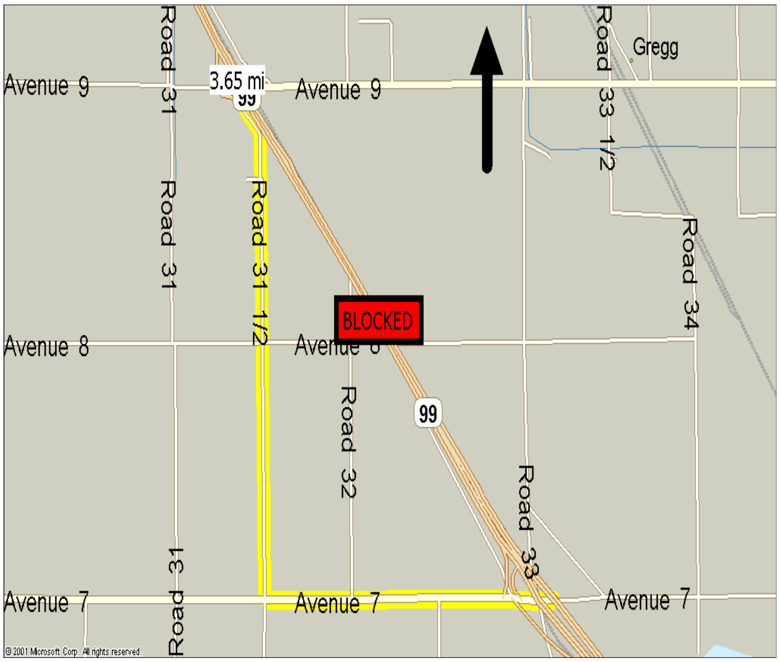


Madera 99, Maintenance Call Area 645: NB Traffic: Off at Ave 9, west to Rd 29, north to Ave. 12 to Hwy 99. SB Traffic: Reverse

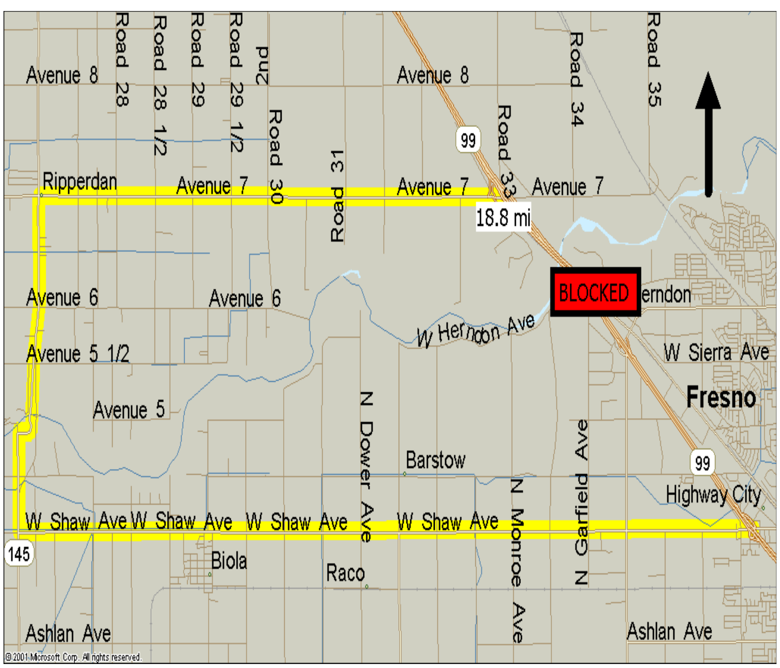


APPENDIX C, CONTINUED
LOCAL ROADS FOR INCIDENT MANAGEMENT

Madera 99, Maintenance Call Area 645: NB Traffic: Off at Ave 7, west to Rd 31 ½ , north to Ave. 9, east to Hwy 99.
SB Traffic: Reverse

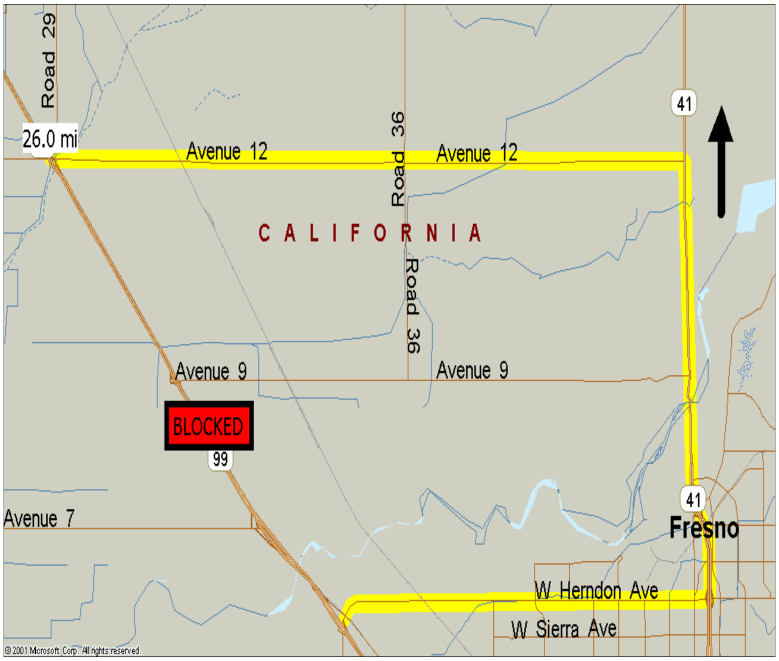


Madera 99, Maintenance Call Area 652: NB Traffic: Off at Shaw Ave. west to Hwy 145, north to Ave 12, east to SR 99.
SB Traffic: Reverse

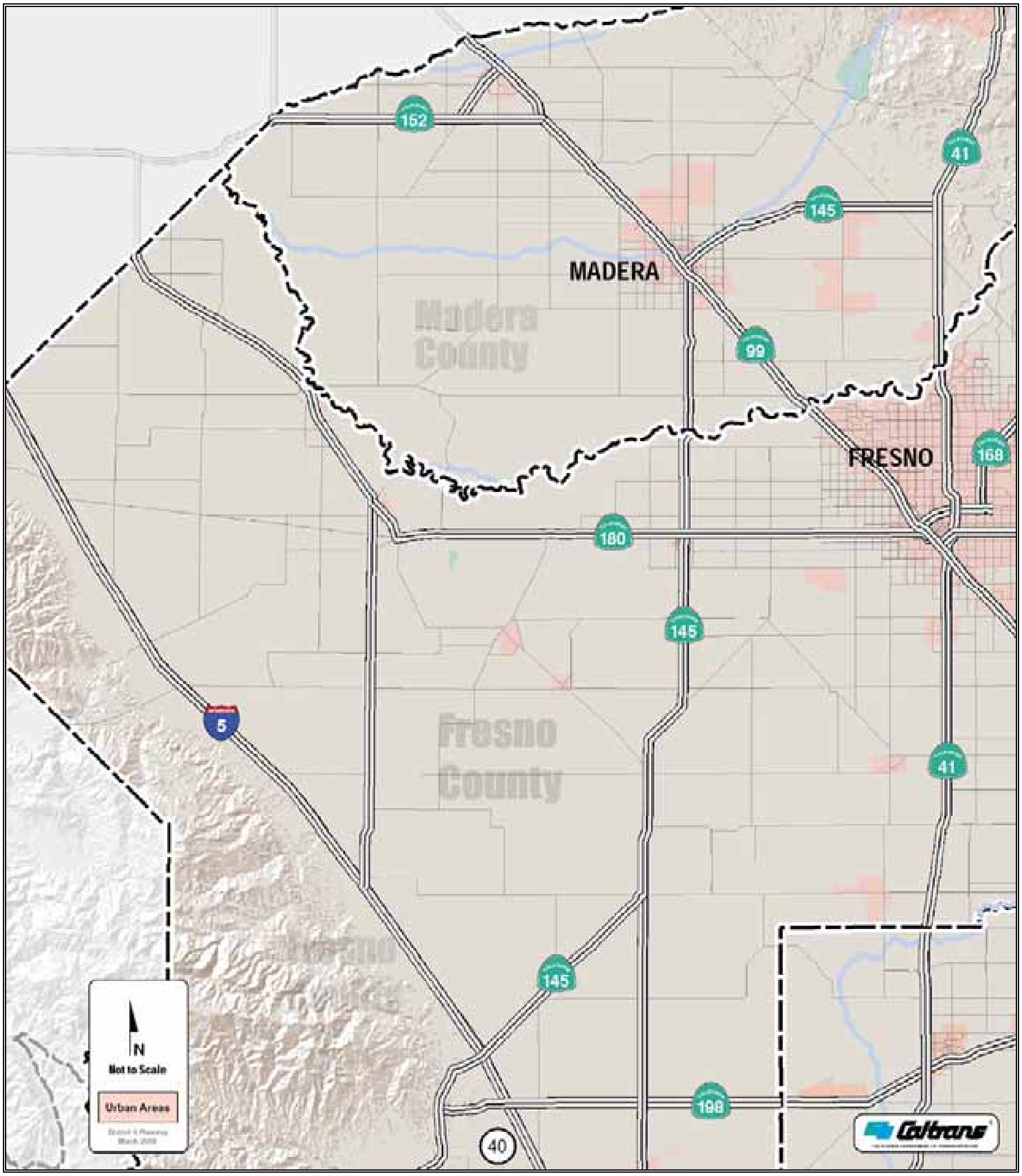


APPENDIX C, CONTINUED
LOCAL ROADS FOR INCIDENT MANAGEMENT

Madera 99, Maintenance Call Area 652: NB Traffic: Off at Herndon Ave., east to SR 41, north to Ave 12,west to SR 99.
SB Traffic: Reverse



APPENDIX D
AVAILABLE DETOURS, STATE HIGHWAYS



APPENDIX E

Fresno/Madera Urban Route 99 Corridor System Management Plan Microsimulation Technical Report

California Department of Transportation
District 6
Technical Planning

March 2009

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EXECUTIVE SUMMARY

E1.1 Project Introduction

The Development and Implementation of a Corridor System Management Plan (CSMP) for Urban Route 99 between American Avenue in Fresno County and State Route 152 in Madera County was identified as the initial phase for a unified effort to address the practices, system management process, and improvements for this highway in the San Joaquin Valley.

Through microsimulation modeling, this corridor was assessed for its current performance and for future improvements. However, microsimulation was not applied to the entire corridor limits due to time constraints in order to comply with Proposition 1B, earlier approved on November 7, 2006. As a result, the microsimulation limits were set from Clinton Avenue in the City of Fresno to Gateway Avenue in Madera County.

To conduct the assessment and future improvements, microsimulation of the corridor was divided in two phases. Chapters 1 through 5 correspond to the first phase of this report which encompasses the development, calibration and validation of a base model. Chapters 6 through 8 correspond to the second phase of the report which encompasses the modeling and analysis of improvements for this corridor within the preceding established microsimulation limits.

E1.2 Project Scope and Objective

The length of approximately 17 highway miles was required to develop a base model of the corridor. Such model partly covers two local jurisdictions, the City of Fresno and the County of Madera. Figure 1 shows a gray rectangle representing the area modeled. This area includes six interchanges, 28 ramps, and six signalized intersections.

Figure 1 Area of Microsimulation Study

As mentioned, two phases were required to conduct a full analysis of the existing and future conditions of the corridor. To accomplish this, the following activities were conducted for each phase:

- Phase 1: Development, Calibration and Validation of a base year 2008 model for the corridor.

- Phase 2: Development, Modeling and Analysis of improvements for the corridor for the year 2030.

Under Phase 1, the following detailed tasks were performed:

- Data collection, analysis, and organization
- Base year model development

- Preliminary Calibration
- Development of Origin-Destination (OD) Matrices
- Calibration and Validation
- Model fine tune

Under Phase 2, the following detailed tasks were performed:

- Incorporation of improvements to the base model
- Development of prospective OD Matrices
- Measure of Effectiveness (MOEs)
- Summary of Results

E1.3 Model Development

The development of a 2008 base year model was conducted as part of Phase 1 of this project. Required data for this model was successfully collected. This data required detailed analysis and organization prior to OD matrix estimation, calibration and validation of the model. Final results obtained during this process were successful and summarized and closely matched field observed data. Careful and meticulous steps were taken during the calibration stage to meet specific guidelines criteria. The calibrated model was then used as a starting point to build a year 2030 model that incorporates future improvements to the corridor.

Due to expected growth in the neighborhood of this corridor in the next two decades as a result of land use and local development that will take place in Fresno and Madera Counties, future improvements to the corridor were identified and summarized. As a result, a year 2030 model was constructed taking into account improvements to the corridor due to this expected growth. Phase 2 of this report describes the process used to develop this model which includes peak spreading, growth factor extraction and application, OD matrix development, measures of effectiveness, and final results. Results revealed future delay, and longer travel times to traverse the corridor due to congestion in both northbound and southbound directions of the corridor for both morning and afternoon periods of simulation.

E1.4 Reference Publications

The work performed for this project followed a comparable methodology used on the California Department of Transportation SR41 Corridor Simulation Study Project. The California Department of Transportation Guidelines for Applying Microsimulation Modeling Software was followed was well.

CHAPTER 1: INTRODUCTION

1.1 Project Background

Within the microsimulation model limits, Route 99 is a six lane corridor from the southern limit near Clinton Avenue through Ashlan Avenue. North of Ashlan Avenue the corridor becomes a four lane facility through the northern limit, near Gateway Avenue as shown in Figure 2. The corridor extends for approximately 17 miles in length and consists of six interchanges. Of these six interchanges, three reside in the City of Fresno and three in Madera County. The interchanges residing within the City of Fresno are located at Ashlan Avenue, Shaw Avenue, and Herndon Avenue, and the interchanges residing in Madera County are located at Avenue 7, Avenue 9, and Avenue 12. In addition, the model includes six signalized intersections, 28 ramps, 319 nodes, 714 links, and 24 traffic analysis zones.

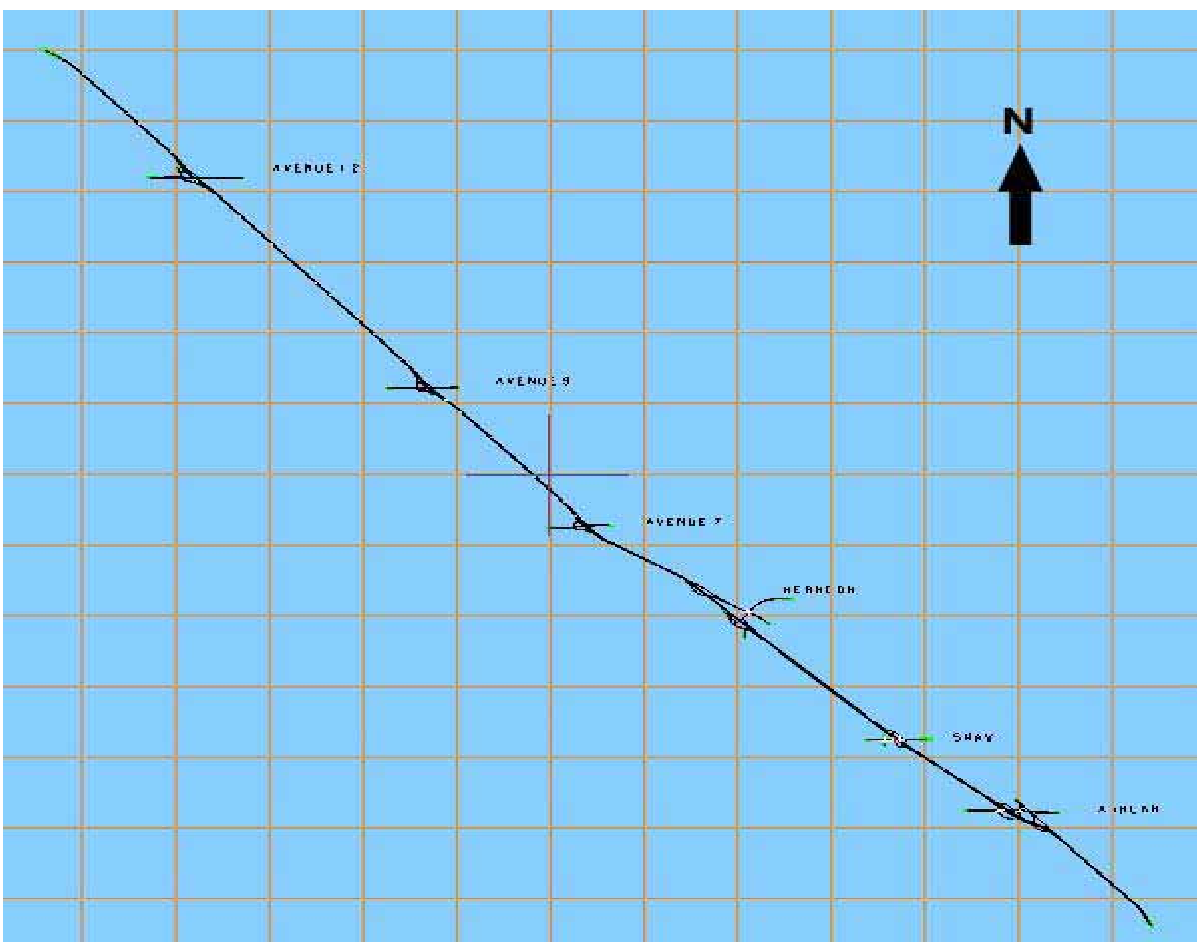


Figure 2 Microsimulation Model Layout

1.2 Project Scope and Objective

Existing and future traffic conditions for the morning and afternoon peak periods were modeled and analyzed in both northbound and southbound directions of the corridor. The morning and afternoon hours are from 6:00 to 9:00 AM and from 4:00 to 7:00 PM. During these time frames, peak hour conditions are present in the corridor. It is the objective of this study to accomplish the development, calibration and analysis of a model representative of such conditions. To do this, the Paramics Software V5.1, short for Parallel Microscopic Simulation, was used as the main tool in reaching our objective. To reach desirable calibrated model results, the potential stop points on Table 1 were our target during calibration. Table 1 lists a set of criteria and measures with required acceptability targets that yield acceptable results. Such criteria, developed in the United Kingdom, was adopted for the purpose of this study.

Criteria & Measures	Acceptability Targets
Hourly Flows, Model vs. Observed	
Individual Link Flows	
Within 15%, for 700 vph < Flow <2700 vph	> 85% of cases
Within 100 vph, for Flow < 700 vph	> 85% of cases
Within 400 vph, for Flow > 2700 vph	> 85% of cases
Total Link Flows	
Within 5%	All Accepting Links
GEH Statistic – Individual Link Flows	
GEH < 5	> 85% of cases
GEH Statistic – Total Link Flows	
GEH < 4	All Accepting Links
Travel Times, Model vs. Observed	
Journey Times Network	
Within 15% (or one minute, if higher)	> 85% of cases
Visual Audits	
Individual Link Speeds	
Visually acceptable Speed-Flow relationship	To analyst's satisfaction
Bottlenecks	
Visually acceptable Queuing	To analyst's satisfaction

Table 1 Microsimulation Model Guidelines Criteria

As listed on Table 1, the Geoffrey E. Havers (GEH) statistic is a formula used to compare two distinctive sets of values. In this study, we compared field collected, or observed data versus modeled data. Thus, the lower the GEH value, the closer the comparison between collected and modeled data. As shown in Figure 3, the formula for computing the GEH statistic is:

$$GEH = \sqrt{\frac{(V - C)^2}{(V + C)/2}}$$

Figure 3 GEH Statistic Equation

where, V = modeled traffic count
C = observed traffic count

GEH values less than 5 for more than 85 percent of all the count locations is considered acceptable, according to Table 1.

Journey or travel time comparison within 15 percent for 85 percent of all cases is also considered acceptable.

CHAPTER 2: DATA COLLECTION

2.1 Introduction

Data collection is perhaps the most important step involved in the development of microsimulation models. Without a reliable and complete data set, model calibration would just not be possible. Data collection should include both demand and performance data for the entire model.

2.2 Data Inventory

Data Collection first required an investigation of available data for the corridor. The investigation aimed at finding data pertinent and necessary to the development of the microsimulation model. Such pertinent data should correspond to:

- Historical Traffic Counts
- Intersection Traffic Counts
- Vehicle Classification Counts
- Vehicle Speeds and Journey Times
- Planning Model OD Pattern Matrix
- Traffic Signal Timing Sheets
- Ramp Meter Timings
- As Built files
- Aerial Images

The results of our investigation produced several sets of data available. Historical Count Data from our Transportation System Network (TSN) database, ranging from October, 2006 through May 2007, was available at several locations on the corridor mainline and ramps. Traffic signal timing records were available for all the signalized intersections. As-Built records and Aerial Images were available as well.

Data not available for the corridor included: Intersection Traffic Counts, Vehicle Classification Counts, Tachnograph Runs, OD Pattern Matrix data, and Ramp Meter data.

It is worth mentioning that OD Pattern Matrix data was not available since no Planning model exists which accurately incorporates two adjacent counties with existing and future improvements. Instead, Planning models exist independently for each county throughout the State. Attempting to create a Planning model to represent two adjacent counties was not within reach of this project.

Also, ramp metering data was not available since the ramps within the microsimulation model limits are not metered.

2.2 Data Collection

The results of the investigation provided a starting point in identifying the needs of unavailable data. Thus, to fully represent the morning and afternoon existing traffic conditions of the corridor in the microsimulation model, traffic count data collection was necessary and as a result, it was scheduled to take place during the month of September, 2007.

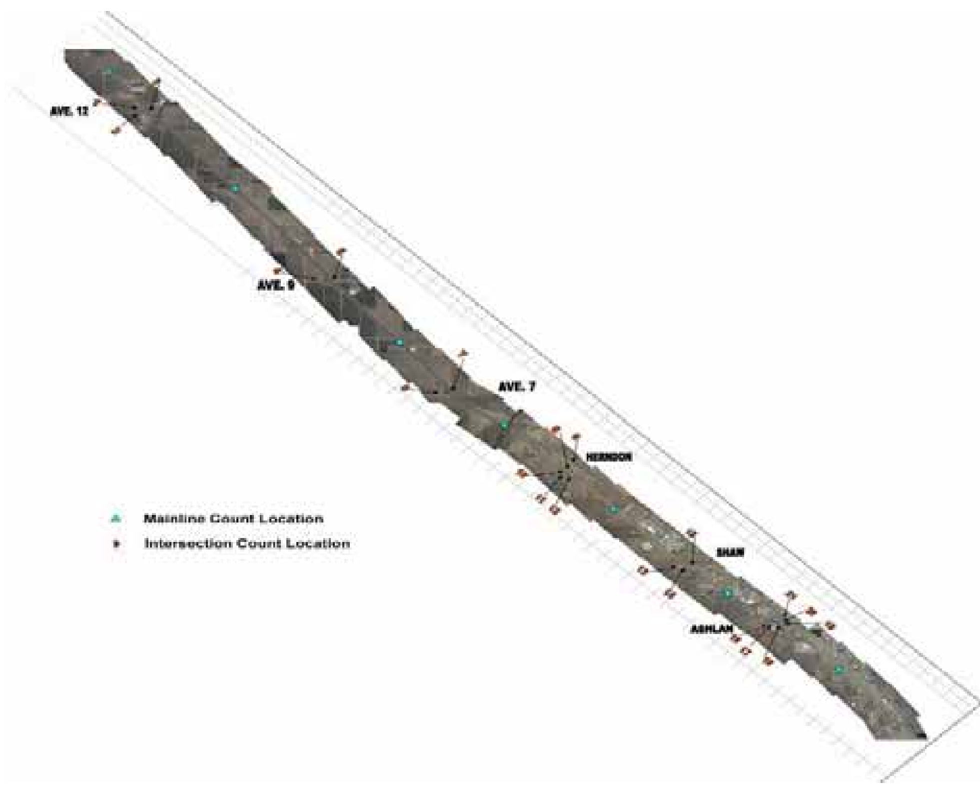


Figure 4 Mainline and Intersections Count Locations

Several mainline locations in the corridor, as shown in Figure 4, were identified as ideal locations where counts could be collected via existing loop detection and radar detection. Also, 21 intersections, as shown on Figure 4 and listed on Table 2, were identified as necessary locations to collect Intersection Traffic Counts.

INTERSECTION COUNT LOCATIONS	
1.	Ave. 12/SR99 Southbound on and off ramps
2.	Ave. 12/Golden State Dr./Road 29
3.	Ave. 12/SR99 Northbound on and off ramps
4.	Ave. 9/Golden State/SR99 Southbound on and off ramps
5.	Ave. 9/SR99 Northbound on and off ramps
6.	Ave. 7/SR99 Southbound on and off ramps
7.	Ave. 7/SR99 Northbound on and off ramps
8.	W. Herndon Ave./SR99 Northbound off ramp
9.	W. Herndon Ave./N. Golden State Blvd.
10.	W. Herndon Ave./SR99 Southbound off ramp
11.	W. Herndon Ave./N. Parkway Dr.
12.	N. Parkway Drive/N. Grantland Ave.
13.	W. Shaw Ave./N. Polk Ave.
14.	W. Shaw Ave./Southbound on and off ramps
15.	W. Shaw Ave./Northbound on and off ramps
16.	W. Ashlan Ave./N. Parkway Dr.
17.	W. Ashlan Ave./SR99 Southbound on ramp
18.	W. Ashlan Ave./SR99 Northbound on ramps
19.	W. Ashlan Ave./SR99 Northbound off ramps
20.	N. Golden State Blvd. Junction
21.	N. Golden State Blvd. Junction

Table 2 Intersection Traffic Count Locations

Though ideal or desirable mainline locations were listed on Figure 4, it was discovered during the investigation that most of the detection at these locations was inactive due to the lack of equipment and to present construction taking place. With the support of the Traffic Management Center (TMC) staff, the locations listed on Table 3 were reconnected to collect mainline traffic count data.

During the collection of mainline traffic count data, Microwave Vehicle Detection Stations (MVDS) were used at two specific locations. One of these was located north of Herndon Avenue and south of Avenue 7 at post mile FRE 31.085, and the other south of Gateway Avenue at post mile MAD 9.283.

SR 99 CSMP MAINLINE DETECTION

VDS Number	Description & Location	PM	Lane Detection Configuration
639/442	Shields Classification Station	FRE 25.0	
638	North of Ashlan Avenue	FRE 27.64	1 & 2 NB, 3 & 4 SB
636	North of Shaw Avenue	FRE 28.580	1 & 2 NB, 3 & 4 SB
679	Avenue 7	FRE 0.989	1 & 2 NB, 3 & 4 SB
316292	SB Direction @ Herndon Ave.	FRE 31.085	SB Direction
316293	NB Direction @ Herndon Ave.	FRE 31.085	NB Direction
316299	SB Direction @ Gateway Dr.	MAD 9.283	SB Direction
316300	NB Direction @ Gateway Dr.	MAD 9.283	NB Direction

Table 3 Mainline Detection Location

At the southernmost part of the corridor, in the vicinity of Shields Avenue at post mile 25.0, vehicle classification data was collected from existing weigh-in-motion stations. Figure 5 illustrates the 13 vehicle classifications representative of the data collected at this location. However, at this weight-in-motion station, data representing 15 vehicle classifications was collected.

