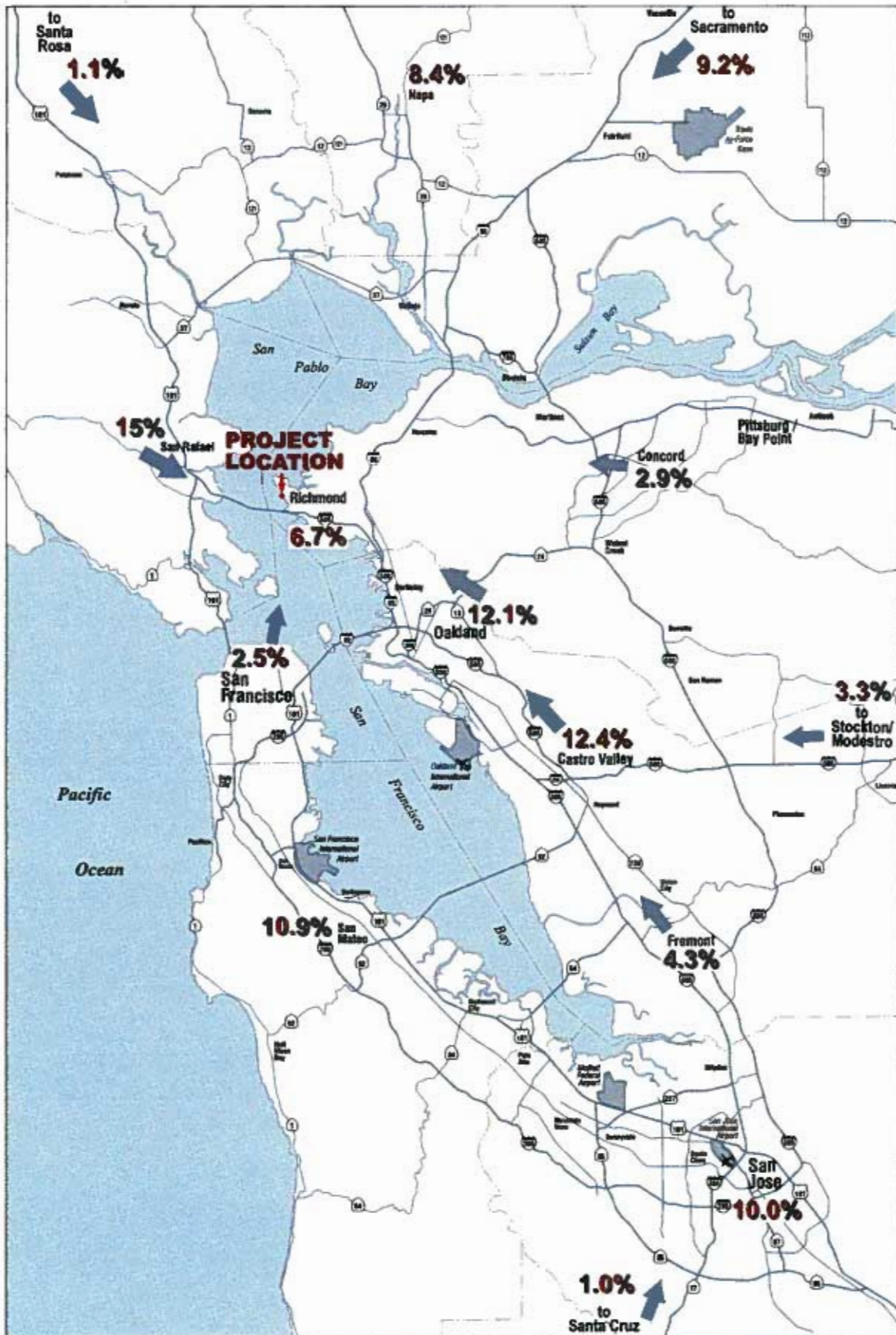


# ***APPENDIX HH***

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***TRAFFIC MEMORANDUMS AND PROJECT TRIP DISTRIBUTION***



POINT MOLATE TRAFFIC IMPACT ANALYSIS  
Attachment A  
**PROJECT TRIP DISTRIBUTION**

## MEMORANDUM

Date: December 4, 2009

To: Mike Taggart  
Analytical Environmental Services  
1801 7th Street, Suite 100  
Sacramento, CA 95811