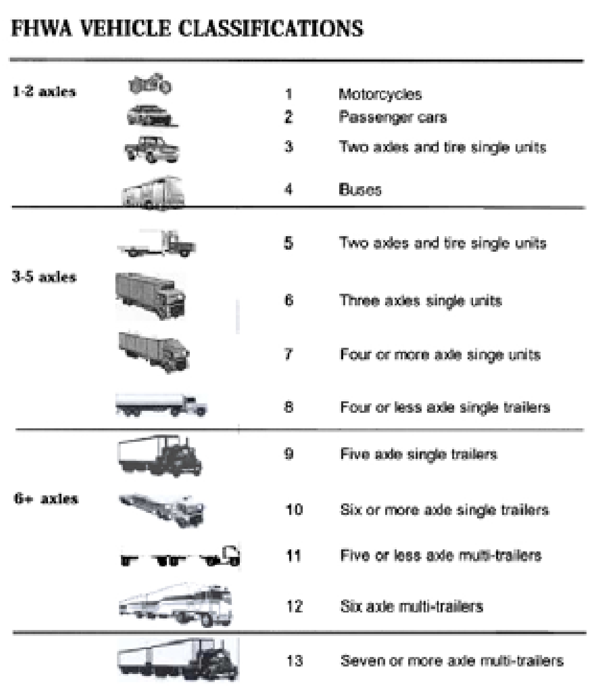


Figure 5 Vehicle Classification

Tachnograph Runs were carried out simultaneously while vehicle traffic counts were being conducted. Vehicles equipped with special devices to conduct this specific activity were deployed to collect journey, or travel times, and vehicular speeds. Support for this was provided by Traffic Operations staff.

CHAPTER 3: MODEL DEVELOPMENT

A base model for the corridor was developed via the application of the Paramics Software Suite V5.1. The construction of this model was achieved using the Paramics Modeller, included in the suite, with a combination of Mircrostation computer aided drafting and design (CADD) files, and Digital Highway Inventory Photography Program (DHIPP) aerial images as a template or background. A model representing the corridor of approximately 17 miles in length was then built. Six interchanges were included in this model with their respective on and off ramps. Six signalized intersections were also included as well as a total of 24 traffic analysis zones.

Several field investigations were conducted in order to verify the existing road geometry, delineation and topographical features as well as signal cycle lengths and signal phases, and vehicular traffic patterns in the corridor. Such investigations facilitated the precision of incorporating the existing roadway geometry of the corridor into the model as well as becoming familiar with existing traffic conditions.

It is important to mention at this stage that prior to initiating the collection of traffic count data, it had been decided not to include any existing parallel arterials in the base model as a result of time constraints and the lack of adjacent parallel routes. By not including parallel routes, the model would only include the corridor and corresponding interchanges. As a result, the model becomes less complex and would most favorably fall in one of two categories as classified by the Paramics software, that is, an all or nothing assignment, AON, or Stochastic assignment model.

Under an AON assignment, it is assumed that all vehicle drivers in the model traveling from one origin zone to a destination zone will choose the same route regardless of time constraints and traffic conditions present. On the other hand, a Stochastic assignment takes into consideration the differences in travel time associated if more than one route exists from an origin zone to the desired destination zone. Therefore, an AON assignment was considered to be more suitable for this corridor due to the lack of multiple realistic and practical routes vehicles would take to travel from their origin to their destination.

CHAPTER 4: ORIGIN DESTINATION MATRIX ESTIMATION

4.1 Data Analysis

The concept used by the Paramics software to load vehicular traffic into a model is through what is known as an Origin-Destination, or OD matrix. The OD matrix is a square matrix that includes all the traffic zones of the model. As traffic is loaded into the model, vehicles travel from an origin zone to a destination zone. Thus, data collected in the form of intersection turn counts and mainline counts must first be converted into an OD matrix in order to load traffic into the model.

Following the development of the base model, the analysis of the collected data proceeded. As shown in Table 2, vehicle turn counts took place at 21 intersections; most of these located at the end of the off ramps and at the beginning of the on ramps along the corridor. These turn counts were performed by District 6 staff during the morning and afternoon time frames from 6-9 AM and 4-7 PM, respectively. Turn counts were collected in 15 minute time intervals. Figure 6 is an example of one location where turn counts were collected.

Figure 6 Intersection Count Location

This collected data, at all 21 intersections, was then organized in a table format corresponding to each specific location as shown on Figure 7. Arranging the data in this format was essential and necessary to begin analyzing it and to search for discrepancies, missing count data, and to identify and correct possible data errors. In addition, this became the basis for establishing a collected count data value to be used in calculating the GEH statistic of the modeled data.

In the corridor, as shown in Table 3, mainline count data was collected at six locations. Data collected in the neighborhood of Ashlan Avenue, Shaw Avenue, and Avenue 7 was possible after the existing detection loops at these locations were reconnected to their corresponding controller cabinets. Near Herndon Avenue, north

ASHLAN NB RAMPS														
PERIOD		SBRT	SBTH	SBLT	WBRT	WBTH	WBLT	NBRT	NBTH	NBLT	EBRT	EBTH	EBLT	TOTAL
6:00	6:15	4	0	11	111	54	0	45	5	18	0	88	17	353
6:15	6:30	5	0	11	113	65	0	60	2	28	0	110	14	408
6:30	6:45	26	0	13	140	71	0	77	1	50	0	131	27	536
6:45	7:00	43	0	30	208	115	0	74	3	34	0	168	52	727
7:00	7:15	65	0	28	187	125	0	66	2	51	0	175	50	749
7:15	7:30	44	0	34	198	164	0	53	0	38	0	214	48	793
7:30	7:45	33	0	51	215	131	0	68	1	30	0	268	49	846
7:45	8:00	32	0	24	185	112	0	146	7	53	0	295	71	925
8:00	8:15	24	0	16	163	107	0	79	2	57	0	173	44	665
8:15	8:30	22	0	17	149	85	0	82	2	43	0	148	39	582
8:30	8:45	17	0	9	102	81	0	81	6	33	0	145	24	498
8:45	9:00	9	0	7	117	85	0	87	4	52	0	143	39	543
6:00 - 9:00 TOTAL		324	0	246	1888	1195	0	918	35	487	0	2058	474	7625

ASHLAN NB RAMPS														
PERIOD		SBRT	SBTH	SBLT	WBRT	WBTH	WBLT	NBRT	NBTH	NBLT	EBRT	EBTH	EBLT	TOTAL
16:00	16:15	58	0	43	151	204	0	104	6	91	0	162	40	851
16:15	16:30	53	0	32	149	202	0	107	2	113	0	207	49	914
16:30	16:45	46	0	27	138	268	0	106	2	111	0	213	34	937
16:45	17:00	52	0	33	138	266	0	90	7	128	0	215	38	967
17:00	17:15	69	0	74	156	261	0	89	2	118	0	199	47	1015
17:15	17:30	51	0	30	104	278	0	93	3	149	0	230	56	994
17:30	17:45	63	0	24	122	286	0	77	7	93	0	208	46	926
17:45	18:00	62	0	27	118	265	0	81	6	116	0	194	58	927
18:00	18:15	73	0	26	94	235	0	68	17	80	0	186	49	828
18:15	18:30	46	0	24	86	200	0	59	9	76	0	163	50	713
18:30	18:45	57	0	17	68	160	0	51	8	78	0	164	46	649
18:45	19:00	52	0	15	78	201	0	41	5	84	0	162	46	684
4:00 - 7:00 TOTAL		674	0	372	1402	2818	0	966	74	1237	0	2303	559	10405

Figure 7 Typical Intersections Count Data

of Avenue 12, and south of Gateway Avenue, data was collected using radar detection. Via Microwave Vehicle Detection Stations, or MVDS, while at the same time linking these stations to the Freeway Performance Measures System, or PeMS, mainline count data was collected at these locations. Figure 8 illustrates an example of a similar MVDS used.

Figure 8 Microwave Vehicle Detection Station

Also, at the southern end of the corridor, near Clinton Avenue, vehicle classification historical count data was available for reference. The analysis of data at this location produced a percentage breakdown of vehicles, as shown on Figure 9, based on their classification as listed on Figure 5.

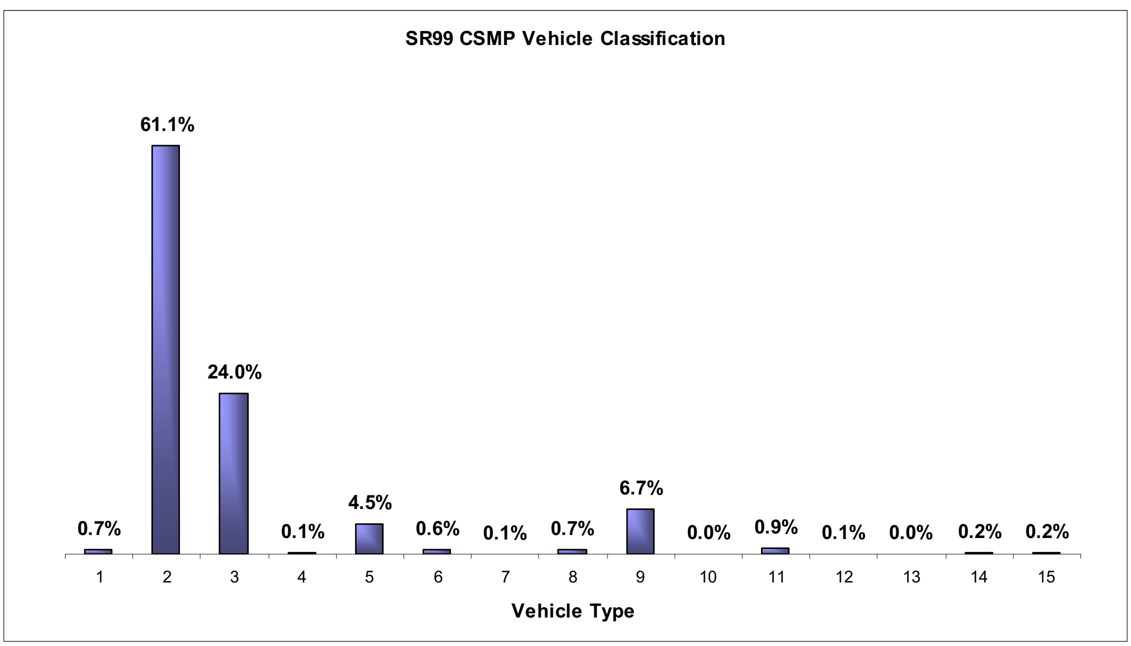


Figure 9 Observed Vehicle Classification

Of the locations where mainline data was collected, it was done so in five minute intervals for three consecutive days, as shown in Figure 10. This was done with the anticipation that incidents such as vehicular accidents could impact the collection of this data.

NOTE: Lanes 1 and 2 are for Northbound (NB) Direction
Lanes 3 and 4 are for Southbound (SB) Direction

9/18/2007	Lane 1	Lane 2	Lane 3	Lane 4
6:00	91	62	86	59
6:05	77	63	79	59
6:10	79	60	72	62
6:15	71	65	112	66
6:20	87	59	106	68
6:25	96	60	125	69
6:30	95	64	112	71
6:35	96	70	173	96
6:40	90	67	152	84
6:45	105	69	149	76
6:50	117	71	172	94
6:55	106	60	119	85
7:00	109	71	177	104
7:05	99	66	135	85
7:10	111	62	167	84
7:15	106	65	197	110
7:20	122	78	161	96
7:25	98	73	182	111
7:30	108	68	214	115

9/19/2007	Lane 1	Lane 2	Lane 3	Lane 4
6:00	70	57	89	53
6:05	77	61	79	64
6:10	69	46	100	57
6:15	97	61	93	72
6:20	81	62	96	64
6:25	88	55	100	68
6:30	92	60	133	72
6:35	93	70	163	97
6:40	103	69	148	78
6:45	79	76	157	85
6:50	108	80	151	81
6:55	100	70	120	71
7:00	83	63	129	81
7:05	101	66	148	82
7:10	109	81	176	100
7:15	122	76	179	86
7:20	108	66	193	89
7:25	129	76	171	60
7:30	119	71	168	97

9/20/2007	Lane 1	Lane 2	Lane 3	Lane 4
6:00	70	51	57	48
6:05	64	56	74	60
6:10	84	48	90	69
6:15	64	53	109	78
6:20	84	58	96	60
6:25	90	61	120	73
6:30	99	64	115	76
6:35	90	67	130	74
6:40	82	74	138	71
6:45	95	70	170	86
6:50	103	62	171	91
6:55	82	74	154	97
7:00	102	72	132	67
7:05	94	73	150	89
7:10	109	68	178	96
7:15	111	77	185	103
7:20	135	81	181	85
7:25	124	68	196	88
7:30	107	78	189	96

Figure 10 Typical Mainline Count Data

After the collected data was analyzed for each location and compared with historical count data, this same collected data was then arranged in a diagrammatic format via a spreadsheet to further identify discrepancies of traffic leaving one location and entering another. Notice the arrow on Figure 20 pointing to the count difference in traffic leaving one intersection and entering the adjacent intersection. This method is a very helpful visual tool to assist in balancing, or adjusting specific counts with discrepancies or errors, while at the same time it becomes the first step in terms of arranging this same data as input data to be used for OD matrix estimation.

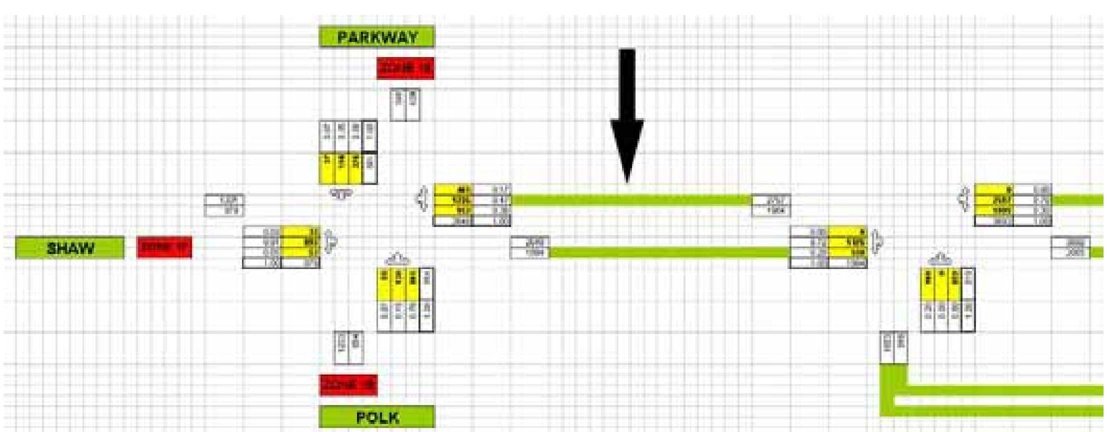


Figure 11 Intersection Count Data Discrepancies

4.2 One Hour Matrix Estimation

Matrix estimation required the conversion of turn count and mainline count data into a square OD matrix representative of all the zones in the model. After analyzing, arranging and balancing all the collected data, the development of one hour matrices for the AM and PM took place. Data collected from 6 to 9 AM and 4 to 7 PM was converted into individual one hour OD matrices. The Paramics Estimator was used to accomplish this and to meet the criteria listed on Table 1 in order to determine if developed hourly matrices were acceptable to be used in the base model. In doing so, turn counts and mainline counts were input into the Paramics Estimator as hourly turn flows and link flows.

The Paramics Estimator has the capability of employing what is known as a pattern matrix. A pattern matrix is a square matrix that can be used during matrix estimation in conjunction with turn flows and link flows. Such pattern matrix provides OD trip patterns that can further help with the development of hourly matrices and can be extracted from available planning models. This type of matrix was not available for this project. However, the Paramics Estimator does have the ability of creating a pattern matrix based on the input turn flows and link flows.

4.3 One Hour Matrix Estimation Results

Having analyzed and input the data for each corresponding hour into the Estimator, the following results were obtained as shown on Table 4. As these are evaluated

LINK FLOWS		AM			PM	
	6 - 7	7 - 8	8 - 9	4 - 5	5 - 6	6 - 7
GEH < 5	100%	100%	100%	100%	100%	100%
AVERAGE GEH	0.48	0.54	0.73	0.72	0.87	0.74

TURN FLOWS		AM			PM	
	6 - 7	7 - 8	8 - 9	4 - 5	5 - 6	6 - 7
GEH < 5	99%	99%	98%	96%	97%	97%
AVERAGE GEH	0.78	0.81	0.74	0.88	0.98	0.85

Table 4 Estimator Results

against Table 1, both link flow and turn flow GEH values have met the required criteria. These results indicate that each hour matrix can be used for the calibration process of the base model.

CHAPTER 5: MODEL CALIBRATION AND VALIDATION

5.1 Global Parameters

The generation of hourly OD matrices is one step required to begin the process of matching modeled data versus field observed data. And although this was accomplished using the Estimator, it is a matter of common experience that results from the Estimator may be acceptable but do not necessarily yield the same results in Modeller. The reason behind this is because Estimator emulates, or uses as reference the model created in Modeller to generate new OD matrices. Specific calibration adjustments that can only be made in Modeller are not available in Estimator. Thus, Estimator can be thought of as an OD matrix calculator only. To match modeled data and field observed data, several global and local parameters within the model required fine tuning adjustments. Within Modeller, these parameters were adjusted and tested until desirable results were obtained as part of the calibration of the base model. Critical global parameters include:

- Time Steps per Second
- Headway
- Reaction Time
- Speed Memory

Time Steps per second specifies the number of distinct simulation intervals that are simulated per second. In other words, the Time Step decides when calculations are conducted during every second of simulation taking place. A default Time Steps of 2 indicates that calculations are done every 0.5 seconds. For the base model for this corridor, a Time Steps of 5 means that calculations are carried every 0.2 seconds.

Mean Target Headway, measured in seconds, is the global time between a vehicle and a following vehicle. Though in essence not quite the same as observed headways, this is influenced by traffic conditions, driver behavior and other factors.

Mean Reaction Time, measured in seconds, refers to the mean reaction time of each vehicle driver. This value refers to the delay in time associated in a vehicle following another and noticing changes in speed.

Speed Memory refers to the number of Time Steps that all vehicles record prior to the current time step.

5.2 Local Parameters

An extensive assortment of local parameters is available in Modeller for fine-tuning and to calibrate the model to the observed conditions and to match collected data as well as vehicle behavior and travel patterns. Of a long list of parameters available, some of the influential ones that have been adjusted are:

- Warm-Up Period OD Matrices
- OD Matrices
- Nodes
- Kerbs
- Stop Lines
- Signposting
- Sign Range
- Next Lanes
- Lane Stacking
- Link Speeds
- Signal Timings
- Lane Choices

A description of each of these parameters can be found in the Paramics Modeller User Guide and the Modeller Reference Manual.

Calibration of the model was performed through a combination of loading the one hour matrices developed in Estimator into Modeller, fine-tuning of the local parameters, and generating results to compare to the field collected data.

5.3 One Hour Calibration and Validation Results

The calibration of the model is an iterative process that involves constant feedback in order to produce desirable results that can meet the criteria listed on Table 1. This process is complex and extensive due to the large amounts of data that must be analyzed each time a model run is performed and while OD trip adjustments are meticulously carried out before the next run. This feedback process, if conducted cautiously, can yield acceptable results that serve as indicators that the model is approaching a reasonable or stable calibration state while at the same time producing simulated data that is comparable or similar to collected data which is also an indication of acceptable model validation or justification.

As validation, results produced for all link flows and turn flows for each individual hour can be seen in Tables 5, 6, 7 and 8.

LINK FLOWS	AM			PM		
	6 - 7	7 - 8	8 - 9	4 - 5	5 - 6	6 - 7
Within 100 vph, for Flow < 700 vph (>85%)	100%	100%	100%	100%	100%	100%
Within 15%, for 700 vph < Flow <2700 vph (>85%)	100%	100%	100%	91%	92%	100%
Within 400 vph, for Flow > 2700 vph (>85%)	100%	100%	100%	100%	100%	100%

Table 5 Link Flow Calibration Results

TURN FLOWS	AM			PM		
	6 - 7	7 - 8	8 - 9	4 - 5	5 - 6	6 - 7
Within 100 vph, for Flow < 700 vph (>85%)	100%	99%	96%	100%	100%	98%
Within 15%, for 700 vph < Flow <2700 vph (>85%)	100%	50%	100%	100%	80%	88%
Within 400 vph, for Flow > 2700 vph (>85%)	N/A	N/A	N/A	N/A	N/A	N/A

Table 6 Turn Flow Calibration Results

LINK FLOWS	AM			PM		
	6 - 7	7 - 8	8 - 9	4 - 5	5 - 6	6 - 7
GEH < 5	100%	95%	95%	95%	95%	95%
AVERAGE GEH	0.93	1.63	1.48	1.82	2.01	2.85

Table 7 Link Flow GEH Calibration Results

TURN FLOWS	AM			PM		
	6 - 7	7 - 8	8 - 9	4 - 5	5 - 6	6 - 7
GEH < 5	99%	95%	98%	97%	96%	95%
AVERAGE GEH	1.03	1.47	1.36	1.15	1.52	1.22

Table 8 Turn Flow GEH Calibration Results

Overall, these one hour results are within desirable ranges with only two exceptions; one of these, the Turn Flow category for flows between 700 and 2700 vehicles per hour (vph) for the 7 - 8 AM hour, and the other for the 5 - 6 PM hour. This can be explained because only a limited number of locations exhibit Turn Flows that fall in this category. Also, GEH values for each hour, as well as their overall average, are in good standing for both the link flows and turn flows.

5.4 Journey Times and Vehicular Speed

Journey Times, or Travel Times, for the corridor were collected with limits situated at the Ashlan Avenue interchange and the Avenue 12 interchange. Detailed graphs corresponding to this data can be found in Appendix A of this report.

Although congestion in the mainline of the corridor was not present, travel times were still recorded as well as vehicular speeds. This was done with the purpose of generating speed contour maps that would identify and illustrate areas of congestion within the corridor. However, speed contour maps for the base model are not included in this report because of the lack of congestion in the corridor and because of the lack of additional data that is needed to accomplish this task. Instead, collected and simulated average journey times and speeds for each individual hour are incorporated and summarized in Tables 9 through 12. These results meet the criteria listed on Table 1.

OBSERVED	NB AM		
	6-7	7-8	8-9
JOURNEY TIME (s)	707	645	630
SPEED (mph)	64	62	64

MODELED	NB AM		
	6-7	7-8	8-9
JOURNEY TIME (s)	663	691	683
SPEED (mph)	68	66	67

% ERROR	NB AM		
	6-7	7-8	8-9
JOURNEY TIME	6%	-7%	-8%
SPEED	7%	-5%	-4%

Table 9 AM Northbound Journey Times and Speeds

OBSERVED	SB AM		
	6-7	7-8	8-9
JOURNEY TIME (s)	678	728	715
SPEED (mph)	67	62	63

MODELED	SB AM		
	6-7	7-8	8-9
JOURNEY TIME (s)	677	677	682
SPEED (mph)	67	67	67

% ERROR	SB AM		
	6-7	7-8	8-9
JOURNEY TIME	0%	7%	5%
SPEED	0%	-8%	-6%

Table 10 AM Southbound Journey Times and Speeds

OBSERVED	NB PM		
	4-5	5-6	6-7
JOURNEY TIME (s)	615	617	N/A
SPEED (mph)	67	65	N/A

MODELED	NB PM		
	4-5	5-6	6-7
JOURNEY TIME (s)	695	684	672
SPEED (mph)	65	66	68

% ERROR	NB PM		
	4-5	5-6	6-7
JOURNEY TIME	13%	-11%	N/A
SPEED	3%	-1%	N/A

Table 11 PM Northbound Journey Times and Speeds

OBSERVED	SB PM		
	4-5	5-6	6-7
JOURNEY TIME (s)	657	681	N/A
SPEED (mph)	67	66	N/A

MODELED	SB PM		
	4-5	5-6	6-7
JOURNEY TIME (s)	676	686	684
SPEED (mph)	67	67	67

% ERROR	SB PM		
	4-5	5-6	6-7
JOURNEY TIME	3%	-1%	N/A
SPEED	1%	-2%	N/A

Table 12 PM Southbound Journey Times and Speeds

5.5 Fifteen Minute Calibration and Validation Results

To further calibrate and validate the base model for the corridor, it was necessary and essential to conduct a calibration analysis every 15 minutes for both the AM and PM hours as it was done for the one hour calibration and validation process. To accomplish this, the one hour matrices previously developed were disseminated into 15 minute matrices to establish a profile of the traffic being loaded into the model. The results produced are shown on Tables 13 and 14 which represent the GEH statistical values for all the flows.

Tables 15 through 18 summarize the northbound and southbound Journey Times. Tables 19 through 22 summarize the northbound and southbound speeds. And, Figures 12 and 13 illustrate the simulated versus observed flows.

FLOWS	AM											
	0600	0615	0630	0645	0700	0715	0730	0745	0800	0815	0830	0845
GEH < 5	84%	89%	85%	87%	91%	89%	86%	81%	82%	84%	87%	85%
AVERAGE GEH	2.67	2.47	2.52	2.70	2.32	2.50	2.77	3.00	3.02	2.60	2.29	2.83

Table 13 15 Minute AM Flows GEH Calibration Results

FLOWS	PM											
	1600	1615	1630	1645	1700	1715	1730	1745	1800	1815	1830	1845
GEH < 5	87%	88%	92%	89%	88%	86%	88%	87%	85%	83%	85%	84%
AVERAGE GEH	2.37	2.67	2.19	2.57	2.49	2.58	2.57	2.83	2.65	2.74	2.82	2.60

Table 14 15 Minute PM Flows GEH Calibration Results

AM NB Journey Times				
Time	Observed (s)	Simulated (s)	Difference (s)	% Difference
6:00	N/A	662	N/A	N/A
6:15	707	657	50	7%
6:30	707	649	58	8%
6:45	707	685	23	3%
7:00	652	696	-44	-7%
7:15	633	696	-63	-10%
7:30	655	705	-50	-8%
7:45	655	666	-11	-2%
8:00	630	680	-50	-8%
8:15	631	672	-41	-6%
8:30	N/A	697	N/A	N/A
8:45	N/A	682	N/A	N/A

Table 15 AM Northbound Journey Times

AM SB Journey Times				
AM SB Journey	Observed (s)	Simulated (s)	Difference (s)	% Difference
6:00	N/A	660	N/A	N/A
6:15	N/A	700	N/A	N/A
6:30	678	672	6	1%
6:45	678	674	4	1%
7:00	N/A	658	N/A	N/A
7:15	767	690	77	10%
7:30	706	683	24	3%
7:45	710	676	34	5%
8:00	725	682	43	6%
8:15	692	699	-7	-1%
8:30	729	678	N/A	N/A
8:45	N/A	667	N/A	N/A

Table 16 AM Southbound Journey Times

PM NB Journey Times				
Time	Observed (s)	Simulated (s)	Difference (s)	% Difference
4:00	679	708	-29	-4%
4:15	597	680	-83	-14%
4:30	592	696	-104	-18%
4:45	633	697	-64	-10%
5:00	621	680	-59	-9%
5:15	636	675	-39	-6%
5:30	569	700	-131	-23%
5:45	624	682	-58	-9%
6:00	N/A	684	N/A	N/A
6:15	N/A	681	N/A	N/A
6:30	N/A	670	N/A	N/A
6:45	N/A	655	N/A	N/A

Table 17 PM Northbound Journey Times

PM SB Journey Times				
Time	Observed (s)	Simulated (s)	Difference (s)	% Difference
4:00	680	679	1	0%
4:15	703	673	30	4%
4:30	645	677	-32	-5%
4:45	629	675	-46	-7%
5:00	682	680	2	0%
5:15	669	694	-25	-4%
5:30	687	681	6	1%
5:45	687	687	0	0%
6:00	N/A	689	N/A	N/A
6:15	N/A	686	N/A	N/A
6:30	N/A	676	N/A	N/A
6:45	N/A	686	N/A	N/A

Table 18 PM Southbound Journey Times

AM NB Speeds				
Time	Observed (mph)	Simulated (mps)	Difference (mph)	% Difference
6:00	N/A	69	N/A	N/A
6:15	N/A	69	N/A	N/A
6:30	64	70	-6	-9%
6:45	N/A	66	N/A	N/A
7:00	62	65	-3	-6%
7:15	63	65	-2	-3%
7:30	62	64	-2	-4%
7:45	63	68	-5	-9%
8:00	64	67	-3	-4%
8:15	64	68	-4	-6%
8:30	64	65	-1	-2%
8:45	N/A	67	N/A	N/A

Table 19 AM Northbound Speeds

AM SB Speeds				
Time	Observed Speed (mph)	Simulated Speed (mps)	Difference (mph)	% Difference
6:00	N/A	69	N/A	N/A
6:15	N/A	65	N/A	N/A
6:30	67	68	0	-1%
6:45	67	67	0	0%
7:00	N/A	69	N/A	N/A
7:15	59	66	-7	-12%
7:30	64	67	-2	-4%
7:45	64	67	-3	-6%
8:00	62	67	-4	-7%
8:15	65	65	0	0%
8:30	62	67	-5	N/A
8:45	N/A	68	N/A	N/A

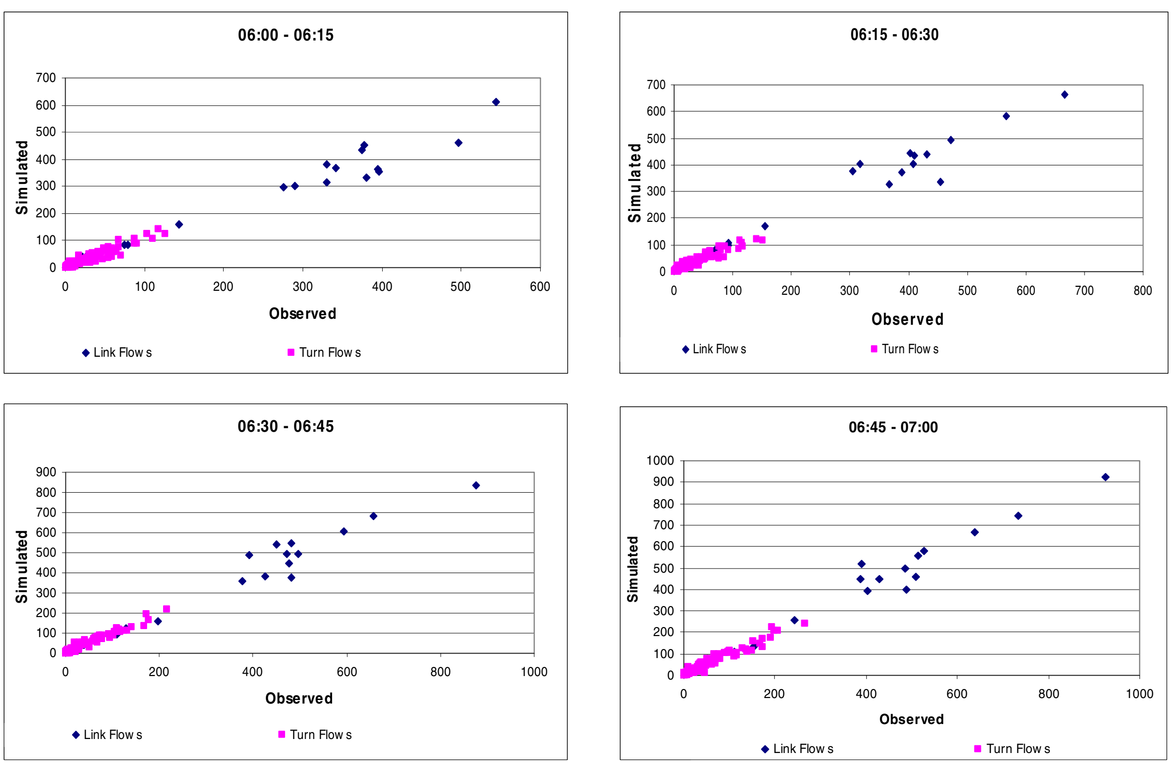
Table 20 AM Southbound Speeds

PM NB Speeds				
Time	Observed Speed (mph)	Simulated Speed (mps)	Difference (mph)	% Difference
4:00	66	64	2	3%
4:15	67	67	1	1%
4:30	68	65	3	4%
4:45	64	65	-1	-2%
5:00	65	67	-2	-3%
5:15	63	67	-4	-7%
5:30	71	65	6	9%
5:45	63	66	-3	-5%
6:00	N/A	66	N/A	N/A
6:15	N/A	67	N/A	N/A
6:30	N/A	68	N/A	N/A
6:45	N/A	69	N/A	N/A

Table 21 PM Northbound Speeds

PM SB Speeds				
Time	Observed Speed (mph)	Simulated Speed (mps)	Difference (mph)	% Difference
4:00	66	67	-1	-1%
4:15	66	67	-1	-2%
4:30	68	67	0	1%
4:45	67	67	0	0%
5:00	65	67	-1	-2%
5:15	67	65	2	3%
5:30	65	67	-2	-3%
5:45	65	66	-1	-2%
6:00	N/A	66	N/A	N/A
6:15	N/A	66	N/A	N/A
6:30	N/A	67	N/A	N/A
6:45	N/A	66	N/A	N/A

Table 22 PM Southbound Speeds



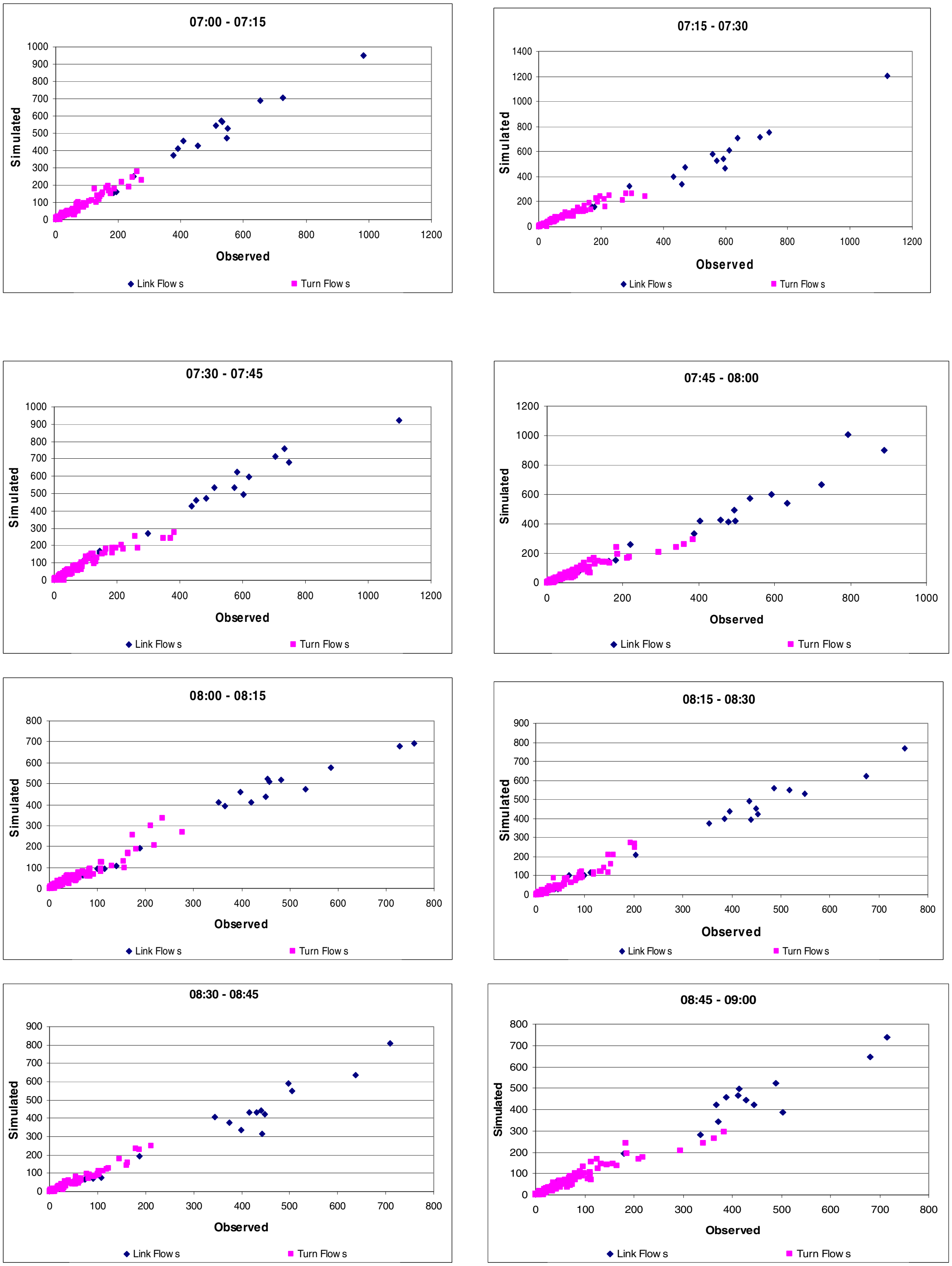
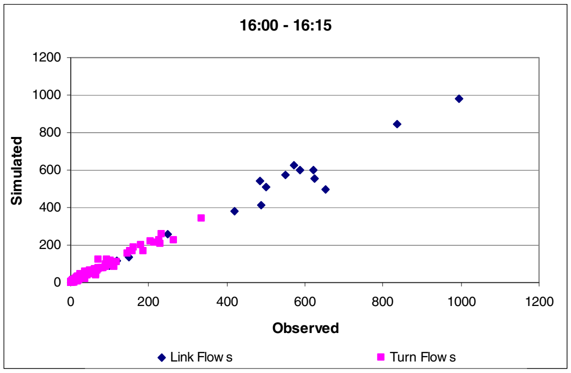
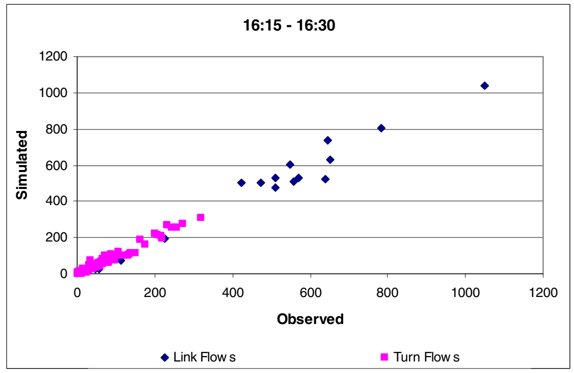
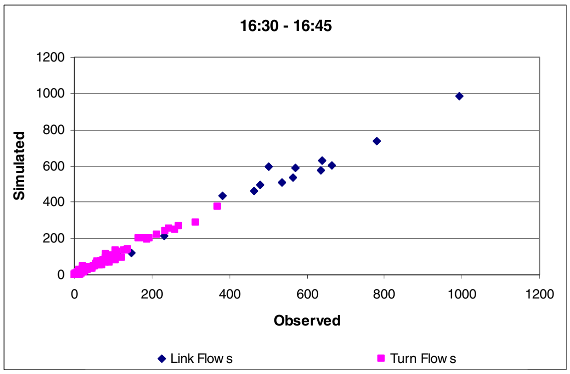
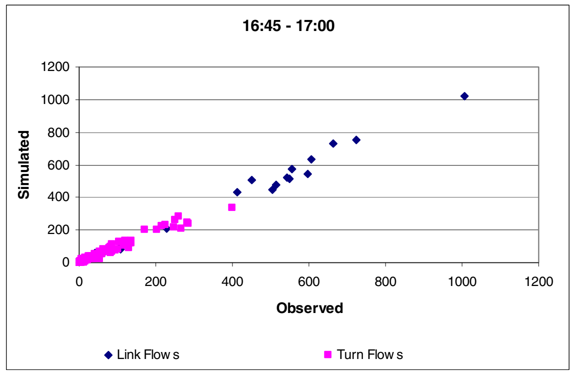


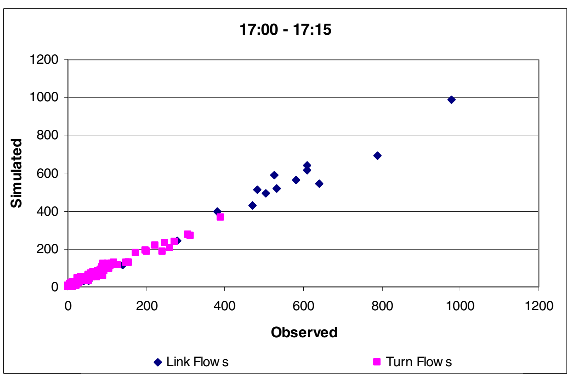
Figure 12 AM Observed and Simulated Flow Comparison

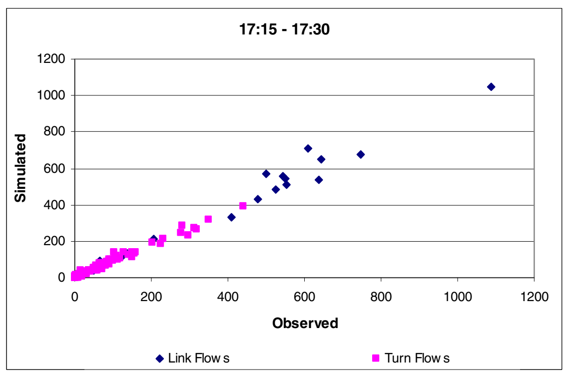

16:00 - 16:15
Simulated
Observed
0
200
400
600
800
1000
1200
Link Flows
Turn Flows

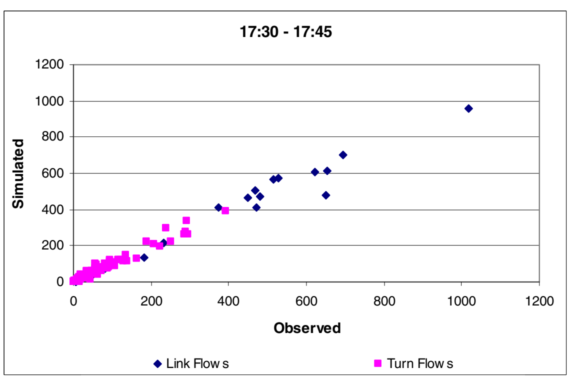

16:15 - 16:30
Simulated
Observed
0
200
400
600
800
1000
1200
Link Flows
Turn Flows

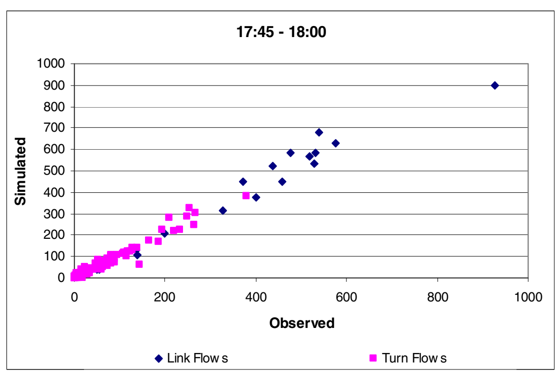

16:30 - 16:45
Simulated
Observed
0
200
400
600
800
1000
1200
Link Flows
Turn Flows


16:45 - 17:00
Simulated
Observed
0
200
400
600
800
1000
1200
Link Flows
Turn Flows


17:00 - 17:15
Simulated
Observed
0
200
400
600
800
1000
1200
Link Flows
Turn Flows


17:15 - 17:30
Simulated
Observed
0
200
400
600
800
1000
1200
Link Flows
Turn Flows


17:30 - 17:45
Simulated
Observed
0
200
400
600
800
1000
1200
Link Flows
Turn Flows


17:45 - 18:00
Simulated
Observed
0
100
200
300
400
500
600
700
800
900
1000
Link Flows
Turn Flows

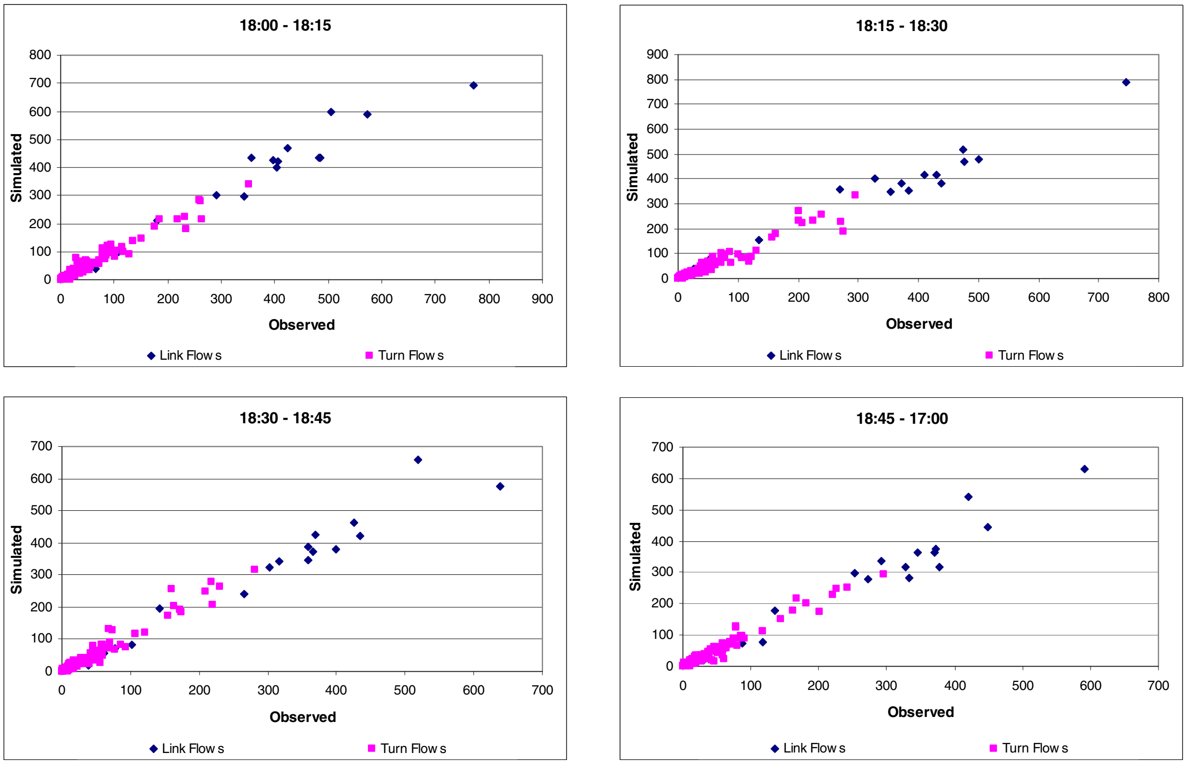


Figure 13 PM Observed and Simulated Flow Comparison

Overall, the results produced have met the criteria listed on Table 1. With these results, Phase 1 of this project has been completed.

In Phase 2, the calibrated model from Phase 1 is used as a starting point to incorporate improvements of the corridor. Evaluation of the corridor with these improvements is conducted as well.

CHAPTER 6: YEAR 2030 MODEL DEVELOPMENT

6.1 Fiscally Constrained Improvements

The development of a year 2030 model of the corridor required identifying projects that are fiscally constrained improvements for the facility. Examples of these improvements include the addition of mainline lanes, addition of ramp metering, intersection modifications, and interchange improvements. The following sources of information were used to identify these improvements:

- California Department of Transportation Status of Projects Central Region
- Fresno Council of Governments 2007 Regional Transportation Plan
- Fresno-Madera Metropolitan Freeway/Interchange Deficiency Study Phase II
- California Department of Transportation Administrative 2008 Draft Project Study Report for Veterans Boulevard
- Fresno/Madera Route 99 Urban Corridor System Management Plan
- El Paseo Study at SR 99 and Herndon Avenue in the City of Fresno
- Fresno County Models for years 2007 and 2030

These improvements are listed on Table 23 followed by a map on Figure 14 which provides an illustration of the locations of these fiscally constrained improvements.

SR 99 CSMP FISCALLY CONSTRAINED IMPROVEMENTS		
	LOCATION	DESCRIPTION
1	NB Off Ramp to Ashlan Avenue	Add New Ramp Lane
2	Motel Drive (Old SR 99) SB Ramp	Install Ramp Meter
3	Ashlan Avenue	Improve Interchange
4	Ashlan Avenue SB and NB On Ramp	Install Ramp Meter
5	Ashlan Avenue	2L to 4L from Blythe Avenue to Parkway Avenue
6	From Ashlan Avenue to Fresno/Madera County Line	4L to 6L Freeway
7	Shaw Avenue	Improve Interchange
8	Shaw Avenue SB and NB On Ramps	Install Ramp Meter
9	Veterans Boulevard	Construct New Interchange
10	Veterans Boulevard SB and NB Ramps	Install Ramp Meter
11	Herndon Avenue	4L to 6L from Millburn to SR 99
12	Herndon Avenue & Golden State Boulevard	Improve Intersection
13	Herndon Avenue NB Off Ramp	Improve and Signalize Off Ramp
14	Herndon Avenue SB Off Ramp	Remove SB Off Ramp
15	Grantland Avenue & Herndon Ave Intersection	Improve and Signalize Intersection
16	Grantland Avenue SB On Ramp	Improve Ramp and Install Ramp Meter
17	Golden State Boulevard	2L to 4L from Herndon Avenue to Ashlan Avenue
18	From Fresno/Madera County Line to Avenue 7	4L to 6L Freeway
19	Avenue 7	Improve Interchange
20	From Avenue 7 to Avenue 12	4L to 6L Freeway
21	Avenue 12	Improve Interchange
22	From Avenue 12 to Avenue 17	4L to 6L Freeway

Table 23 Fiscally Constrained Improvements

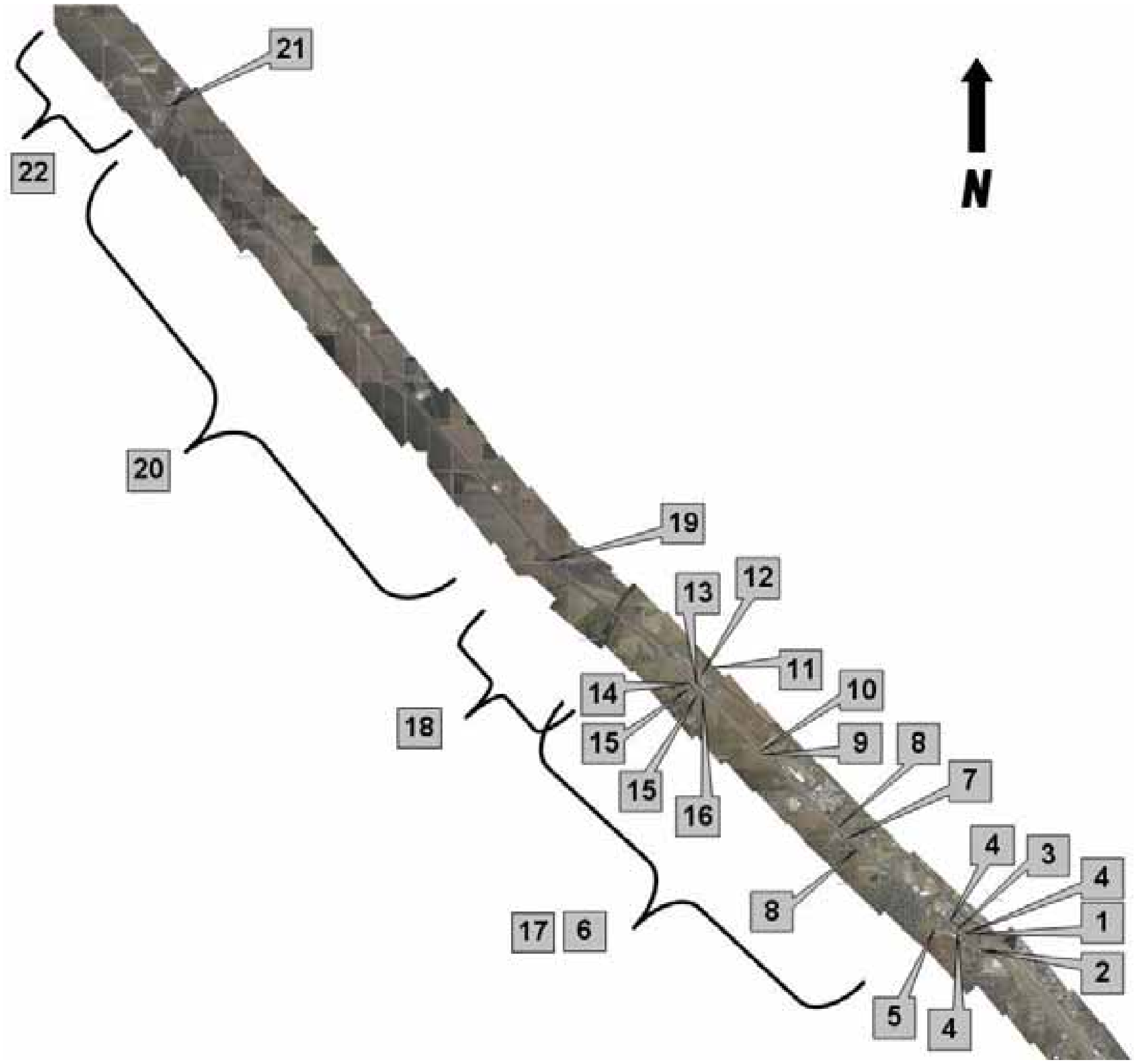


Figure 14 Fiscally Constrained Improvements Map

During the identification process of these improvements, several discrepancies in the sources used were noticed at specific locations on the corridor. These discrepancies corresponded to different geometric configurations of the Shaw Avenue interchange, the Ashlan Avenue interchange, the Veterans Boulevard interchange, the Herndon Avenue interchange, and the number of mainline lanes in the facility. These discrepancies were reviewed and discussed internally to provide support in the development of a logical and reasonable model that took under consideration the proposed improvements as listed in the sources previously mentioned.

6.2 Model Development

The calibrated base model and the fiscally constrained improvements served as a starting point to build and code a new model representative of the year 2030. The development of this model involved the addition of an extra lane to the mainline to convert this into a six lane facility along the entire corridor limits described on page 9. Modification of several interchanges took place with the exception of the Avenue 9 interchange for which no improvements were identified. A new interchange, Veterans Boulevard, was added to the model between the Shaw Avenue and the Herndon Avenue interchanges. OD matrices representative of the year 2030 were also developed. And cycle lengths for all the signalized intersections were derived as well as the addition of ramp metering for most on ramps.

During the model development, modifications of the Avenue 12 interchange impacted traffic analysis zones 2 and 4. As a result, zones 2 and 4 were relocated to serve the new Veterans Boulevard interchange as shown on Figures 15, 16, and 17.