From: Steve Abrams

Subject: Point Molate Casino/Resort DEIS/DEIR – Additional Traffic Analysis

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This memorandum summarizes the results of additional analysis conducted in response to comments received on the Point Molate Casino/Resort DEIS/DEIR.<sup>1</sup> This updated analysis was completed to provide information on the potential for impacts to additional roadway and freeway facilities that were not previously analyzed. The potential project impacts were analyzed under both background and cumulative conditions with the inclusion of traffic from the proposed Scotts Valley Casino Project.

### **Project Description and Alternatives**

This analysis compliments the transportation impact analysis prepared by DMJM Harris (DMJM Harris TIA)<sup>2</sup> and the Supplemental Traffic Impact Analysis (STIA)<sup>3</sup> prepared for the proposed project. This analysis was prepared based on guidelines set forth by Contra Costa County, Marin County, the City of Larkspur, and the California Department of Transportation's (Caltrans) Guide to the Preparation of Traffic Impact Studies.<sup>4</sup>

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<sup>1</sup> Point Molate Mixed-Used Tribal Destination Resort DEIR/DEIR, Analytical Environmental Services, Sacramento CA, July, 2009..

<sup>2</sup> Point Molate Casino/Resort Project Transportation Impact Analysis, DMJM Harris – AECOM, Oakland, CA, June, 2008.

<sup>3</sup> Point Molate Casino/Resort Supplemental TIA, Abrams Associates, Walnut Creek, CA, April, 2009.

<sup>4</sup> Guide for the Preparation of Traffic Impact Studies, Caltrans, Sacramento, CA, December, 2002.

The proposed project would be located on the shoreline in the City of Richmond just across the Richmond San Rafael Bridge from Marin County. Alternative A was considered the preferred buildout alternative and consists of casino, lodging, retail, entertainment facility, and office land use components. The alternatives are described in more detail in the DMJM Harris TIA and the Point Molate Casino/Resort DEIS/DEIR.

### **Additional Facilities Studied**

The additional facilities have been analyzed for the typical weekday morning peak hour (8:00 – 9:00 AM), the afternoon commute peak hour (5:00 – 6:00 PM) and the Saturday afternoon peak hour (4:00 – 5:00 PM). It should be noted that the analysis includes all of the signalized intersections on Sir Francis Drake Boulevard in Larkspur where more than 50 trips would be added. The proposed project's impacts were specifically analyzed for the following facilities:

#### State Route 4 Freeway Segments near Hercules

1. I-80 Ramps to Willow Avenue
2. Willow Avenue to Sycamore Avenue

#### Sir Francis Drake Boulevard Intersections in Larkspur

1. U.S. 101 southbound off-ramp/Sir Francis Drake Boulevard
2. U.S. 101 northbound on- and off-ramp/Sir Francis Drake Boulevard
3. Larkspur Landing Circle (west)/Sir Francis Drake Boulevard
4. Larkspur Landing Circle (east)/Sir Francis Drake Boulevard

### **Additional Review of Transportation Demand Management Reductions**

In response to comments on the Transportation Demand Management (TDM) assumptions some additional analysis and discussion of the effectiveness of the TDM measures was prepared. This is intended to provide justification for the 15% reduction in automobile traffic that was applied, but only to the trip generation from the casino portion of the project. Under Alternative A this equates to a reduction of approximately 200 trips during the critical PM peak hour. Please note that no TDM reductions were applied to the hotel or retail components of the project.