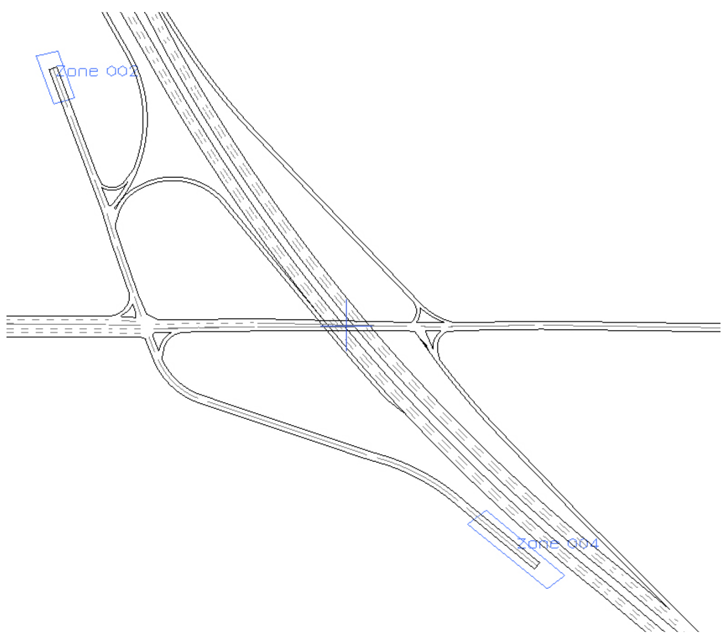


Figure 15 Base Model Avenue 12 Interchange with Zones 2 and 4

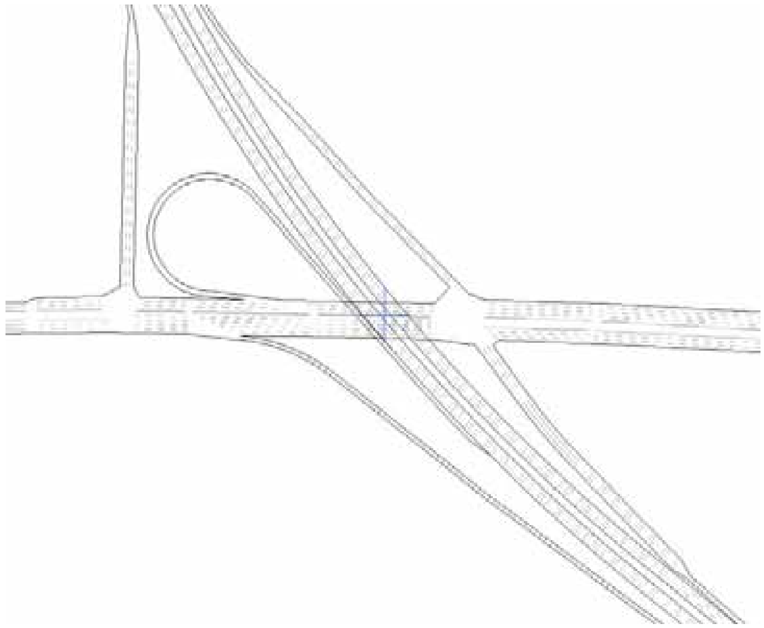


Figure 16 Year 2030 Avenue 12 Improvements without Zones 2 and 4

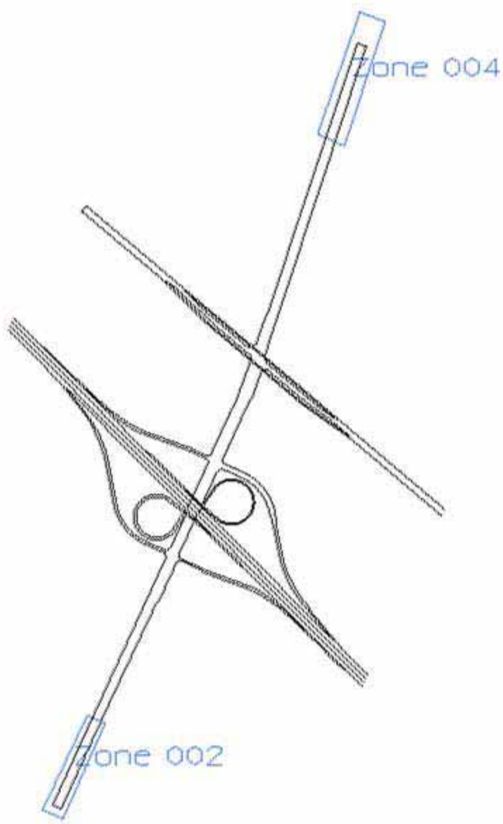


Figure 17 Veterans Boulevard with Zones 2 and 4

Origin Destination Matrix Development

The development of OD matrices representative of the year 2030 was a major challenge in this phase of the project. The approach taken to derive these OD matrices involved the forecasting of the mainline, ramp, and intersection volumes for the year 2030. Thus, the year 2007 and year 2030 Fresno and Madera County Planning models were used in conjunction with a year 2030 model corresponding to the Fresno-Madera Metropolitan Freeway/Interchange Deficiency Study and the California Department of Transportation Administrative 2008 Draft Project Study Report for Veterans Boulevard. From these resources, AM (7 to 8) and PM (5 to 6) peak hour volumes were generated. New peak hour OD matrices were derived from these forecasted volumes using the process described in sections 4.2 and 4.3 of this report and then disseminated into 15 minute matrices. Growth factors were also extracted from the base model and the year 2030 AM and PM peak hour matrices and applied to the shoulder hours 15 minute matrices. In this case, the shoulder hours correspond to 6 to 7 and 8 to 9 AM and 4 to 5 and 6 to 7 PM.

Some ambiguous dilemmas were encountered during the generation of the 2030 OD matrices. One of these was the incorporation of the new Veterans Boulevard into the model. Since this new interchange now required two zones in order to have traffic loaded to it, zones 2 and 4 were assigned to serve this interchange. Traffic from adjacent zones 13 and 14 was used as reference for zones 2 and 4 during the OD development process since this is a new interchange and no data, prior to its existence, was available. The other dilemma corresponds to the amount of commercial trucks loaded into the year 2030 model. For this model, the amount of commercial trucks was not grown and remained the same as in the base model. This was done to eliminate the possibility of applying growth factors that might not be realistic and because of lack of data available to determine future commercial truck volumes.

Model Testing

Due to the expected traffic growth for the year 2030, which will have a significant impact on the signalized intersections, new signals' cycle lengths were developed to accommodate such expected growth. To accomplish this, the Synchro software was used to develop new cycle lengths to be used in the model. Also, as part of the improvements, ramp metering was added to all the northbound and southbound on ramps at Ashlan Avenue, Shaw Avenue, Veterans Boulevard and Herndon Avenue interchanges. Only the southbound on ramp at Avenue 7 and the northbound on ramp at Avenue 12 interchanges in the Madera County were metered.

Having incorporated these new signals' cycle lengths and ramp metering, the model was tested as the simulation was observed continuously to identify erratic traffic behavior and unrealistic congestion. And with the new OD matrices in place, AM and PM profiles representative of the year 2030 were derived which can be seen and compared versus the base model profiles as shown on Figures 18 and 19.

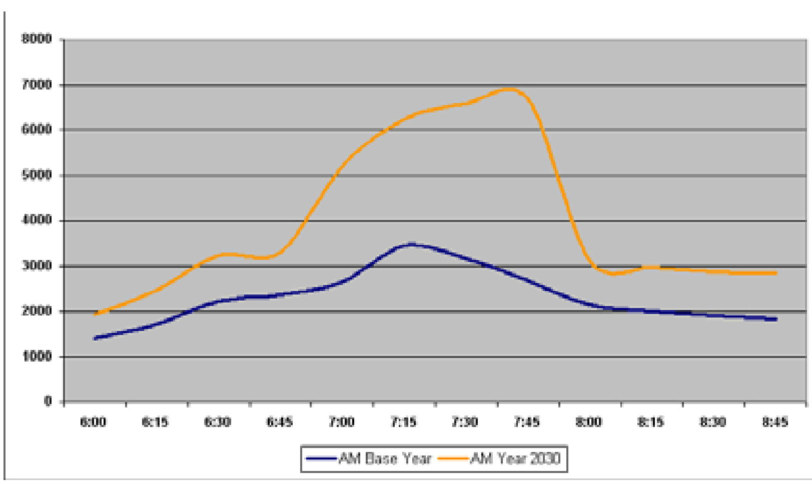


Figure 18 AM Base and Year 2030 Profiles

Figure 18 AM Base and Year 2030 Profiles

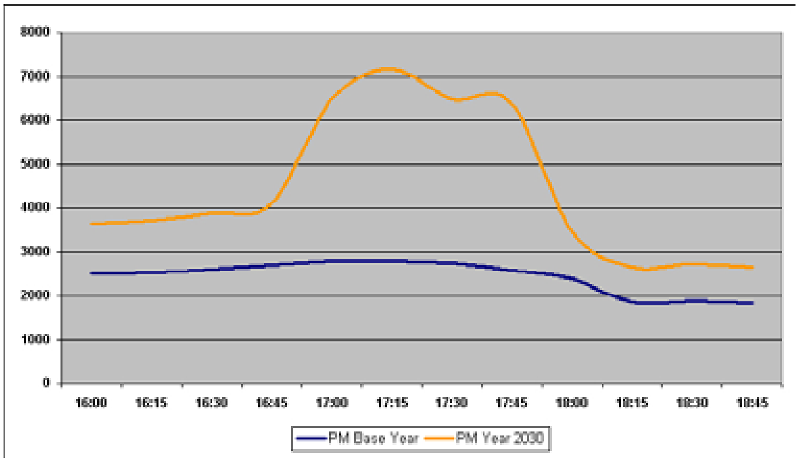


Figure 19 PM Base and Year 2030 Profiles

Locations where improvements took place were examined and adjustments were made accordingly in order to minimize some of the unrealistic congestion and traffic behavior noticed. As an example, lane choices were added at the new Veterans Boulevard interchange and at the new Avenue 12 interchange as seen on Figure 20.

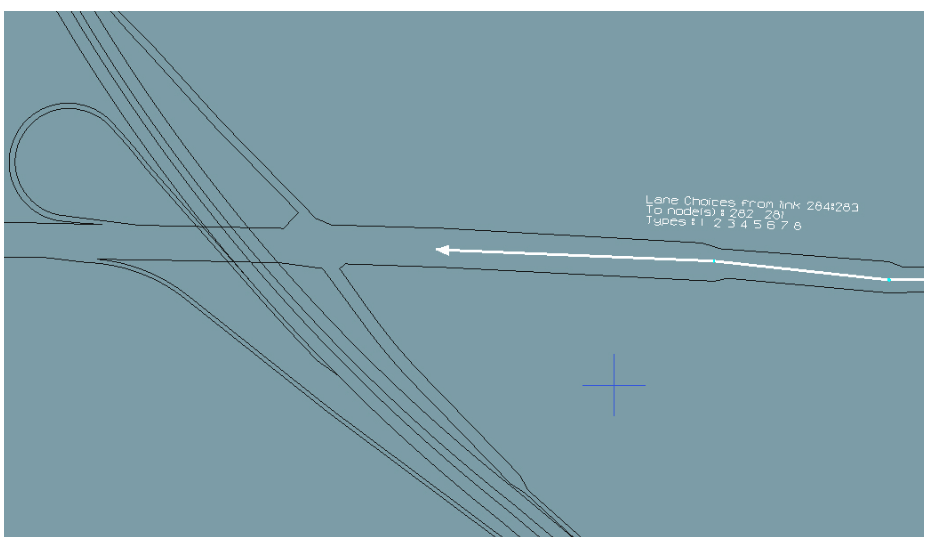


Figure 20 Avenue 12 with Lane Choices

Also, all the zones in the model were analyzed and observed for unreleased vehicles. Unreleased vehicles at the zones take place when the vehicular demand is higher than the capacity. Therefore, unreleased vehicles will not load into the model and will be accumulated, or stacked in the zone, waiting to be released until the demand levels drop. These unreleased vehicles were noticed and recorded during the AM and PM peak hours. Figure 21 shows zones 1, 4, 5, 16, 18, 19, 22, and 24 with the corresponding 15 minute time intervals of unreleased vehicles and their totals for the PM peak hour.

	ZONE							
TIME	1*	4*	5*	16*	18*	19*	22*	24*
17:00	0	0	3	1	0	150	239	702
17:15	94	0	5	15	54	252	268	361
17:30	13	243	61	16	54	15	235	429
17:45	107	259	224	3	8	51	159	236
	214	502	293	35	116	468	901	1728

Figure 21 Zones with PM Peak Hour Unreleased Vehicles

6.5 Peak Spreading Approach

The approach used to accommodate unreleased vehicles consisted of distributing these volumes of unreleased vehicles away from the peak hours into the shoulder hours. Zone 24, shown in Figure 22, servers as an example to illustrate the approach taken to apply peak spreading for this project.

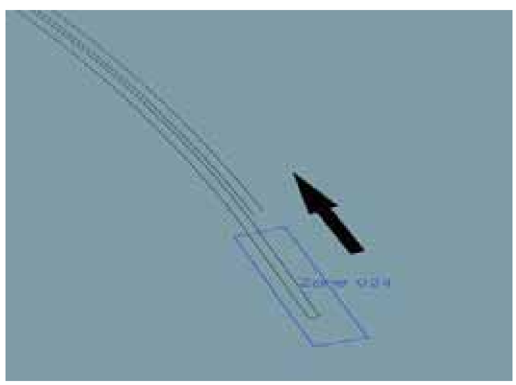


Figure 22 Zone 24

In Figure 22, the black arrow indicates the direction of traffic originating from zone 24 on to a three lane segment of freeway. A total of 8261 vehicles were forecasted to originate from this zone by the year 2030; however, if we base this on the capacity that a three lane freeway segment can handle, which is in the neighborhood of 2200 vehicles per hour per lane, this zone would only be able to accommodate 6600 vehicles per hour. In Figure 21, a total of 1728 unreleased vehicles from zone 24 were identified for the 5 to 6 PM peak hour. Thus, 8261 forecasted vehicles minus 1728 unreleased vehicles would yield a total of 6533 vehicles which is in the neighborhood of the 6600 vehicles per hour that a 3 lane freeway section can serve. After applying peak spreading to all the zones with unreleased vehicles in the AM and PM hours, a comparison was then made for the profile before and after peak spreading was applied as seen on Figures 23, 24, and 25.

	ZONE							
TIME	1*	4*	5*	16*	18*	19*	22*	24*
17:00	0	0	0	0	0	0	41	74
17:15	0	0	0	0	0	0	65	0
17:30	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	12	20
	0	0	0	0	0	0	118	94

Figure 23 Zones with Unreleased Vehicles After Peak Spreading

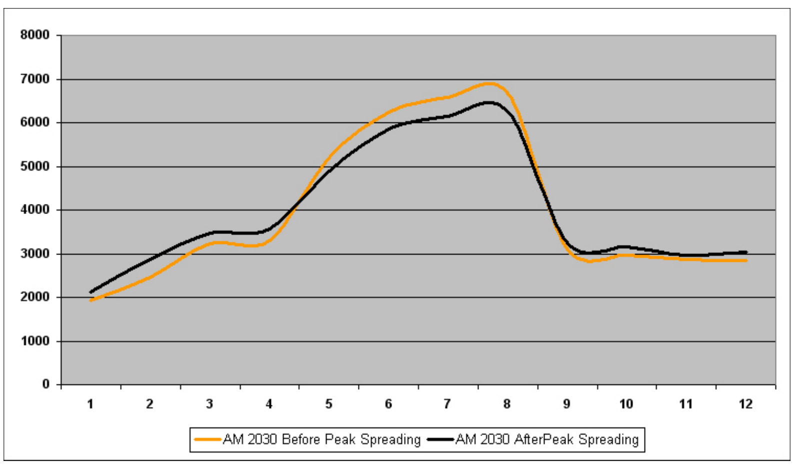


Figure 24 AM Year 2030 Profiles Before and After Peak Spreading

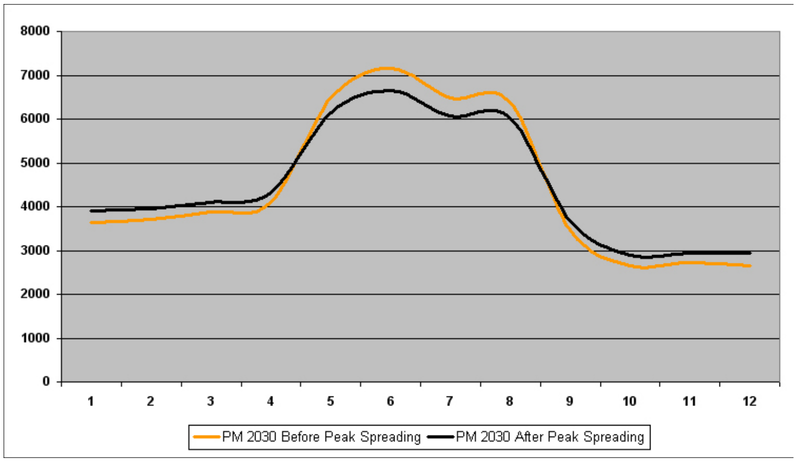


Figure 25 PM Year 2030 Profiles Before and After Peak Spreading

CHAPTER 7: PERFORMANCE MEASURES AND RESULTS

7.1 Production Runs

The last step in this phase of the project involved producing acceptable sound results of the year 2030 model randomly. This involved running the model with what is called a seed value of zero. In Paramics, the seed value is the starting point to a random release of traffic within the program. Thus, different seed values will produce different results and in this case, assigning a seed value of zero will yield different results from the original seed value used to calibrate the base model. When compared, these new results will not be identical but must be within a reasonable and acceptable tolerance to those produced by the original seed value.

To accomplish this process, production runs of the model were carried out for a total of 10 model runs for the AM and PM scenarios for both the base model and the year 2030 model. Results, such as Average Vehicle Speed, Vehicle Miles Traveled (VMT), and Vehicle Hours Traveled (VHT) were extracted from each model run which served as measures of effectiveness and also as part of the performance measures or indicators that the model is running reasonably. These results can be seen in Tables 24 through 27.

Base Model AM Run	Total Number of Vehicles	Total Mean Vehicle Speed (mph)	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)
1	40046	43.9	248254	5663
2	40399	43.5	252488	5814
3	40302	44.6	249453	5594
4	40169	43.5	250762	5774
5	40521	43.0	252459	5872
6	40263	43.4	250440	5770
7	40716	42.7	253329	5939
8	40248	42.3	251401	5945
9	40115	43.1	253264	5878
10	40406	43.3	252059	5819
Average	**40319**	**43.3**	**251391**	**5807**
Stnd Deviation	**199.9**	**0.6**	**1664.9**	**112.8**

Table 24 AM Base Model Results

Base Model PM Run	Total Number of Vehicles	Total Mean Vehicle Speed (mph)	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)
1	47445	41.4	268760	6502
2	47777	39.9	275720	6912
3	47883	41.5	273600	6599
4	47655	40.5	272384	6729
5	47828	39.6	273361	6906
6	47808	40.1	275140	6865
7	48031	41.1	272254	6623
8	47883	39.9	273671	6859
9	47916	40.7	276266	6784
10	47758	40.6	271775	6698
Average	**47798**	**40.5**	**273293**	**6748**
Stnd Deviation	**160.1**	**0.7**	**2189.3**	**141.4**

Table 25 PM Base Model Results

2030 AM Run	Total Number of Vehicles	Total Mean Vehicle Speed (mph)	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)
1	64756	44.8	393666	8796
2	64513	44.2	394159	8922
3	64304	44.4	391094	8814
4	64881	44.9	392792	8756
5	64248	44.9	392763	8751
6	64921	44.7	398440	8921
7	64336	43.9	391500	8933
8	64314	45.4	391994	8631
9	64592	45.5	396899	8721
10	64521	44.9	390503	8700
Average	**64539**	**44.8**	**393381**	**8795**
Stnd Deviation	**246.2**	**0.5**	**2546.5**	**103.3**

Table 26 AM Year 2030 Model Results

2030 PM Run	Total Number of Vehicles	Total Mean Vehicle Speed (mph)	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)
1	75227	42.9	436662	10188
2	75114	41.8	433751	10382
3	75196	42.1	432210	10283
4	75115	43.1	433136	10055
5	75350	42.5	437220	10284
6	75695	42.5	438346	10319
7	75308	41.9	432078	10318
8	75118	42.6	433515	10189
9	75344	43.0	436356	10164
10	75447	41.1	436543	10623
Average	**75291**	**42.4**	**434982**	**10281**
Stnd Deviation	**182.4**	**0.6**	**2277.1**	**153.5**

Table 27 PM Year 2030 Model Results

Other results obtained are shown on Tables 28 and 29 which correspond to average speeds and average journey times to traverse the corridor from the Ashlan Avenue interchange to the Avenue 12 interchange for the base year model and the year 2030 model.

OBSERVED	2007 NB AM			2007 SB AM		
	6-7	7-8	8-9	6-7	7-8	8-9
JOURNEY TIME (s)	707	645	630	678	728	715
SPEED (mph)	64	62	64	67	62	63
MODELED	2030 NB AM			2030 SB AM		
	6-7	7-8	8-9	6-7	7-8	8-9
JOURNEY TIME (s)	742	766	768	836	990	991
SPEED (mph)	63	60	60	56	47	49
DIFFERENCE	NB AM			SB AM		
	6-7	7-8	8-9	6-7	7-8	8-9
JOURNEY TIME (s)	35	121	138	158	262	276
SPEED (mph)	-1	-2	-4	-11	-15	-14

Table 28 AM Average Journey Times and Speeds

OBSERVED	2007 NB PM			2007 SB PM		
	6-7	7-8	8-9	6-7	7-8	8-9
JOURNEY TIME (s)	615	617	N/A	657	681	N/A
SPEED (mph)	67	65	N/A	67	66	N/A
MODELED	2030 NB PM			2030 SB PM		
	6-7	7-8	8-9	6-7	7-8	8-9
JOURNEY TIME (s)	789	858	825	887	937	950
SPEED (mph)	59	54	56	52	50	50
DIFFERENCE	NB PM			SB PM		
	6-7	7-8	8-9	6-7	7-8	8-9
JOURNEY TIME (s)	174	241	N/A	229	256	N/A
SPEED (mph)	-8	-12	N/A	-14	-16	N/A

Table 29 PM Average Journey Times and Speeds

Also, average delay to traverse the facility by the year 2030 as modeled by the program is shown on Tables 30 and 31.

MODELED	2030 NB AM			2030 SB AM		
	6-7	7-8	8-9	6-7	7-8	8-9
DELAY (s)	89	113	116	183	337	338

Table 30 Year 2030 AM Average Delay

MODELED	2030 NB PM			2030 SB PM		
	6-7	7-8	8-9	6-7	7-8	8-9
DELAY (s)	136	205	173	234	284	297

Table 31 Year 2030 PM Average Delay

And, speed contour maps for the year 2030 model were developed and are shown on Figures 26 through 29. The red areas in these maps represent lower vehicular speeds projected by the model.

	SR99FrePM24.55NB to SR99FrePM25.55NB	SR99FrePM25.55NB to SR99AshlanNB	SR99AshlanNB to SR99ShawNB	SR99ShawNB to SR99VeteransNB	SR99VeteransNB to SR99HerndonNB	SR99HerndonNB to SR99MadPM0.0NB	SR99MadPM0.0NB to SR99Ave7NB	SR99Ave7NB to SR99Ave8NB	SR99Ave8NB to SR99Ave9NB	SR99Ave9NB to SR99Ave11NB	SR99Ave11NB to SR99Ave12NB	SR99Ave12NB to SR99Ave13NB	SR99Ave13NB to SR99GatewayNB
6:05	62	56	60	63	71	66	61	60	59	61	64	62	60
6:10	62	60	64	58	66	66	65	67	63	55	53	59	60
6:15	61	59	63	62	65	60	60	64	63	68	64	63	61
6:20	62	56	60	69	71	63	61	61	58	61	61	68	63
6:25	63	58	63	60	70	67	70	68	64	60	56	58	53
6:30	59	58	62	63	68	65	59	62	66	71	66	68	60
6:35	64	60	62	64	71	67	67	63	63	62	64	68	70
6:40	63	59	65	67	72	65	63	65	64	65	61	64	58
6:45	62	58	66	65	73	69	67	66	61	62	64	68	65
6:50	61	57	63	64	70	64	63	62	61	66	59	65	66
6:55	60	57	62	62	68	65	65	64	59	61	60	64	62
7:00	58	59	58	61	71	68	63	63	59	60	58	65	62
7:05	61	55	60	61	71	66	65	68	68	63	60	60	61
7:10	59	56	58	57	68	64	60	66	65	66	63	67	58
7:15	55	56	62	62	67	62	58	60	57	60	60	64	64
7:20	52	55	58	62	69	64	65	62	55	55	55	60	56
7:25	48	51	58	50	75	66	60	62	56	58	55	59	53
7:30	52	54	58	47	62	57	58	63	62	59	55	62	58
7:35	58	53	60	58	65	57	48	57	51	57	58	61	53
7:40	51	52	61	58	62	59	55	57	52	54	52	56	54
7:45	54	56	58	57	67	60	56	59	54	55	52	56	45
7:50	56	53	55	60	69	68	59	59	53	56	54	60	50
7:55	57	53	59	41	64	56	58	61	59	55	53	58	47
8:00	59	55	58	51	67	61	56	55	52	57	54	60	46
8:05	62	58	61	57	69	62	55	60	56	53	51	59	56
8:10	56	56	63	63	70	64	60	61	54	56	51	58	46
8:15	55	56	58	57	63	63	66	61	57	56	54	59	48
8:20	59	58	60	60	71	61	54	58	55	59	57	66	56
8:25	54	55	63	65	68	62	62	66	62	59	56	59	63
8:30	61	57	55	57	63	62	59	63	64	67	64	68	58
8:35	59	55	63	59	62	55	53	55	54	56	57	65	64
8:40	62	58	59	62	71	66	59	60	54	54	54	59	61
8:45	62	58	63	64	64	61	61	63	63	60	56	58	53
8:50	60	58	64	63	68	61	60	60	55	63	62	63	53
8:55	60	56	58	62	70	67	63	63	58	53	51	56	56
9:00	57	53	60	62	71	62	56	58	61	61	55	58	53

Figure 26 Year 2030 AM NB Speed Contour Map

	SR99GatewaySB to SR99Ave13SB	SR99Ave13SB to SR99Ave12SB	SR99Ave12SB to SR99Ave11SB	SR99Ave11SB to SR99Ave9SB	SR99Ave9SB to SR99Ave8SB	SR99Ave8SB to SR99Ave7SB	SR99Ave7SB to SR99MadPM0.0SB	SR99MadPM0.0SB to SR99HerndonSB	SR99HerndonSB to SR99VeteransSB	SR99VeteransSB to SR99ShawSB	SR99ShawSB to SR99AshlanSB	SR99AshlanSB to SR99FrePM25.55SB	SR99FrePM25.55SB to SR99FrePM24.55SB
6:05	66	61	66	53	65	59	68	63	71	69	67	69	64
6:10	70	63	61	56	51	50	66	65	74	74	72	70	66
6:15	65	61	63	50	59	54	58	53	60	62	69	71	70
6:20	68	64	66	60	57	46	62	61	69	60	55	65	61
6:25	64	60	60	51	54	55	68	56	63	57	64	64	64
6:30	66	60	58	48	56	49	60	56	64	65	59	57	57
6:35	66	62	60	49	59	48	61	57	74	59	52	67	63
6:40	64	60	58	47	55	49	60	57	66	62	66	65	62
6:45	65	59	53	48	63	54	63	52	63	64	59	60	58
6:50	67	63	61	42	52	47	59	59	68	59	55	64	63
6:55	65	60	59	48	59	46	60	52	64	61	67	62	61
7:00	67	61	59	42	52	48	71	61	63	47	53	60	59
7:05	63	56	63	51	54	49	61	57	67	65	52	54	54
7:10	64	59	55	50	57	48	65	58	65	57	56	67	62
7:15	63	57	57	52	59	51	59	54	63	63	62	62	61
7:20	63	60	63	41	51	57	67	56	64	57	43	63	60
7:25	60	51	61	48	54	45	52	52	68	62	45	60	55
7:30	54	47	56	51	54	46	39	52	63	49	56	60	58
7:35	60	42	62	45	56	47	39	50	65	33	41	62	61
7:40	64	56	62	45	56	46	52	48	39	26	41	66	62
7:45	64	57	61	37	60	41	31	45	32	29	41	64	60
7:50	64	59	57	45	59	34	40	55	33	31	39	63	60
7:55	61	57	56	40	59	43	31	43	25	21	33	63	62
8:00	64	60	59	39	56	47	37	44	19	21	37	63	55
8:05	66	58	59	44	55	46	40	41	19	25	43	62	61
8:10	63	59	63	45	53	43	52	40	24	28	42	63	60
8:15	65	59	60	49	56	48	57	48	21	26	38	62	62
8:20	64	61	62	54	58	47	61	56	41	27	34	63	59
8:25	64	59	57	49	54	54	62	59	64	31	34	61	58
8:30	66	60	63	50	58	48	62	58	69	64	45	59	57
8:35	67	63	59	49	48	46	58	61	68	63	65	69	60
8:40	65	61	60	56	53	45	59	50	62	72	63	65	62
8:45	65	59	56	51	55	52	60	55	66	56	61	69	66
8:50	67	61	56	42	47	47	61	59	69	62	54	62	62
8:55	67	62	64	55	52	41	57	51	69	71	68	67	63
9:00	67	61	63	60	60	54	62	57	61	53	67	65	65

Figure 27 Year 2030 AM SB Speed Contour Map

	SR99FrePM24.55NB to SR99FrePM25.55NB	SR99FrePM25.55NB to SR99AshlanNB	SR99AshlanNB to SR99ShawNB	SR99ShawNB to SR99VeteransNB	SR99VeteransNB to SR99HerndonNB	SR99HerndonNB to SR99MadPM0.0NB	SR99MadPM0.0NB to SR99Ave7NB	SR99Ave7NB to SR99Ave8NB	SR99Ave8NB to SR99Ave9NB	SR99Ave9NB to SR99Ave11NB	SR99Ave11NB to SR99Ave12NB	SR99Ave12NB to SR99Ave13NB	SR99Ave13NB to SR99GatewayNB
16:05	55	53	59	65	61	56	56	62	62	59	56	60	48
16:10	59	55	58	59	69	64	59	58	52	58	56	59	50
16:15	54	54	59	62	66	64	58	67	63	59	52	56	54
16:20	55	53	58	59	64	61	61	59	56	59	60	65	53
16:25	58	54	61	62	67	61	54	59	54	60	56	60	51
16:30	57	57	61	59	68	66	62	62	57	54	55	58	59
16:35	58	54	60	60	67	61	55	58	56	60	54	56	49
16:40	61	60	63	61	65	60	58	59	54	57	53	59	48
16:45	59	59	60	63	69	64	61	59	56	57	54	58	52
16:50	56	54	58	60	65	61	61	60	57	60	55	61	55
16:55	51	58	60	60	63	57	56	60	54	56	56	62	53
17:00	51	52	58	60	69	69	61	61	56	56	53	56	54
17:05	48	55	59	53	61	55	50	60	62	58	53	59	60
17:10	47	57	60	52	64	59	51	57	51	53	58	59	54
17:15	45	57	70	72	76	62	51	65	56	52	51	61	54
17:20	38	56	66	72	79	70	68	66	64	62	53	59	52
17:25	41	57	56	57	70	70	68	68	64	67	67	65	43
17:30	32	52	57	57	65	53	51	62	61	65	66	71	67
17:35	42	54	53	50	60	58	52	65	58	60	57	64	67
17:40	44	56	56	44	47	48	46	56	52	60	53	56	47
17:45	34	53	59	41	51	50	43	57	50	52	50	62	53
17:50	39	55	54	53	56	41	53	64	55	53	49	53	43
17:55	36	53	56	52	53	46	42	57	56	58	52	47	38
18:00	35	54	55	52	51	47	46	55	49	54	53	43	46
18:05	34	55	52	51	54	50	41	57	50	51	47	54	50
18:10	34	55	58	48	60	48	44	59	53	53	50	55	44
18:15	33	54	55	62	56	47	40	56	53	56	52	57	42
18:20	34	51	60	46	65	54	52	63	53	53	52	53	47
18:25	31	55	54	51	62	58	49	59	55	53	49	54	40
18:30	54	54	55	54	68	60	51	57	54	56	54	58	41
18:35	57	55	57	58	58	54	49	60	54	54	52	58	50
18:40	60	56	59	61	71	63	62	57	51	54	49	57	47
18:45	63	61	61	62	70	67	61	66	61	58	53	56	46
18:50	59	54	60	65	74	64	60	61	59	65	59	59	56
18:55	60	55	57	60	65	65	67	64	64	59	58	65	60
19:00	64	61	62	63	64	60	59	60	59	63	62	65	59

Figure 28 Year 2030 PM NB Speed Contour Maps

	SR99GatewaySB to SR99Ave13SB	SR99Ave13SB to SR99Ave12SB	SR99Ave12SB to SR99Ave11SB	SR99Ave11SB to SR99Ave9SB	SR99Ave9SB to SR99Ave8SB	SR99Ave8SB to SR99Ave7SB	SR99Ave7SB to SR99MadPM0.0SB	SR99MadPM0.0SB to SR99HerndonSB	SR99HerndonSB to SR99VeteransSB	SR99VeteransSB to SR99ShawSB	SR99ShawSB to SR99AshlanSB	SR99AshlanSB to SR99FrePM25.55SB	SR99FrePM25.55SB to SR99FrePM24.55SB
16:05	66	62	57	58	54	53	62	57	60	56	65	63	63
16:10	64	60	58	44	56	56	60	57	60	64	57	63	62
16:15	64	58	58	48	55	48	62	59	71	61	59	60	60
16:20	66	59	58	47	45	47	66	56	59	61	69	64	59
16:25	67	62	63	55	55	45	58	50	60	59	58	61	63
16:30	61	56	58	49	54	51	62	56	60	46	57	63	61
16:35	66	61	55	46	54	52	58	57	61	66	49	60	55
16:40	65	61	63	44	52	50	56	54	68	60	60	63	60
16:45	64	62	60	58	54	45	59	55	64	54	63	62	62
16:50	64	60	58	54	56	55	62	54	52	60	64	61	59
16:55	64	59	58	50	55	53	61	59	64	56	50	63	62
17:00	60	57	57	44	55	50	61	58	62	64	58	62	59
17:05	61	57	59	49	54	46	61	56	66	61	63	64	65
17:10	56	36	61	51	52	50	59	57	66	70	64	66	62
17:15	40	28	63	57	58	49	43	50	69	61	61	64	63
17:20	29	28	59	46	62	52	45	50	66	64	60	62	59
17:25	23	30	63	46	53	49	61	54	68	56	52	65	62
17:30	24	29	65	44	55	48	59	49	64	59	53	64	60
17:35	20	29	64	49	55	46	57	49	62	56	51	62	62
17:40	21	33	60	50	54	49	58	50	61	45	51	58	54
17:45	26	32	61	45	53	47	57	51	59	47	31	64	57
17:50	27	31	66	43	55	44	58	53	68	34	32	60	58
17:55	50	31	64	51	56	49	54	51	54	41	36	66	59
18:00	67	49	58	54	60	48	32	48	67	35	26	64	60
18:05	65	59	60	46	59	58	37	44	65	18	22	66	63
18:10	66	61	60	53	56	49	59	52	34	16	22	67	63
18:15	65	59	59	48	51	52	58	54	50	17	25	65	59
18:20	69	65	63	54	58	46	61	54	70	20	33	62	60
18:25	69	62	59	55	59	53	61	61	62	56	44	62	58
18:30	68	63	63	48	57	57	62	58	64	68	57	63	61
18:35	67	62	62	58	53	43	61	59	69	59	62	65	65
18:40	69	67	65	58	58	56	60	55	66	67	67	67	62
18:45	69	63	60	60	61	59	64	64	69	65	63	66	63
18:50	64	63	66	59	56	52	63	60	66	60	67	66	63
18:55	69	63	64	53	58	60	61	60	69	68	66	64	63
19:00	71	64	60	59	57	51	58	58	70	72	69	68	64

Figure 29 Year 2030 PM SB Speed Contour Maps

CHAPTER 8: CONCLUSIONS

8.1 Phase 1: Base Model Development, Calibration and Validation

Phase 1 of this project served as a starting point to analyze, via microsimulation, the existing traffic conditions of the SR 99 corridor within its project limits. In doing so, a great collective effort was made with the assistance of District 6 staff to obtain all the essential data pertinent to the development of a base model using the Paramics software. Data that lacked accuracy and completeness was balanced to attempt to reach equilibrium during the calibration stage of the project in order to achieve reasonable and sound results. Examples of this were encountered during the deployment of radar detection systems, reconnecting existing detection loops, and during collection of vehicle classification data. As a result of uncertain data generated by these detection systems, balancing of this count data became necessary while at the same time earlier data records, or historical data, were used to establish a balanced and sound count data set.

Successful results were achieved for each individual hour that was calibrated. However, this was not the case after several attempts were made to calibrate the model at each 15 minute time interval. Convergence of link counts to meet guidelines criteria was not quite reachable. This was due in part to the limited number of link counts present in the model. Instead, both link counts and turn counts were combined to accomplish getting reasonable results in the neighborhood of those required by the guidelines. This was done in order to reduce the time spent on this portion of the project and because of time constraints associated to delivery this project.

Our initial objective of developing, calibrating, and analyzing a model representative of the corridor's existing conditions was accomplished. The calibrated model served as a good starting point for future modeling testing of a wide variety of improvements.

8.2 Phase 2: Year 2030 Model

In developing a year 2030 model, several obstacles were encountered during this phase of the project. At first, a list of future improvements had been created, but then required a very detailed revision since several of the corridor improvements originally listed were not fiscally constrained. This included capacity improvements for a significant portion of the corridor along with modifications to several interchanges. As a result, only fiscally constrained improvements were included. During the investigation of these fiscally constrained improvements, many discrepancies were found on several of the sources used listed on page 37 of this report; however, these discrepancies were internally discussed and a consensus was reached to select only the improvements that met the fiscally constrained condition.

The lack of planning models that incorporates both Fresno and Madera counties also presented a challenge and developing such model was not pursued due to time constraints associated in conducting such task. Having these models available would have been preferable during the development of OD matrices for both the base and year 2030 models. Instead, the Paramics Estimator was used to solve this dilemma. And because of the lack of these models, growth factors were extracted from the peak hours OD matrices for both the base and year 2030 models and then applied and adjusted accordingly to the shoulder hours of the year 2030 model. These growth factor adjustments were necessary since during the testing year 2030 OD matrices, many zones generated significant quantities of unreleased vehicles during the peak hours. And as a result, peak spreading was applied to these zones which required to have their growth factors adjusted corresponding to the shoulder hours in order to reduce the amount of unrealistic congestion present before and after peak spreading.

Results for this phase of the project showed that AM and PM congestion was present in the future model at several locations of the corridor despite the addition of capacity improvements and the addition of ramp metering. This congestion resulted in lower speeds in the neighborhood of these congested locations, increase travel time and also an increase in delay to traverse the corridor.

APPENDIX A: TACHNOGRAPH RUNS

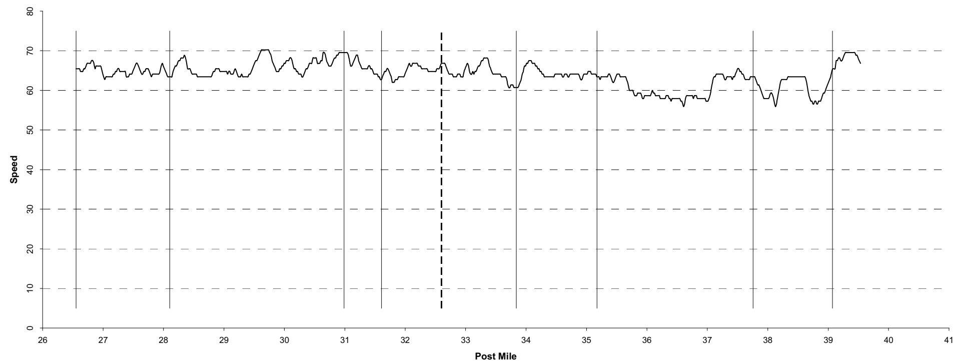
A.1 AM NB Run

TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: KEN LY | Car: A | **Code: FRE99NB** | Date: 9/18/2007 - Tues | Set: 01 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	6:21:14 AM	
SHAW AVE OC	28.102	6:22:39 AM	64.93
HERNDON AVE OC	30.988	6:25:17 AM	65.98
FRE COUNTY END	31.609	6:25:51 AM	66.10
AVE 7 OC	**32.598**	**6:26:46 AM**	**64.86**
AVE 8 OC	33.839	6:27:55 AM	64.46
AVE 9 OC	35.173	6:29:10 AM	64.25
AVE 11 OC	37.757	6:31:43 AM	60.65
AVE 12 OC	39.073	6:33:01 AM	60.46

PM TIME FLAG

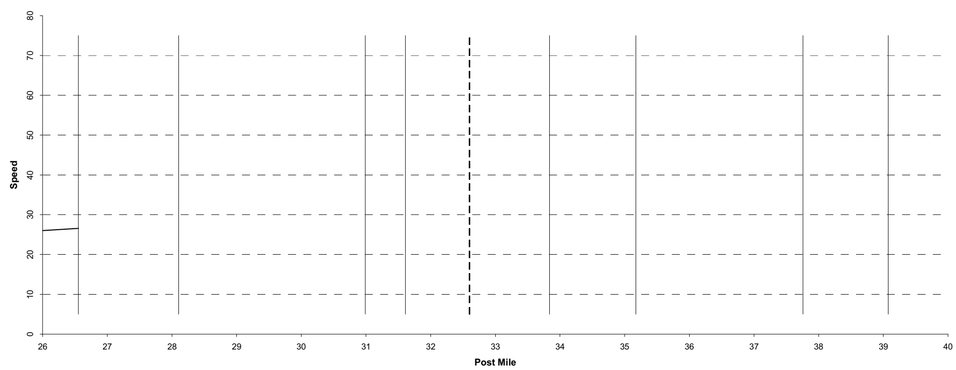


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: Bill Bigbee | Car: B | **Code: FRE99NB** | Date: 9/18/2007 - Tues | Set: 01 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	6:51:31 AM	
SHAW AVE OC	28.102		
HERNDON AVE OC	30.988		
FRE COUNTY END	31.609		
AVE 7 OC	**32.598**		
AVE 8 OC	33.839		
AVE 9 OC	35.173		
AVE 11 OC	37.757		
AVE 12 OC	39.073		

PM TIME FLAG

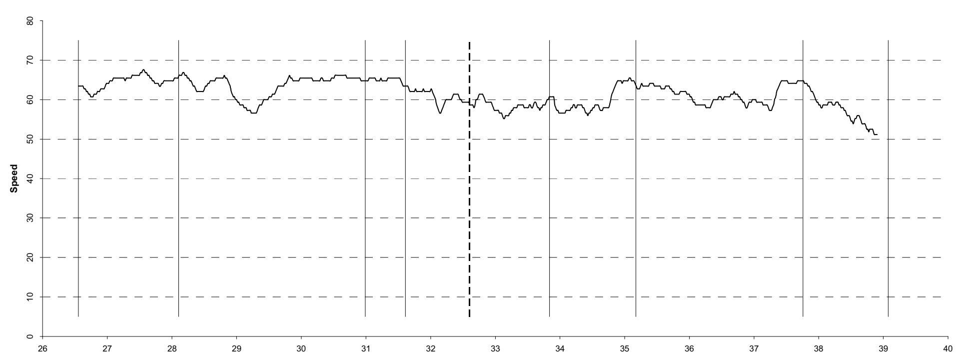


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: Bill Bigbee | Car: B | **Code: FRE99NB** | Date: 9/18/2007 - Tues | Set: 02 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	7:00:11 AM	
SHAW AVE OC	28.102	7:01:37 AM	64.40
HERNDON AVE OC	30.988	7:04:21 AM	63.34
FRE COUNTY END	31.609	7:04:55 AM	65.03
AVE 7 OC	**32.598**	**7:05:54 AM**	**60.74**
AVE 8 OC	33.839	7:07:11 AM	58.34
AVE 9 OC	35.173	7:08:31 AM	59.57
AVE 11 OC	37.757	7:11:03 AM	61.24
AVE 12 OC	39.073		

PM TIME FLAG

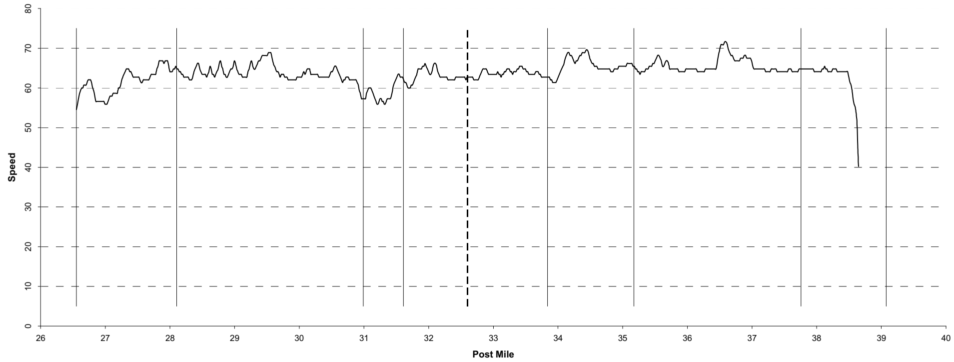


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: KEN LY | Car: A | **Code: FRE99NB** | Date: 9/18/2007 - Tues | Set: 02 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	7:12:10 AM	
SHAW AVE OC	28.102	7:13:40 AM	61.33
HERNDON AVE OC	30.988	7:16:23 AM	63.76
FRE COUNTY END	31.609	7:17:01 AM	58.74
AVE 7 OC	**32.598**	**7:17:58 AM**	**63.00**
AVE 8 OC	33.839	7:19:08 AM	63.65
AVE 9 OC	35.173	7:20:21 AM	65.58
AVE 11 OC	37.757	7:22:43 AM	65.52
AVE 12 OC	39.073		

PM TIME FLAG

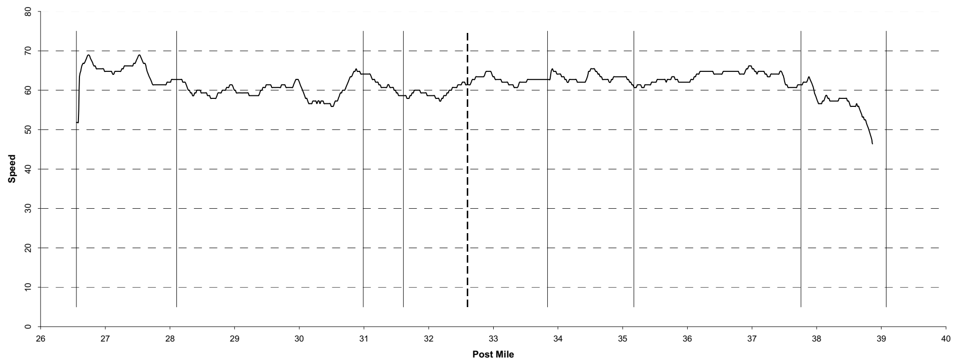


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: Bill Bigbee | Car: B | **Code: FRE99NB** | Date: 9/18/2007 - Tues | Set: 03 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	7:32:09 AM	
SHAW AVE OC	28.102	7:33:35 AM	64.36
HERNDON AVE OC	30.988	7:36:29 AM	59.83
FRE COUNTY END	31.609	7:37:05 AM	61.29
AVE 7 OC	**32.598**	**7:38:05 AM**	**59.42**
AVE 8 OC	33.839	7:39:16 AM	62.58
AVE 9 OC	35.173	7:40:32 AM	63.23
AVE 11 OC	37.757	7:42:59 AM	63.26
AVE 12 OC	39.073		

PM TIME FLAG

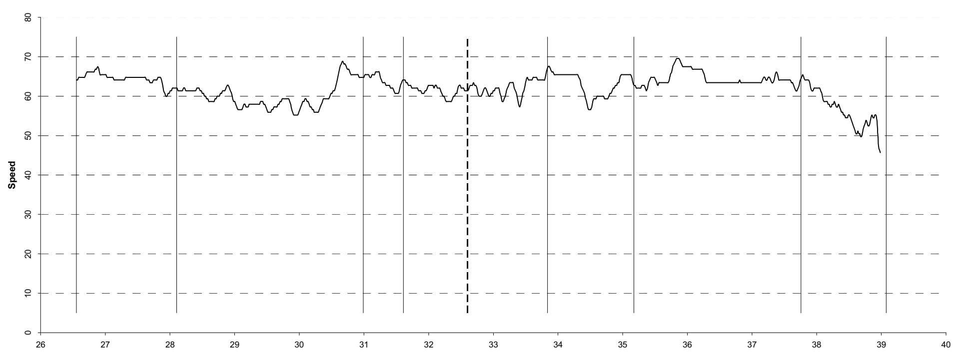


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: KEN LY | Car: A | **Code: FRE99NB** | Date: 9/18/2007 - Tues | Set: 03 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	7:48:43 AM	
SHAW AVE OC	28.102	7:50:09 AM	64.32
HERNDON AVE OC	30.988	7:53:03 AM	59.79
FRE COUNTY END	31.609	7:53:38 AM	63.68
AVE 7 OC	**32.598**	**7:54:36 AM**	**61.47**
AVE 8 OC	33.839	7:55:48 AM	62.04
AVE 9 OC	35.173	7:57:04 AM	62.92
AVE 11 OC	37.757	7:59:29 AM	64.27
AVE 12 OC	39.073		

PM TIME FLAG

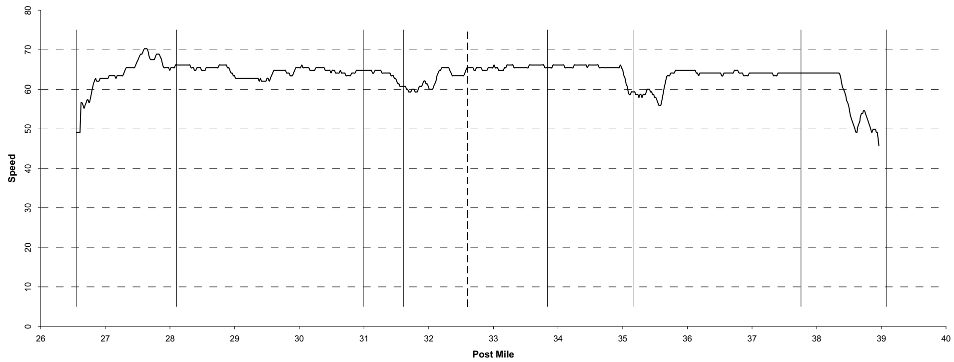


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: Bill Bigbee | Car: B | **Code: FRE99NB** | Date: 9/18/2007 - Tues | Set: 04 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	7:58:55 AM	
SHAW AVE OC	28.102	8:00:22 AM	63.30
HERNDON AVE OC	30.988	8:03:03 AM	64.49
FRE COUNTY END	31.609	8:03:39 AM	63.64
AVE 7 OC	**32.598**	**8:04:36 AM**	**62.25**
AVE 8 OC	33.839	8:05:44 AM	65.53
AVE 9 OC	35.173	8:06:58 AM	65.03
AVE 11 OC	37.757	8:09:25 AM	62.97
AVE 12 OC	39.073		

PM TIME FLAG

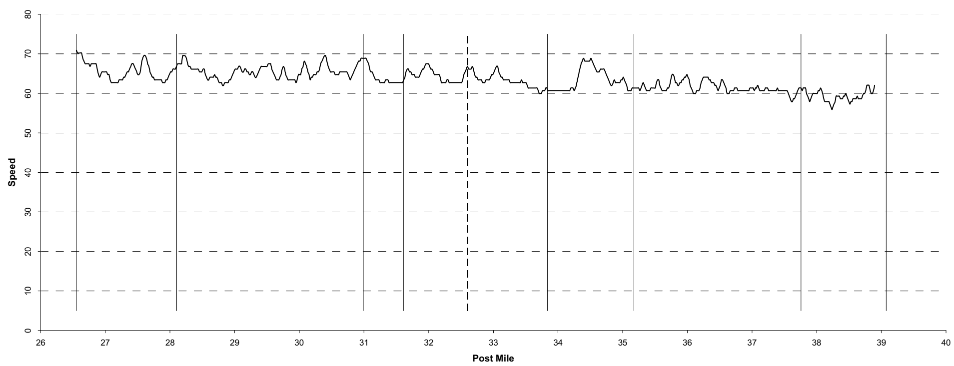


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: KEN LY | Car: A | **Code: FRE99NB** | Date: 9/18/2007 - Tues | Set: 04 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	8:21:49 AM	
SHAW AVE OC	28.102	8:23:14 AM	65.61
HERNDON AVE OC	30.988	8:25:52 AM	65.47
FRE COUNTY END	31.609	8:26:27 AM	64.03
AVE 7 OC	**32.598**	**8:27:22 AM**	**64.44**
AVE 8 OC	33.839	8:28:33 AM	63.18
AVE 9 OC	35.173	8:29:49 AM	63.28
AVE 11 OC	37.757	8:32:20 AM	61.45
AVE 12 OC	39.073		

PM TIME FLAG



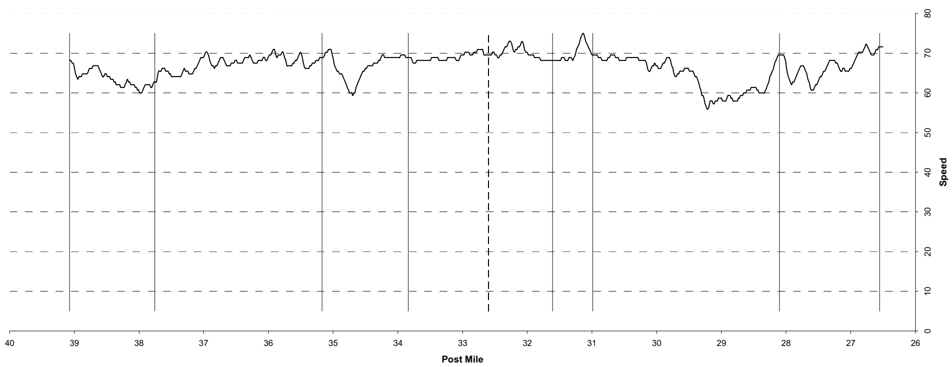
A.2 AM SB Run

TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: KEN LY | Car: A | **Code: FRE99SB** | Date: 9/18/2007 - Tues | Set: 01 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	6:40:16 AM	
AVE 11 OC	37.757	6:41:30 AM	63.54
AVE 9	35.173	6:43:48 AM	67.31
AVE 8 OC	33.839	6:45:00 AM	66.54
AVE 7 OC	**32.598**	**6:46:05 AM**	**68.97**
FRE COUNTY END	31.609	6:46:56 AM	69.97
HERNDON AVE OC	30.988	6:47:28 AM	70.04
SHAW AVE OC	28.102	6:50:10 AM	64.00
ASHLAN AVE OC	26.554	6:51:34 AM	66.57