The TDM reduction is intended to account for patrons and employees who would utilize transit and shuttle busses to access the project site. This reduction would apply to patrons and employees who would utilize the various methods of transit to travel to Richmond and then transfer to a private shuttle bus or an extended AC Transit line. The TDM reduction also accounts for charter bus trips from outlying areas and employees who park in designated offsite employee parking lots and are shuttled to Point Molate. The following is a list of various factors that are pertinent to the effectiveness of the Point Molate TDM program.

*Effectiveness of Employee TDM Measures* - It is important to note that the project is proposing to provide economic incentives for employees to use transit. This is in addition to the other major provisions for transit including subsidizing public bus and ferry routes, providing shuttle buses to and from off-site employee parking areas and BART, and providing charter bus service for outlying areas.

The Institute of Traffic Engineers (ITE) Trip Generation Handbook contains a detailed summary of surveys and studied on the effects of TDM and transit on Trip Generation.<sup>5</sup> This is provided for overall project traffic and for traffic specifically from employees. Based on detailed surveys of various TDM programs the ITE Trip Generation Handbook has provided a summary of the benefits to transportation (both perceived and actual).

For employees the Trip Generation Handbook provides extensive data to support the effectiveness of various TDM measures. It is important to again note that the project is proposing all of the key components that are typically part of a successful TDM program (according to ITE) including support measures, economic incentives, and transportation services. Support measures include things like employee transportation coordinators, promotional activities, rideshare matching, on-site dependent care, and alternative work schedules. Economic incentives are any steps taken by an employer to provide a monetary incentive to use an alternate travel mode. Transportation services include employer based efforts such as van-pool programs, shuttle bus service to off-site transit stations, guaranteed ride home programs, and the provision of on-site showers and changing facilities.

According to ITE the combination of economic incentives with transportation services (such as those proposed by the project) produced an average reduction in commuter vehicles of 24 percent at the survey sites. At a typical employer that operates during normal business hours there can be up to 85% of the employees arriving and/or departing during the peak hour. However, at a casino resort with 24-hour operations there are normally three shifts per day so that the maximum number arriving during the peak hours would be no more than about a third of the employees. In addition, since most employees work a five day work week it was assumed that 2 sevenths of the employees would not be working on any given day. Also, the percent arriving would typically be reduced by another 10 percent to account for absences due to vacations, illness, etc.

The resort is estimated to have 4000 employees so assuming a vehicle occupancy rate for employees of 1.5 persons per vehicle (due to ridesharing) the above mentioned reductions equate to an estimated potential for 635 vehicle trips (due to employees) during the PM peak hour. This is based on a scenario where no transit service or TDM programs are provided. Based on the ITE surveys the

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<sup>5</sup> *Trip Generation Handbook, Second Edition*, Institute of Transportation Engineers, Washington, D.C, June, 2004.

24 percent reduction for the TDM measures should readily equate to a overall reduction to the casino traffic of about 150 PM peak hour trips. Information gathered at Cache Creek Casino Resort and Thunder Valley Casino indicates that the average occupancy of vehicles with resort patrons is about 2.4 persons per vehicle.

Therefore, based on this analysis the project's shuttle services and public bus transit subsidies would only need to serve about 120 resort patrons during the peak hour to meet the 15% TDM reduction assumed in the project trip generation. This would equate to about 7 percent of the resort patrons estimated to arrive during the PM peak hour. This was determined to be a reasonable assumption given the direct connection to BART and the effects of other transportation services such as charter buses.

*Overall Effectiveness of the TDM Measures on both Patrons and Employees* – The Institute of Traffic Engineers (ITE) Trip Generation Handbook also contains a detailed summary of surveys and studies on the overall effects of TDM and transit on the total traffic generation of a project. Since the proposed project would construct both a bus transit center and a ferry terminal the ITE survey results indicate these features should result in an overall reduction in vehicle trip generation of 20%.

Applying a 20 percent TDM reduction to the entire project is reasonable because employees from the hotels and the retail areas would also be provided incentives to use transit and they would certainly be expected to utilize the on-site transit options available to them. This reduction would therefore apply to the entire project which results in a estimated reduction of 270 peak hour trips. This is less than the 200 trip reduction assumed for the project and validates the assumptions used. This difference is largely due to the fact that the TDM reductions were only applied to the casino portion of the project.