PM TIME FLAG

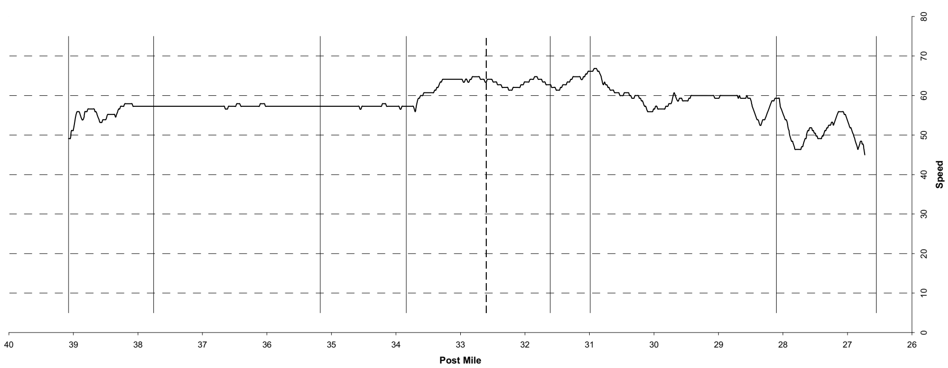


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: Bill Bigbee | Car: B | **Code: FRE99SB** | Date: 9/18/2007 - Tues | Set: 01 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	7:17:34 AM	
AVE 11 OC	37.757	7:18:58 AM	55.64
AVE 9	35.173	7:21:41 AM	57.30
AVE 8 OC	33.839	7:23:05 AM	57.27
AVE 7 OC	**32.598**	**7:24:17 AM**	**62.10**
FRE COUNTY END	31.609	7:25:13 AM	63.04
HERNDON AVE OC	30.988	7:25:48 AM	63.55
SHAW AVE OC	28.102	7:28:44 AM	59.22
ASHLAN AVE OC	26.554	7:30:21 AM	51.02

PM TIME FLAG

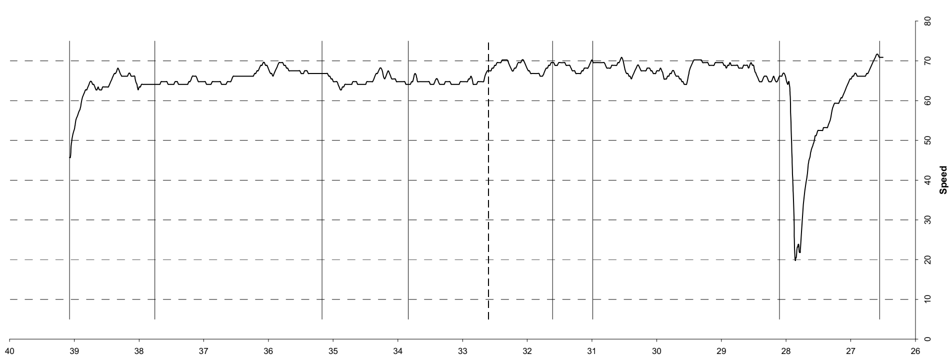


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: KEN LY | Car: A | **Code: FRE99SB** | Date: 9/18/2007 - Tues | Set: 02 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	7:28:53 AM	
AVE 11 OC	37.757	7:30:08 AM	62.55
AVE 9	35.173	7:32:29 AM	66.01
AVE 8 OC	33.839	7:33:43 AM	65.12
AVE 7 OC	**32.598**	**7:34:52 AM**	**64.81**
FRE COUNTY END	31.609	7:35:44 AM	68.39
HERNDON AVE OC	30.988	7:36:16 AM	68.44
SHAW AVE OC	28.102	7:38:50 AM	67.81
ASHLAN AVE OC	26.554	7:40:39 AM	50.90

PM TIME FLAG

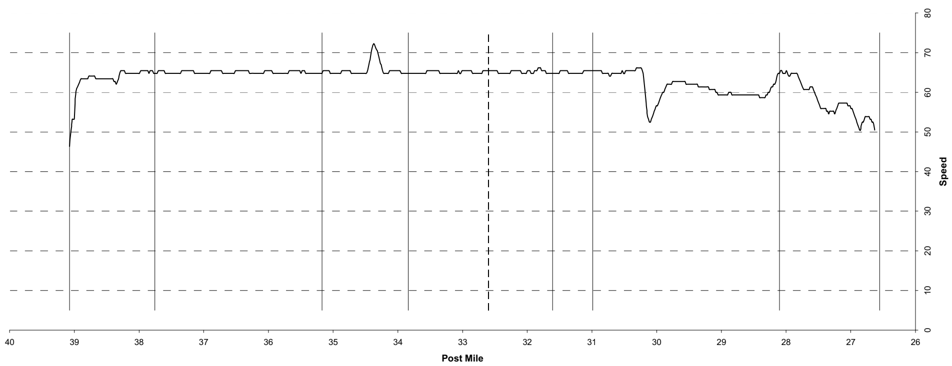


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: Bill Bigbee | Car: B | **Code: FRE99SB** | Date: 9/18/2007 - Tues | Set: 02 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	7:46:16 AM	
AVE 11 OC	37.757	7:47:30 AM	62.95
AVE 9	35.173	7:49:53 AM	65.05
AVE 8 OC	33.839	7:51:07 AM	65.72
AVE 7 OC	**32.598**	**7:52:15 AM**	**65.03**
FRE COUNTY END	31.609	7:53:10 AM	65.18
HERNDON AVE OC	30.988	7:53:44 AM	65.07
SHAW AVE OC	28.102	7:56:34 AM	61.35
ASHLAN AVE OC	26.554	7:58:06 AM	57.68

PM TIME FLAG

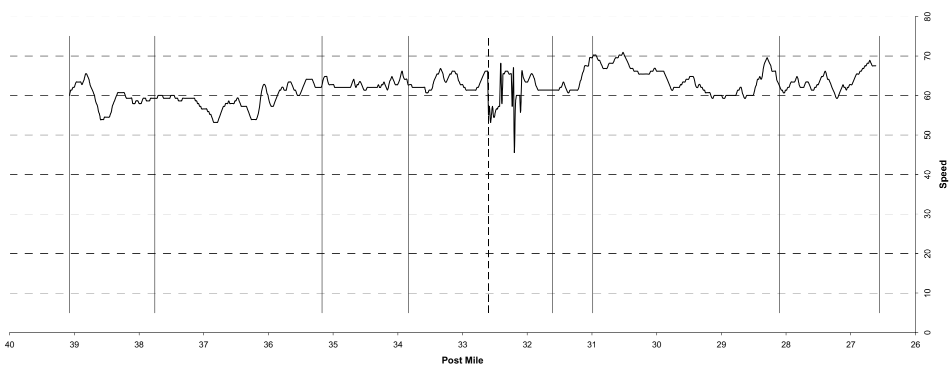


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: KEN LY | Car: A | **Code: FRE99SB** | Date: 9/18/2007 - Tues | Set: 03 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	8:04:07 AM	
AVE 11 OC	37.757	8:05:26 AM	59.35
AVE 9	35.173	8:08:04 AM	58.87
AVE 8 OC	33.839	8:09:21 AM	62.81
AVE 7 OC	**32.598**	**8:10:32 AM**	**63.10**
FRE COUNTY END	31.609	8:11:30 AM	61.19
HERNDON AVE OC	30.988	8:12:05 AM	63.33
SHAW AVE OC	28.102	8:14:47 AM	64.16
ASHLAN AVE OC	26.554	8:16:12 AM	63.45

PM TIME FLAG

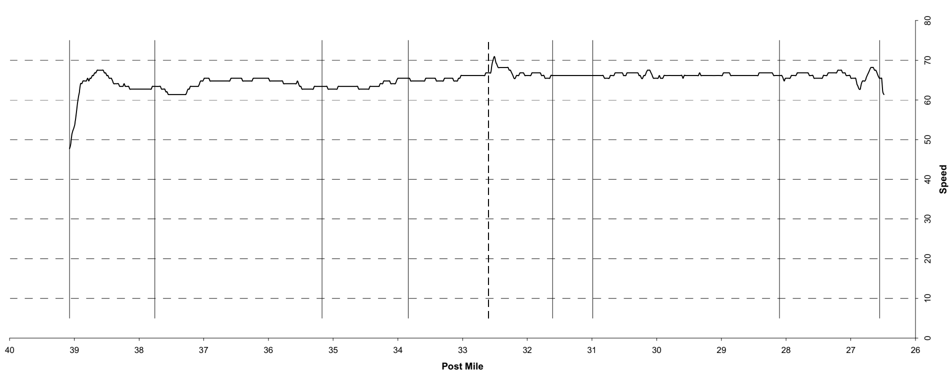


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: Bill Bigbee | Car: B | **Code: FRE99SB** | Date: 9/18/2007 - Tues | Set: 03 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	8:13:03 AM	
AVE 11 OC	37.757	8:14:18 AM	62.89
AVE 9	35.173	8:16:43 AM	63.94
AVE 8 OC	33.839	8:17:58 AM	63.68
AVE 7 OC	**32.598**	**8:19:07 AM**	**65.48**
FRE COUNTY END	31.609	8:20:00 AM	66.97
HERNDON AVE OC	30.988	8:20:34 AM	66.14
SHAW AVE OC	28.102	8:23:10 AM	66.26
ASHLAN AVE OC	26.554	8:24:35 AM	66.11

PM TIME FLAG

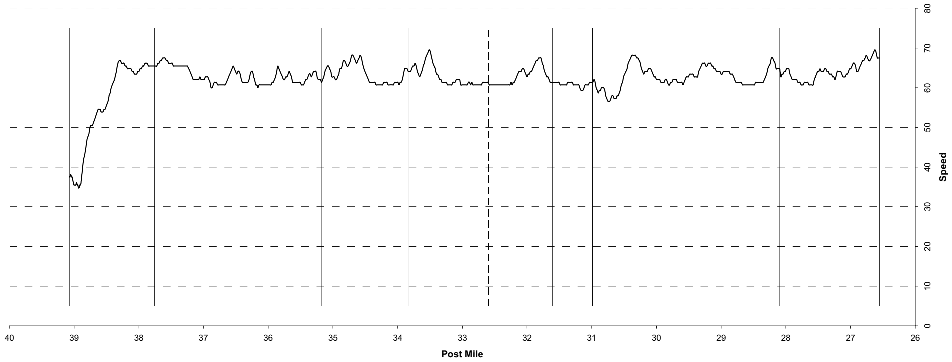


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: KEN LY | **Code: FRE99SB** | Date: 9/18/2007 - Tues | Set: 04 | Run: 1
Car: A

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	8:34:58 AM	
AVE 11 OC	37.757	8:36:26 AM	53.53
AVE 9	35.173	8:38:54 AM	62.88
AVE 8 OC	33.839	8:40:09 AM	63.35
AVE 7 OC	**32.598**	**8:41:21 AM**	**62.72**
FRE COUNTY END	31.609	8:42:17 AM	62.78
HERNDON AVE OC	30.988	8:42:54 AM	60.81
SHAW AVE OC	28.102	8:45:40 AM	62.58
ASHLAN AVE OC	26.554	8:47:07 AM	63.96

PM TIME FLAG



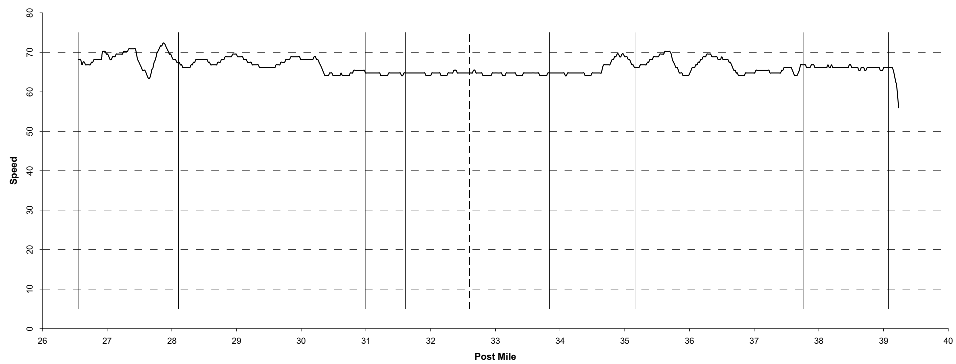
A.3 PM NB Run

TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: Bill Bigbee | Car: | **Code: FRE99NB** | Date: 10/10/2007 - Wed | Set: 01 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	4:02:49 PM	
SHAW AVE OC	28.102	4:04:10 PM	68.51
HERNDON AVE OC	30.988	4:06:45 PM	66.91
FRE COUNTY END	31.609	4:07:20 PM	64.60
AVE 7 OC	**32.598**	**4:08:15 PM**	**64.67**
AVE 8 OC	33.839	4:09:24 PM	64.56
AVE 9 OC	35.173	4:10:37 PM	65.89
AVE 11 OC	37.757	4:12:57 PM	66.53
AVE 12 OC	39.073	4:14:08 PM	66.16

PM TIME FLAG

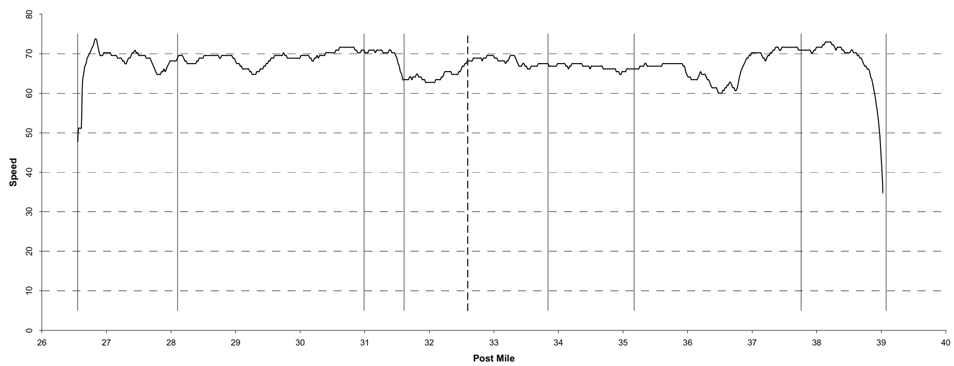


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: L Xiong | Car: A | **Code: FRE99NB** | Date: 10/10/2007 - Wed | Set: 01 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	4:10:16 PM	
SHAW AVE OC	28.102	4:11:38 PM	67.55
HERNDON AVE OC	30.988	4:14:08 PM	68.90
FRE COUNTY END	31.609	4:14:41 PM	69.52
AVE 7 OC	**32.598**	**4:15:36 PM**	**64.35**
AVE 8 OC	33.839	4:16:42 PM	68.09
AVE 9 OC	35.173	4:17:54 PM	66.59
AVE 11 OC	37.757	4:20:13 PM	66.56
AVE 12 OC	39.073		

PM TIME FLAG

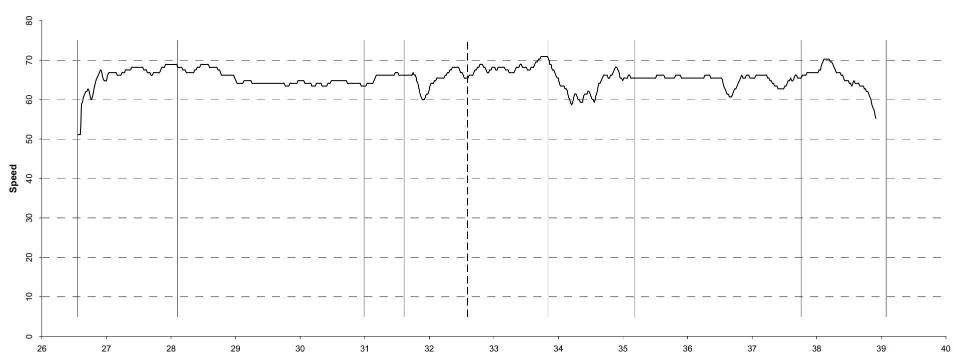


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: Bill Bigbee | Car: | **Code: FRE99NB** | Date: 10/10/2007 - Wed | Set: 02 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	4:29:46 PM	
SHAW AVE OC	28.102	4:31:10 PM	65.56
HERNDON AVE OC	30.988	4:33:50 PM	65.14
FRE COUNTY END	31.609	4:34:24 PM	65.61
AVE 7 OC	**32.598**	**4:35:18 PM**	**65.15**
AVE 8 OC	33.839	4:36:24 PM	68.12
AVE 9 OC	35.173	4:37:39 PM	63.79
AVE 11 OC	37.757	4:40:02 PM	65.03
AVE 12 OC	39.073		

PM TIME FLAG

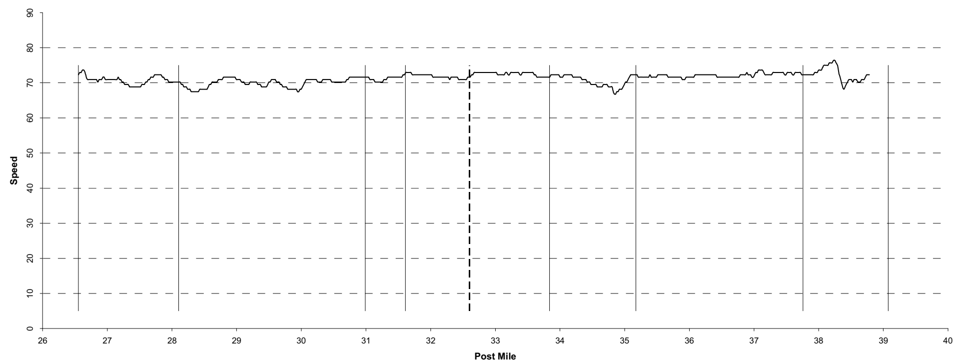


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: L Xiong | Car: A | **Code: FRE99NB** | Date: 10/10/2007 - Wed | Set: 02 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	4:36:19 PM	
SHAW AVE OC	28.102	4:37:37 PM	70.76
HERNDON AVE OC	30.988	4:40:06 PM	69.94
FRE COUNTY END	31.609	4:40:37 PM	71.17
AVE 7 OC	**32.598**	**4:41:27 PM**	**71.84**
AVE 8 OC	33.839	4:42:28 PM	72.55
AVE 9 OC	35.173	4:43:37 PM	70.47
AVE 11 OC	37.757	4:45:46 PM	72.12
AVE 12 OC	39.073		

PM TIME FLAG

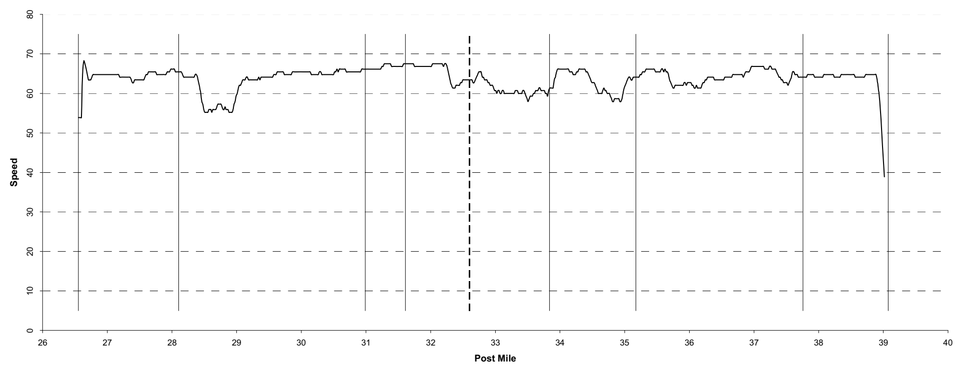


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: Bill Bigbee | Car: | **Code: FRE99NB** | Date: 10/10/2007 - Wed | Set: 03 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	4:55:21 PM	
SHAW AVE OC	28.102	4:56:47 PM	64.18
HERNDON AVE OC	30.988	4:59:32 PM	62.86
FRE COUNTY END	31.609	5:00:06 PM	66.70
AVE 7 OC	**32.598**	**5:01:00 PM**	**65.62**
AVE 8 OC	33.839	5:02:13 PM	61.14
AVE 9 OC	35.173	5:03:30 PM	62.80
AVE 11 OC	37.757	5:05:54 PM	64.30
AVE 12 OC	39.073		

PM TIME FLAG

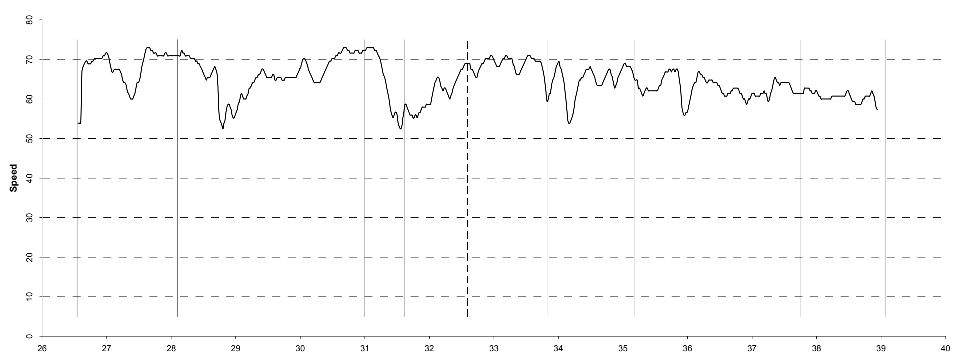


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: L Xiong | Car: A | **Code: FRE99NB** | Date: 10/10/2007 - Wed | Set: 03 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	5:04:28 PM	
SHAW AVE OC	28.102	5:05:50 PM	67.75
HERNDON AVE OC	30.988	5:08:27 PM	65.82
FRE COUNTY END	31.609	5:09:03 PM	63.43
AVE 7 OC	**32.598**	**5:10:01 PM**	**60.99**
AVE 8 OC	33.839	5:11:06 PM	68.55
AVE 9 OC	35.173	5:12:21 PM	64.41
AVE 11 OC	37.757	5:14:49 PM	62.64
AVE 12 OC	39.073		

PM TIME FLAG

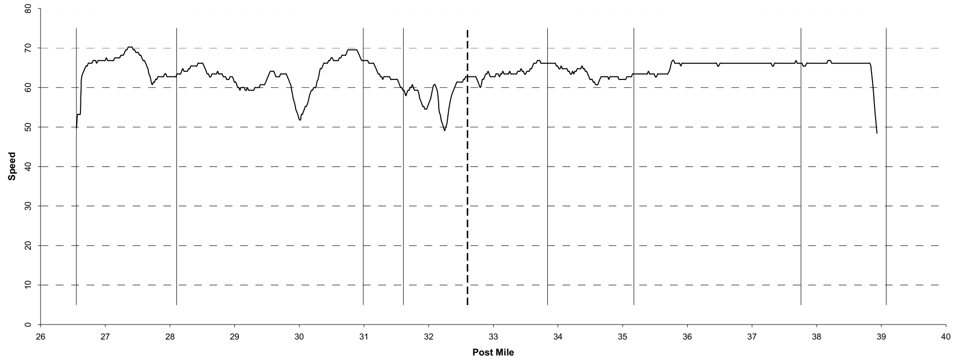


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: Bill Bigbee | Car: | **Code: FRE99NB** | Date: 10/10/2007 - Wed | Set: 04 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	5:22:21 PM	
SHAW AVE OC	28.102	5:23:46 PM	64.98
HERNDON AVE OC	30.988	5:26:32 PM	62.69
FRE COUNTY END	31.609	5:27:07 PM	63.39
AVE 7 OC	**32.598**	**5:28:09 PM**	**57.53**
AVE 8 OC	33.839	5:29:19 PM	63.74
AVE 9 OC	35.173	5:30:35 PM	63.47
AVE 11 OC	37.757	5:32:57 PM	65.52
AVE 12 OC	39.073		

PM TIME FLAG

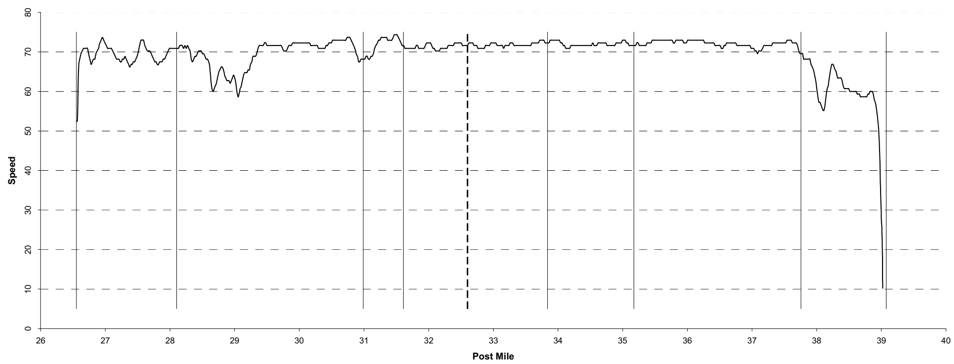


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: L Xiong | Car: A | **Code: FRE99NB** | Date: 10/10/2007 - Wed | Set: 04 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	5:29:54 PM	
SHAW AVE OC	28.102	5:31:14 PM	69.02
HERNDON AVE OC	30.988	5:33:44 PM	69.15
FRE COUNTY END	31.609	5:34:15 PM	71.79
AVE 7 OC	**32.598**	**5:35:05 PM**	**71.32**
AVE 8 OC	33.839	5:36:07 PM	71.82
AVE 9 OC	35.173	5:37:14 PM	71.97
AVE 11 OC	37.757	5:39:23 PM	72.10
AVE 12 OC	39.073		

PM TIME FLAG

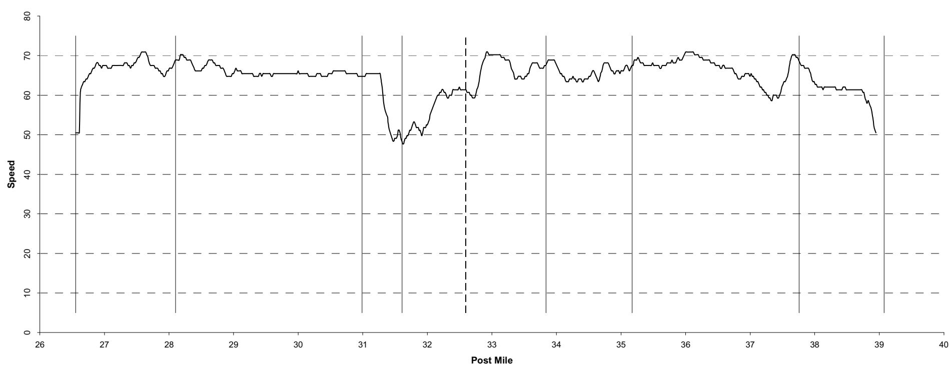


TACHOGRAPH

Location: FRE-99-26.554/39.073 | Driver: Bill Bigbee | Car: | **Code: FRE99NB** | Date: 10/10/2007 - Wed | Set: 05 | Run: 1

LOCATION	PM	TIME	SPEED
ASHLAN AVE OC	26.554	5:49:15 PM	
SHAW AVE OC	28.102	5:50:39 PM	66.11
HERNDON AVE OC	30.988	5:53:16 PM	66.03
FRE COUNTY END	31.609	5:53:55 PM	57.64
AVE 7 OC	**32.598**	**5:54:58 PM**	**55.80**
AVE 8 OC	33.839	5:56:06 PM	66.27
AVE 9 OC	35.173	5:57:19 PM	65.78
AVE 11 OC	37.757	5:59:39 PM	66.44
AVE 12 OC	39.073		

PM TIME FLAG



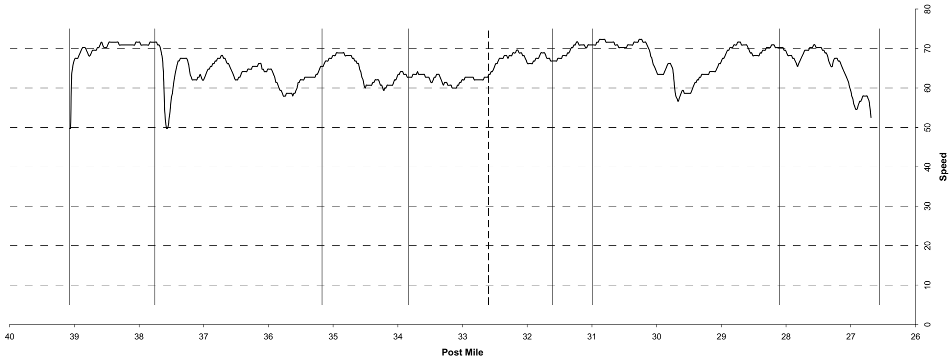
A.2 PM SB Run

TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: L Xiong | Car: A | **Code: FRE99SB** | Date: 10/10/2007 - Wed | Set: 01 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	3:57:16 PM	
AVE 11 OC	37.757	3:58:23 PM	69.64
AVE 9	35.173	4:00:51 PM	63.20
AVE 8 OC	33.839	4:02:05 PM	64.15
AVE 7 OC	**32.598**	**4:03:17 PM**	**62.19**
FRE COUNTY END	31.609	4:04:10 PM	67.33
HERNDON AVE OC	30.988	4:04:42 PM	69.42
SHAW AVE OC	28.102	4:07:17 PM	67.24
ASHLAN AVE OC	26.554	4:08:36 PM	64.72

PM TIME FLAG

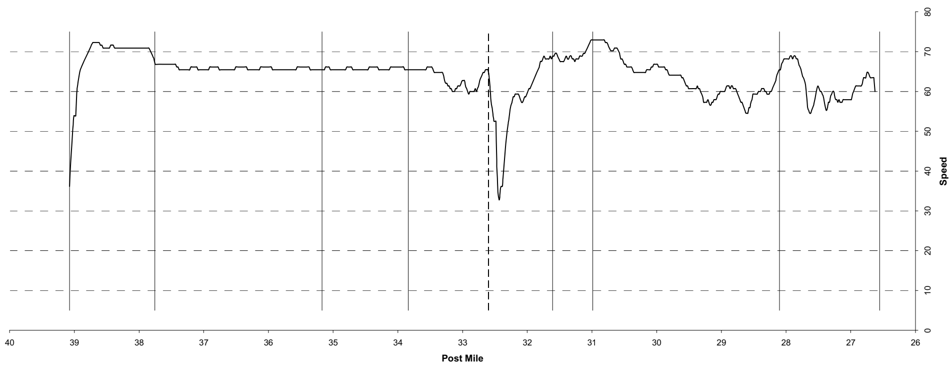


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: Bill Bigbee | Car: | **Code: FRE99SB** | Date: 10/10/2007 - Wed | Set: 01 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	4:16:16 PM	
AVE 11 OC	37.757	4:17:25 PM	67.57
AVE 9	35.173	4:19:46 PM	65.86
AVE 8 OC	33.839	4:20:59 PM	65.73
AVE 7 OC	**32.598**	**4:22:10 PM**	**63.27**
FRE COUNTY END	31.609	4:23:14 PM	55.31
HERNDON AVE OC	30.988	4:23:47 PM	69.09
SHAW AVE OC	28.102	4:26:32 PM	62.98
ASHLAN AVE OC	26.554	4:27:59 PM	61.18

PM TIME FLAG

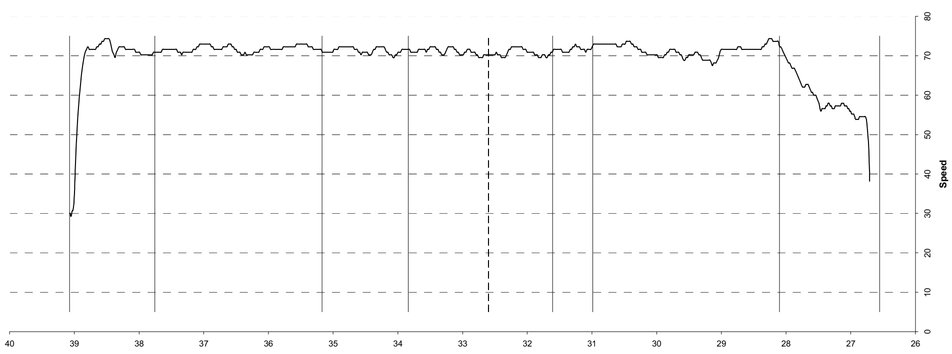


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: L Xiong | Car: A | **Code: FRE99SB** | Date: 10/10/2007 - Wed | Set: 02 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	4:23:57 PM	
AVE 11 OC	37.757	4:25:09 PM	64.38
AVE 9	35.173	4:27:19 PM	71.72
AVE 8 OC	33.839	4:28:26 PM	71.32
AVE 7 OC	**32.598**	**4:29:29 PM**	**71.09**
FRE COUNTY END	31.609	4:30:20 PM	70.74
HERNDON AVE OC	30.988	4:30:51 PM	71.61
SHAW AVE OC	28.102	4:33:16 PM	71.38
ASHLAN AVE OC	26.554	4:34:42 PM	59.13

PM TIME FLAG

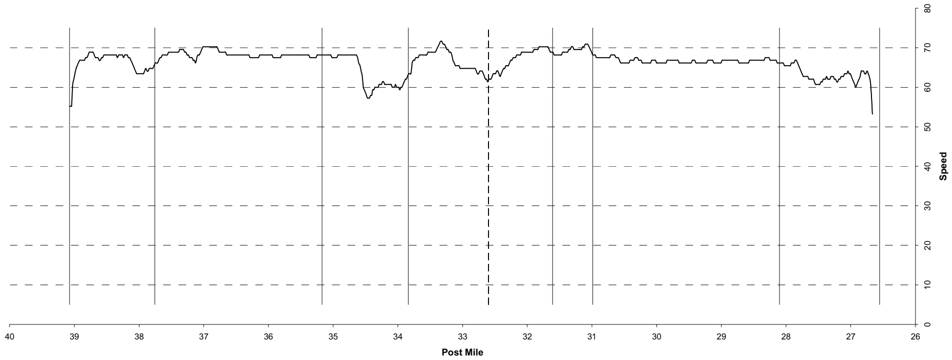


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: Bill Bigbee | Car: | **Code: FRE99SB** | Date: 10/10/2007 - Wed | Set: 02 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	4:42:40 PM	
AVE 11 OC	37.757	4:43:51 PM	65.98
AVE 9	35.173	4:46:07 PM	68.29
AVE 8 OC	33.839	4:47:23 PM	63.43
AVE 7 OC	**32.598**	**4:48:30 PM**	**66.55**
FRE COUNTY END	31.609	4:49:23 PM	67.13
HERNDON AVE OC	30.988	4:49:55 PM	69.33
SHAW AVE OC	28.102	4:52:31 PM	66.70
ASHLAN AVE OC	26.554	4:53:54 PM	62.93

PM TIME FLAG

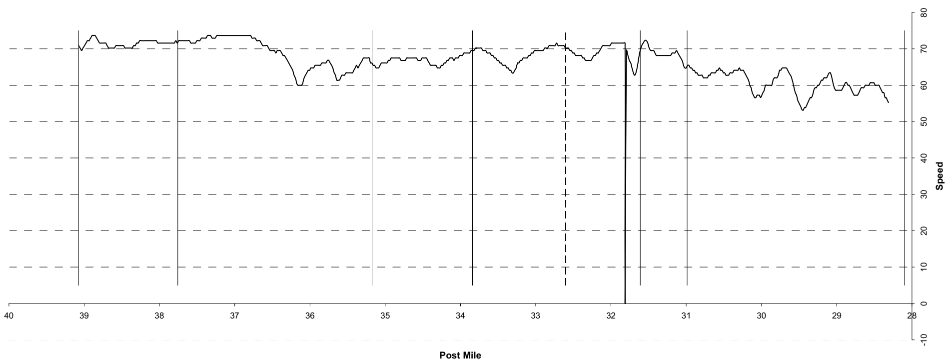


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: L Xiong | Car: A | **Code: FRE99SB** | Date: 10/10/2007 - Wed | Set: 03 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	4:52:37 PM	
AVE 11 OC	37.757	4:53:43 PM	71.48
AVE 9	35.173	4:55:59 PM	68.46
AVE 8 OC	33.839	4:57:10 PM	66.86
AVE 7 OC	**32.598**	**4:58:16 PM**	**68.35**
FRE COUNTY END	31.609	4:59:09 PM	67.50
HERNDON AVE OC	30.988	4:59:41 PM	68.71
SHAW AVE OC	28.102	5:02:21 PM	60.49
ASHLAN AVE OC	26.554		

PM TIME FLAG

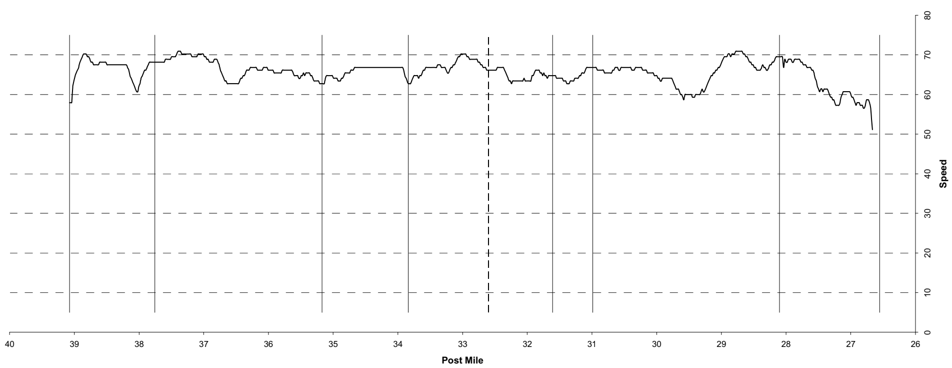


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: Bill Bigbee | Car: | **Code: FRE99SB** | Date: 10/10/2007 - Wed | Set: 03 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	5:09:44 PM	
AVE 11 OC	37.757	5:10:55 PM	66.35
AVE 9	35.173	5:13:14 PM	66.61
AVE 8 OC	33.839	5:14:27 PM	65.81
AVE 7 OC	**32.598**	**5:15:34 PM**	**66.99**
FRE COUNTY END	31.609	5:16:29 PM	64.83
HERNDON AVE OC	30.988	5:17:04 PM	64.58
SHAW AVE OC	28.102	5:19:42 PM	65.51
ASHLAN AVE OC	26.554	5:21:06 PM	62.17

PM TIME FLAG

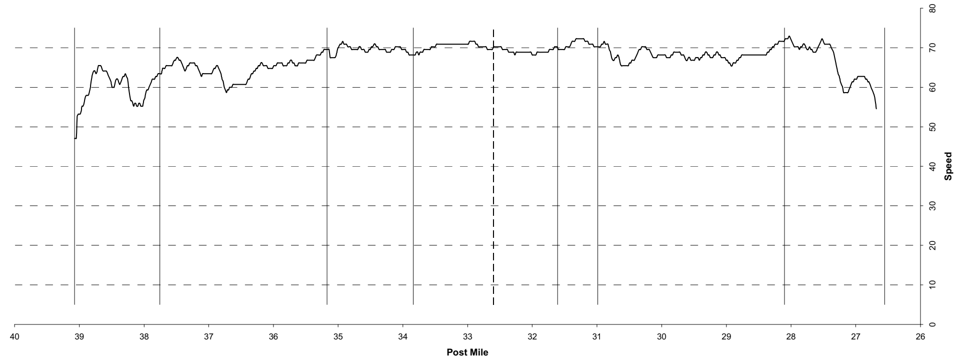


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: L Xiong | Car: A | **Code: FRE99SB** | Date: 10/10/2007 - Wed | Set: 04 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	5:17:29 PM	
AVE 11 OC	37.757	5:18:48 PM	59.37
AVE 9	35.173	5:21:12 PM	64.68
AVE 8 OC	33.839	5:22:21 PM	69.53
AVE 7 OC	**32.598**	**5:23:24 PM**	**70.31**
FRE COUNTY END	31.609	5:24:16 PM	69.18
HERNDON AVE OC	30.988	5:24:47 PM	70.93
SHAW AVE OC	28.102	5:27:20 PM	68.17
ASHLAN AVE OC	26.554	5:28:38 PM	65.82

PM TIME FLAG

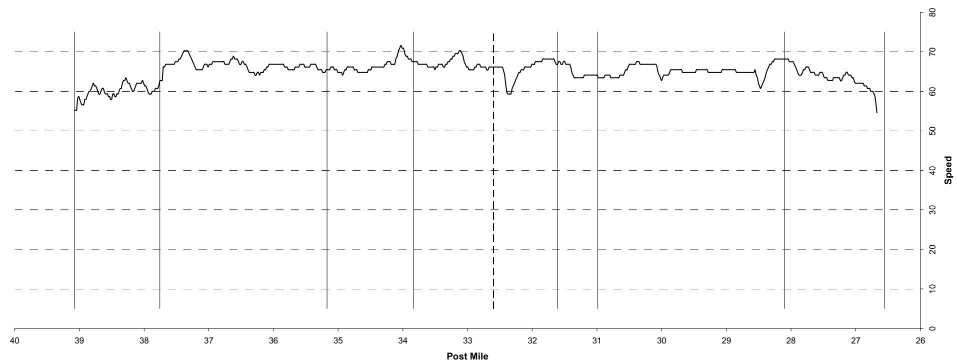


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: Bill Bigbee | Car: | **Code: FRE99SB** | Date: 10/10/2007 - Wed | Set: 04 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	5:35:59 PM	
AVE 11 OC	37.757	5:37:17 PM	59.97
AVE 9	35.173	5:39:37 PM	66.53
AVE 8 OC	33.839	5:40:49 PM	66.45
AVE 7 OC	**32.598**	**5:41:56 PM**	**66.89**
FRE COUNTY END	31.609	5:42:51 PM	65.52
HERNDON AVE OC	30.988	5:43:25 PM	64.87
SHAW AVE OC	28.102	5:46:04 PM	65.14
ASHLAN AVE OC	26.554	5:47:26 PM	63.61

PM TIME FLAG

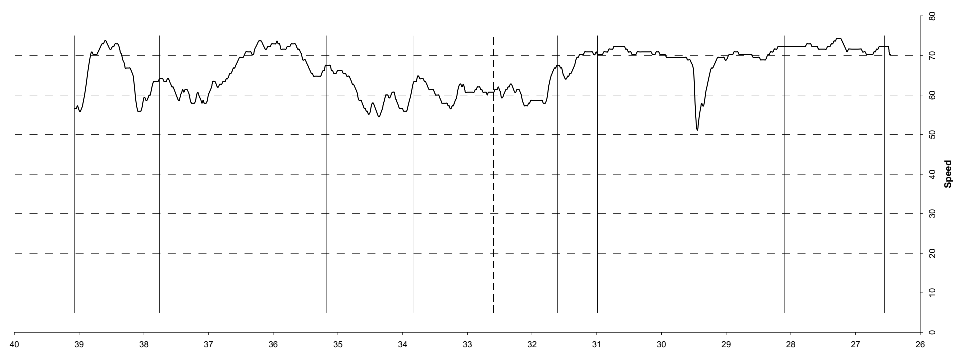


TACHOGRAPH

Location: FRE-99-39.073/26.554 | Driver: L Xiong | Car: A | **Code: FRE99SB** | Date: 10/10/2007 - Wed | Set: 05 | Run: 1

LOCATION	PM	TIME	SPEED
AVE 12 OC	39.073	5:46:56 PM	
AVE 11 OC	37.757	5:48:09 PM	64.68
AVE 9	35.173	5:50:30 PM	65.99
AVE 8 OC	33.839	5:51:50 PM	60.05
AVE 7 OC	**32.598**	**5:53:03 PM**	**60.79**
FRE COUNTY END	31.609	5:54:02 PM	60.52
HERNDON AVE OC	30.988	5:54:35 PM	68.33
SHAW AVE OC	28.102	5:57:05 PM	68.97
ASHLAN AVE OC	26.554	5:58:23 PM	72.05

PM TIME FLAG



REFERENCES

- Quadstone Paramics V5.1 Manuals
- California SR 41 Corridor Simulation Study
- California Department of Transportation Guidelines for Applying Traffic Microsimulation Software
- Fresno Madera Urban Route 99 Corridor System Management Plan
- California Department of Transportation Status of Projects Central Region
- Fresno Council of Governments 2007 Regional Transportation Plan
- Fresno-Madera Metropolitan Freeway/Interchange Deficiency Study Phase II
- California Department of Transportation Administrative 2008 Draft Project Study Report for Veterans Boulevard
- El Paseo Study at SR 99 and Herndon Avenue in the City of Fresno

APPENDIX F

FREQ DATA
GRAPHICAL DISPLAY OF FREEWAY CONDITIONS

The output is displayed for each subsection (numbered across the top of the data area) and for each time slice (numbered down the left of the data area). The colors that are used for the data displayed are defined as follows:

GREEN: Free-flow conditions

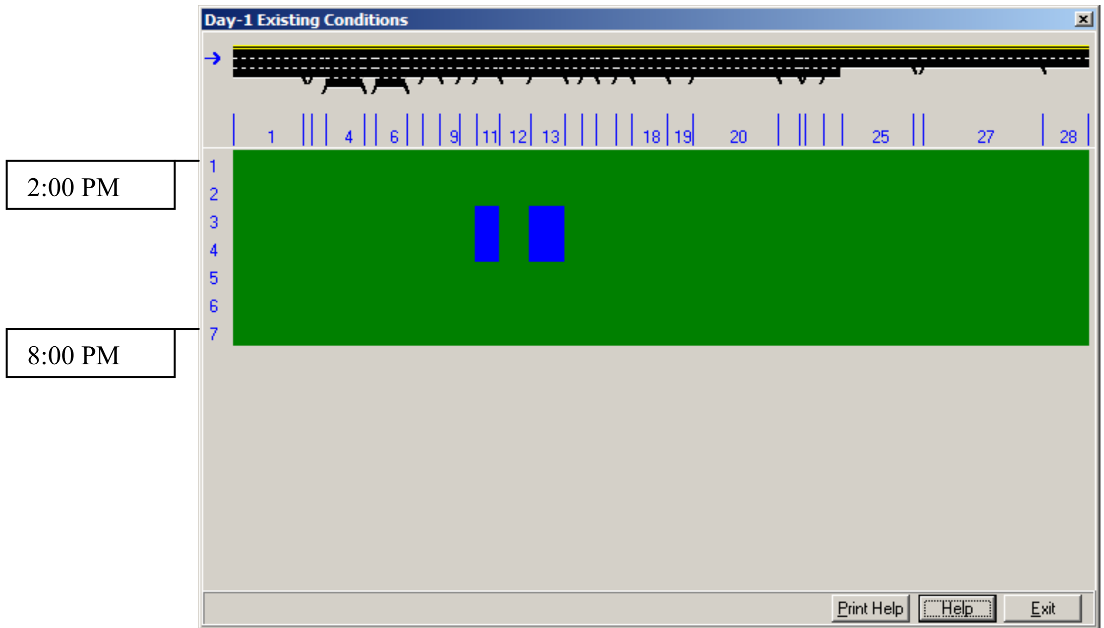
BLUE: Near capacity conditions where: .9 <= V/C < 1.00. Might indicate a "hidden" bottleneck.

YELLOW: Bottleneck (V/C = 1.00) located immediately downstream of the queue and a transition area between free-flow conditions and congested conditions

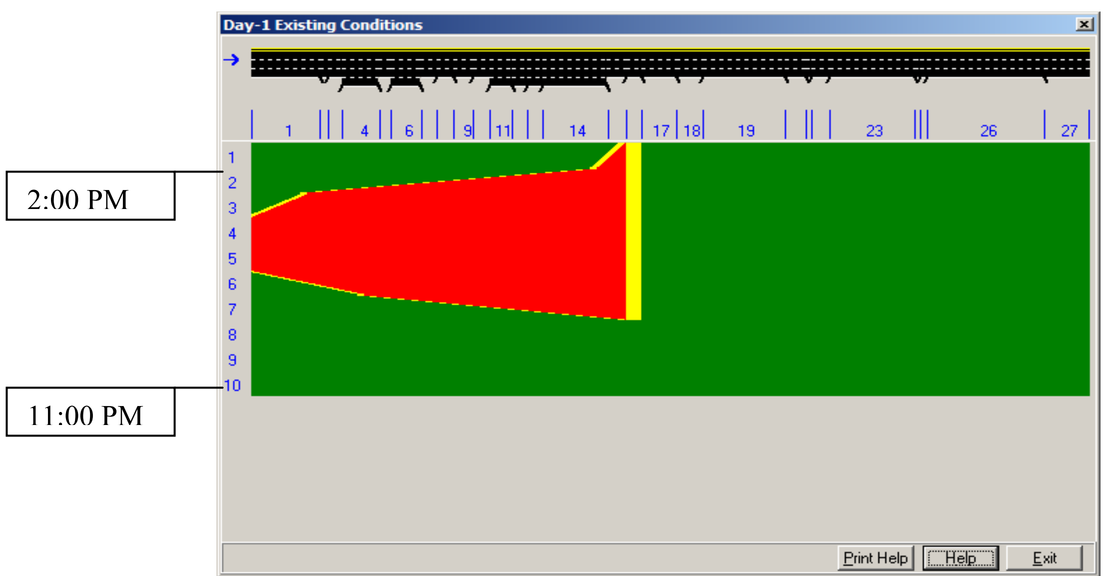
RED: Congested flow conditions

APPENDIX F, CONTINUED

FREQ DATA
GRAPHICAL DISPLAY OF FREEWAY CONDITIONS
See Pages 68 – 75 for definition of locations



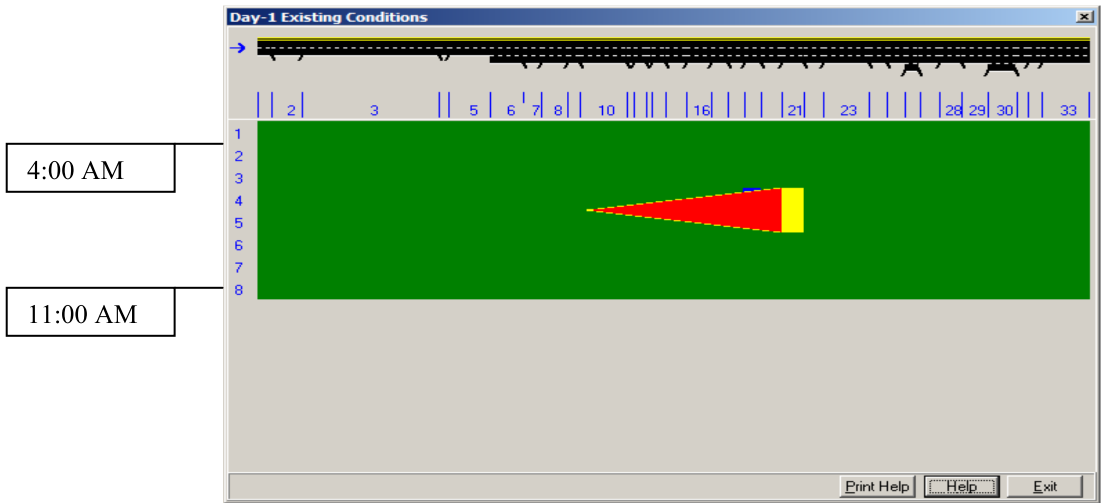
FRE 99 NB – YEAR 2000



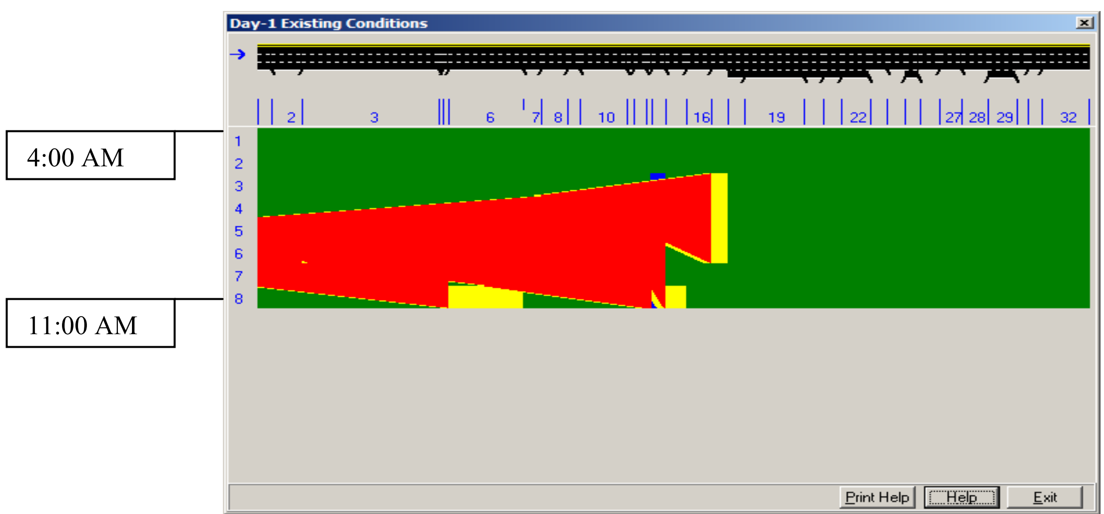
FRE 99 NB – YEAR 2030

APPENDIX F, CONTINUED

FREQ DATA
GRAPHICAL DISPLAY OF FREEWAY CONDITIONS
See Pages 68 – 75 for definition of locations



FRE 99 SB – YEAR 2000



FRE 99 SB – YEAR 2030

Frequency Strip # 1

District 6 HOV Study

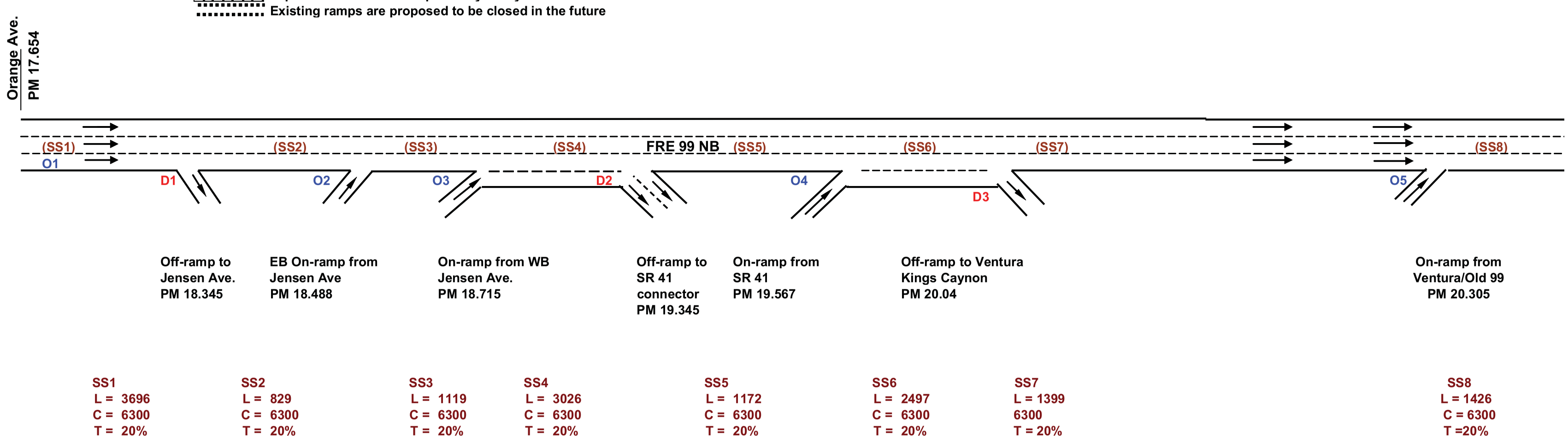
FRE-99 NORTHBOUND
From Orange Avenue OC. to Herndon Avenue OC
PM 17.654 to PM 30.988

N
Drawing Not To Scale

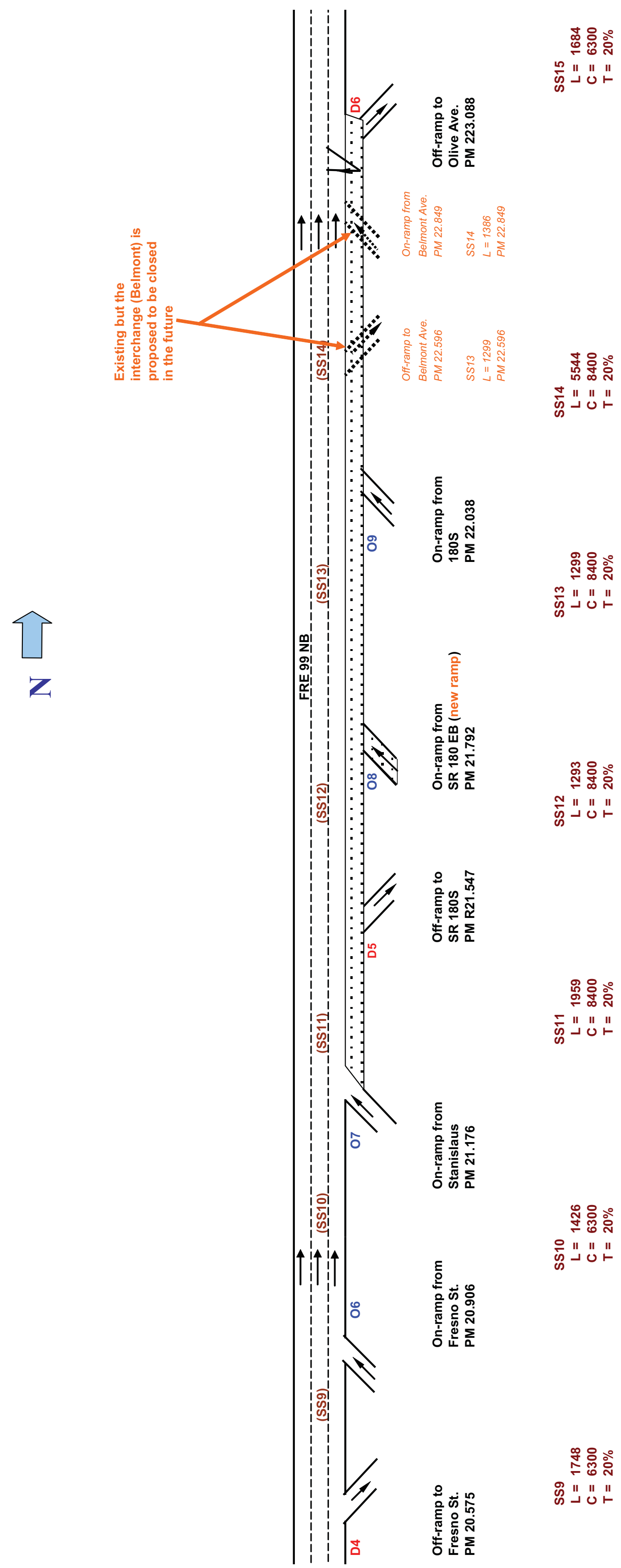
LEGEND:

- → Direction of Traffic
- L = Length of Subsection in feet (Nose to Nose)
- C = Subsection Capacity (veh/hr)
- T = Percent of Truck Traffic (%)
- Improvements to be Completed by Study Year 2030
- Existing ramps are proposed to be closed in the future

- O# = Origin No.
- D# = Destination No.
- SS# = Subsection No.



Frequency Strip # 2



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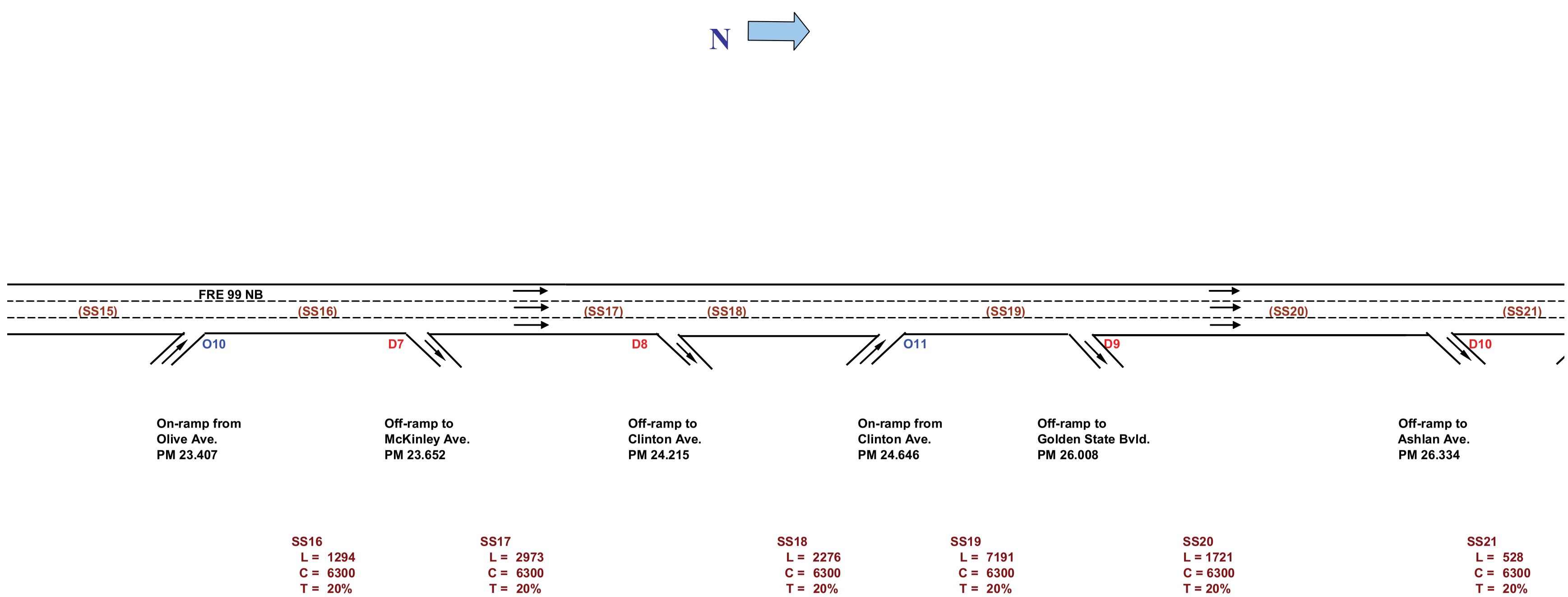

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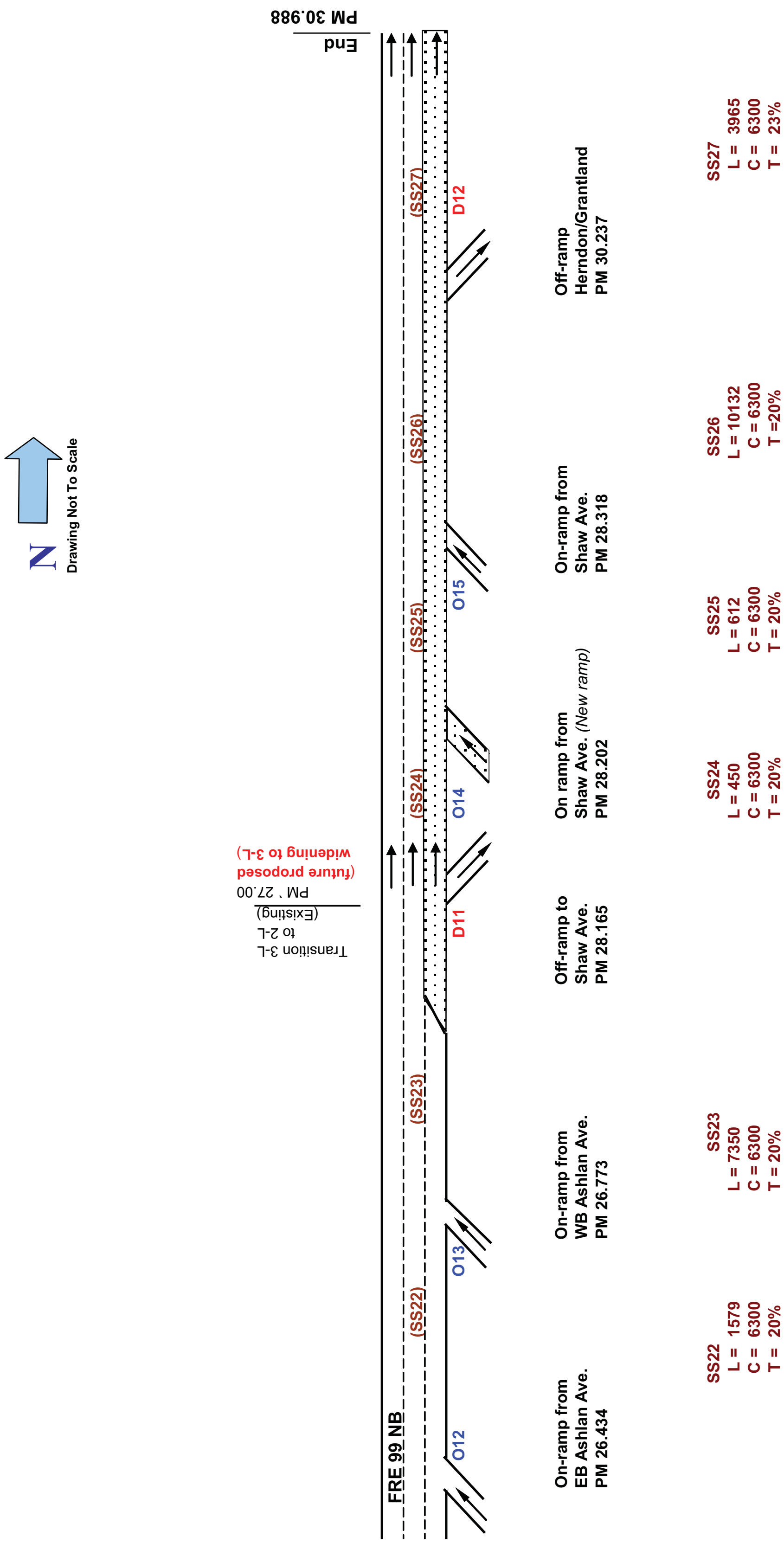
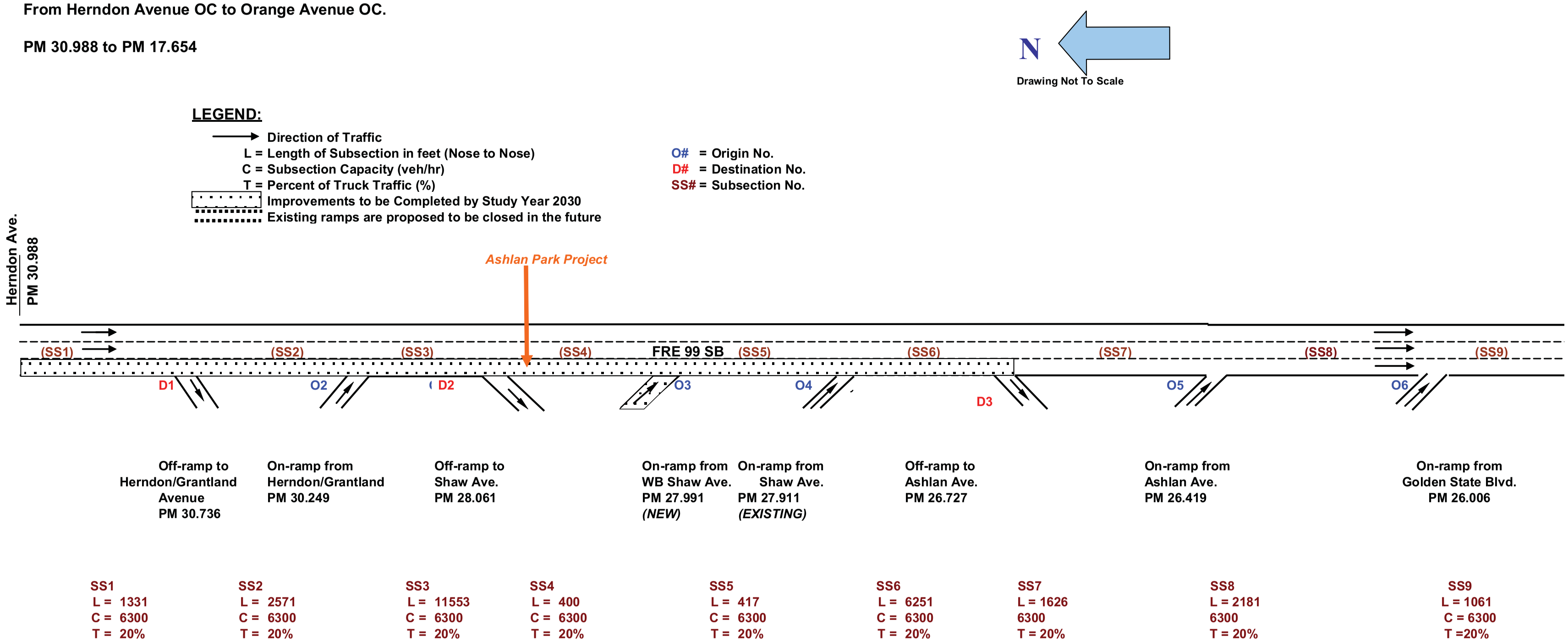


Frequency Strip # 5

District 6 HOV Study

FRE-99 SOUTHBOUND
From Herndon Avenue OC to Orange Avenue OC.

PM 30.988 to PM 17.654



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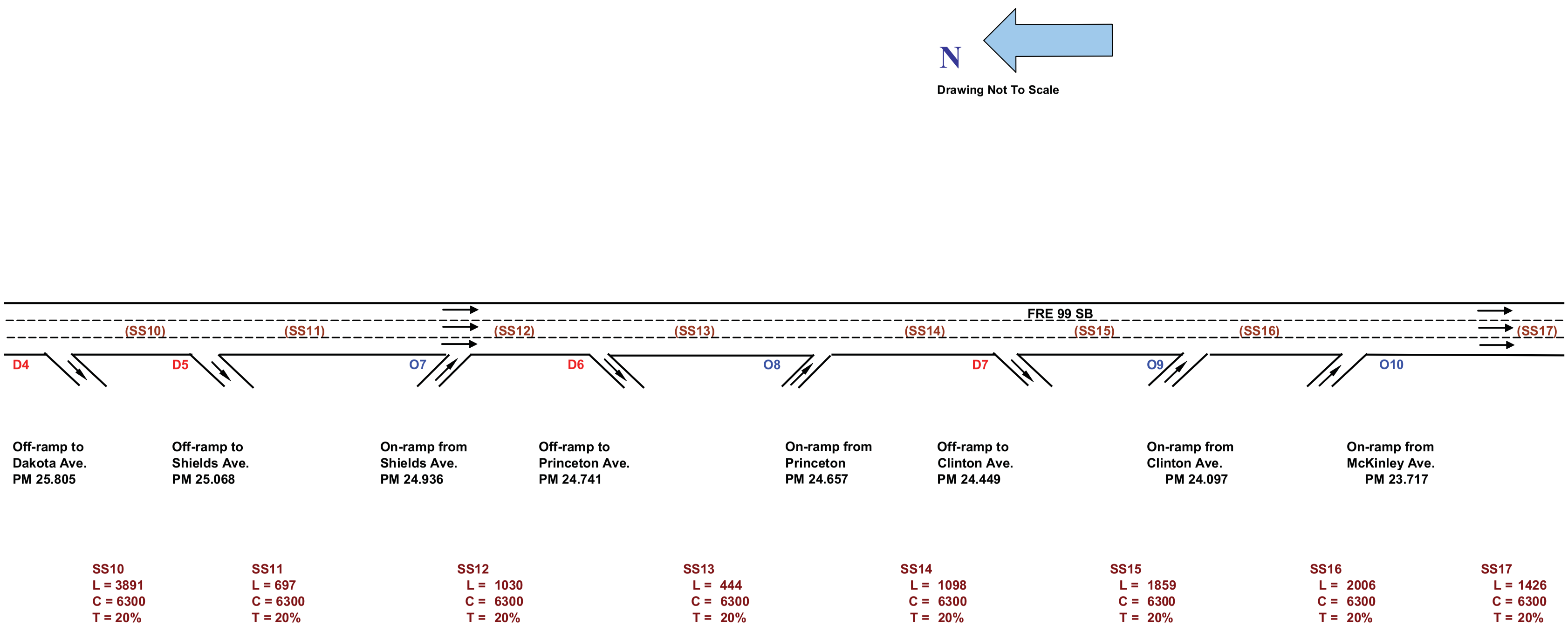

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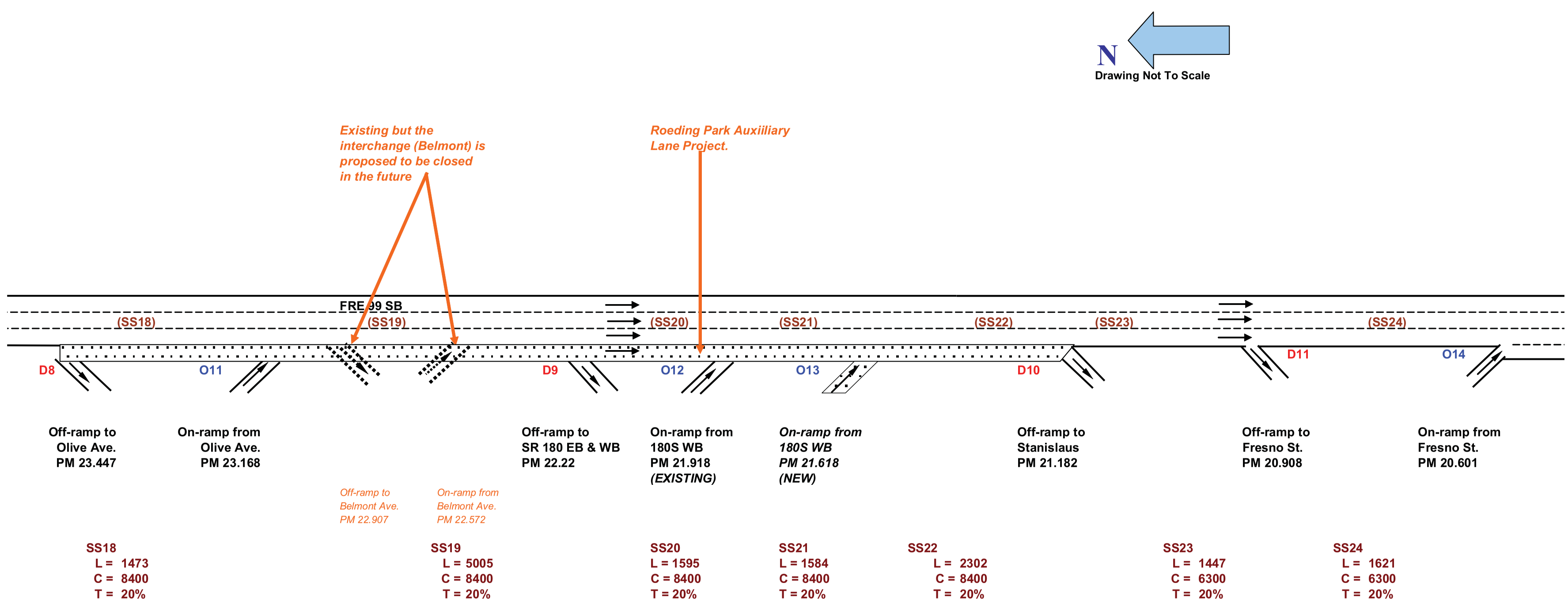

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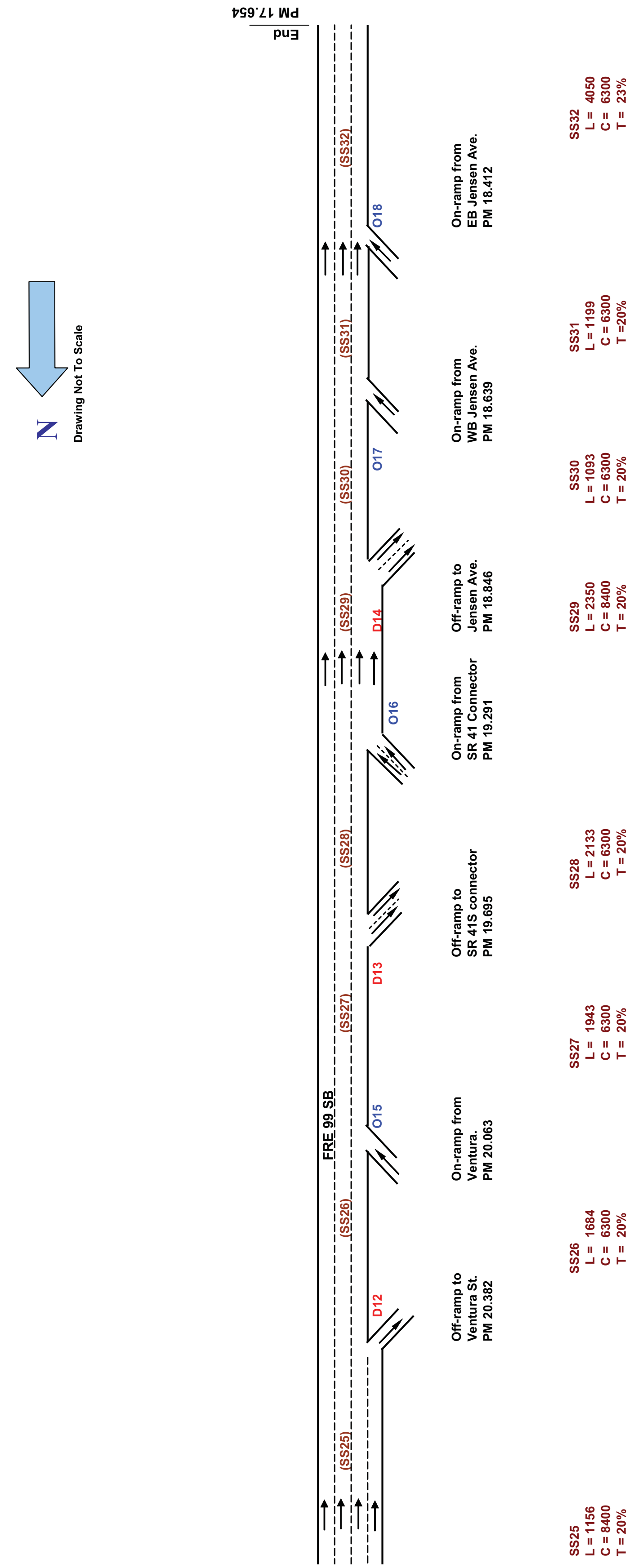

APPENDIX G
DOCUMENTS USED IN THE PREPARATION OF THIS CSMP

1) Transportation Management System (TMS) Master Plan; Caltrans
2) Traffic Operations Strategic Plan; Caltrans
3) Route 99 Corridor Enhancement Master Plan; Caltrans District 6
4) Preliminary Cost Assessment for Conversion of Route 99 to an Interstate; Caltrans District 6
5) Highway 99 Beautification Master Plan; Association for the Beautification of Highway 99 and the Council of Fresno County Governments
6) Highway 99 Corridor Business Plan; Caltrans District 6
7) I-880 Corridor System Management Plan; Caltrans District 4
8) State Route 99 TCR; Caltrans District 6
9) Highway 99: The Main Street of the San Joaquin Valley; The Great Valley Center
10) High Occupancy Vehicle Lane Viability for the San Joaquin Valley; Caltrans District 6 and District 10
11) Mainstreaming ITS and Use in the Planning and Programming Environment; Caltrans
12) Interregional Transportation Strategic Plan; Caltrans
13) Regional Transportation Plan; Council of Fresno County Governments
14) Regional Transportation Plan; Madera County Transportation Commission
15) Bay Area/California High-Speed Rail Ridership and revenue Forecasting Study; California High-Speed Rail Authority
16) Goods Movement Action Plan; Business, Transportation and Housing Agency and California Environmental Protection Agency
17) 2002 Global Gateways Development Program; Caltrans
18) Demographic Research Unit, California State Census Data Center, Census 2000 PL94-171, California Department of Finance
19) California State Rail Plan; Caltrans
20) San Joaquin Valley Goods Movement Study; Counties of the San Joaquin Valley and Caltrans
21) County of Madera General Plan; Madera County
22) City of Fresno General Plan; City of Fresno
23) Freeway Performance Initiative Traffic Analysis; Metropolitan Transportation Commission, Final Report, October 2007
24) Goods Movement Action Plan; Business, Transportation and Housing Agency And California Environmental Protection Agency, January 2007

APPENDIX H
ACRONYMS

AADT - Average Annual Daily Traffic
ADA - Americans with Disabilities Act
ATIS - Advanced Traveler Information System
ATMIS - Advanced Transportation Management Information Systems
B/C - Benefit/Cost
BNSF - Burlington Northern Santa Fe
BRT - Bus rapid transit
CAPM - Capital Preventive Maintenance
CCTV - Closed Circuit Television Cameras
CHP - California Highway Patrol
CMAQ - Congestion Mitigation and Air Quality
CMIA - Corridor Mobility Improvement Account
CMS - Changeable Message Sign
COFCG - Council of Fresno County Governments
CPUC - California Public Utilities Commission
CSMP - Corridor System Management Plan
CT - Caltrans
CTC - California Transportation Commission
FAX - Fresno Area Express
FCRTA - Fresno County Regional Transit Agency
FREQ - Freeway Queue Macroscopic Freeway Operation Model Software
FYI - Fresno Yosemite International
HAR - Highway Advisory Radio
HOV - High-Occupancy Vehicle Lanes
HSRA - High Speed Rail Authority
I-5 - Interstate 5
IIP - Interregional Improvement Program
IRI - International Ride Index
ITS - Intelligent Transportation System
ITSP - Interregional Transportation Strategic Plan
LOS - Level of Service
MAE - Madera Area Express
MCC - Madera County Connection
MOU - Memorandum of Understanding
MSL - Maintenance Service Level
MCTC - Madera County Transportation Commission
MTC - Metropolitan Transportation Commission
ND – Not Determined
OC - Overcrossing
OH - Overhead
PCR - Pavement Condition Report
PCS - Pavement Condition Survey
PDT - Project Development Team

PeMS - Performance Measurement System
PHT - Person Hours Traveled
PM - Postmile
PMT - Person Miles Traveled
RIP - Regional Improvement Program
ROW - Right-of-Way
RWIS - Remote Weather information Station
SAFETEA-LU - Safe Accountable Flexible Efficient Transportation Equity Act- Legacy for Users
SHOPP - State Highway Operation Protection Program
SJV - San Joaquin Valley
SJUAPCD - San Joaquin Unified Air Pollution Control District
SJVR - San Joaquin Valley Railroad
STAA - Surface Transportation Assistance Act
STIP - State Transportation Improvement Program
TASAS - Traffic Accident Surveillance and Analysis System
TCM - Transportation Control Measure
TCRP - Transportation Congestion Relief Program
TIM - Traffic Incident Management
TMC - Transportation Management Center
TMS - Transportation Management System
UC - Undercrossing
UPRR - Union Pacific Railroad
UTC - Ultimate Transportation Concept
VHT - Vehicle Hours Traveled
VMT - Vehicle Miles Traveled