### **Traffic Analysis Scenarios**

Five study scenarios have been addressed as part of this traffic analysis. Please note that the AM and PM peak hours were both analyzed for each of the scenarios listed below:

- 1) ***Existing Conditions*** - This scenario evaluates the level-of-service at the studied freeway segments and intersections for the existing conditions based on various EIR's referenced in this memo.
  
- 2) ***Background (Year 2010) Conditions*** - This scenario evaluates the background level-of-service at the studied freeway segments and intersections for the existing conditions with the addition of traffic from reasonably foreseeable projects in the area as summarized in the DMJM Harris TIA and the various EIR's referenced in this memo.

3) **Background Plus Project Conditions** - This scenario includes analyses of the effects of traffic from the proposed project and each of the alternatives on the 2013 traffic operations.

4) **Cumulative 2030 Conditions** - This scenario includes the analysis of build-out conditions in the area, projected for the Year 2030.

5) **Cumulative Plus Project Conditions** - this scenario includes the cumulative Year 2030 traffic volumes with traffic from the proposed project and each of the alternatives.

### **Intersection Analysis Methodology for Sir Francis Drake Boulevard**

The level of service (LOS) measurement is a qualitative description of traffic operating conditions for intersections and roadways. Levels of service describe these conditions in terms of such factors as speed, travel time, delays, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. Levels of service are given letter designations ranging from A to F, which are defined in Tables 1 and 2. The LOS measurement that is used to determine the significance of any impacts a project might have on traffic and circulation is an intersection's *overall* LOS.

The operating conditions at the signalized study intersections were evaluated using the 2000 *Highway Capacity Manual (HCM)* "Level of Service" methodology. The *HCM* methodology determines the capacity of each lane group approaching the intersection. The LOS is then based on average delay (in seconds per vehicle) for the various movements within the intersection. A combined weighted average delay and LOS are presented for the intersection. The LOS definitions for signalized intersections are included in Table 1.

### **Freeway Segment Analysis Methodology for SR 4**

For State Route 4 the freeway analysis was based on the 2000 Highway Capacity Manual (2000 HCM)<sup>6</sup> using the Highway Capacity Software (HCS)<sup>7</sup>. In the 2000 HCM the level of service is described as a quality measure describing operation conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. In the 2000 HCM six levels of service grades are defined for each type of facility that has analysis procedures available. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each Level of Service represents a range of operating

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<sup>6</sup> Highway Capacity Manual (HCM 2000 – Updated), Transportation Research Board, Washington, D.C., October 12, 2006.

<sup>7</sup> Highway Capacity Software Version 5.21, McTrans Center, University of Florida, Gainesville, FL, 2005.

**Table 1**  
**Level of Service for Signalized Intersections**

The **2000 HIGHWAY CAPACITY MANUAL** methodology for analyzing signalized intersections measures the performance by the control delay per vehicle in seconds. The **CRITICAL MOVEMENT ANALYSIS METHODOLOGY**<sup>8</sup>, required by the CCTA is described in Transportation Research Board’s Circular 212, and defines Level of Service (LOS) for signalized intersections in terms of the ratio of critical movement traffic volumes to an estimate of the maximum capacity for critical volume at an intersection. Critical movements at an intersection are calculated by determining the maximum traffic volumes for conflicting traffic movements (i.e., left-turns plus opposing through traffic) per single stream of traffic (by lane). For the Critical Movement Methodology the **LOS** for intersections is determined by the ratio of critical movement volume to critical movement capacity (volume-to-capacity ratio = V/C) for the entire intersection. Six categories of LOS are defined, ranging from **LOS “A”** with minor delay to **LOS “F”** with delays averaging more than 40 seconds during the peak hour.

Level-of-Service		Description	
<b>LOS “A”</b>	V/C Range Average Stop Delay (seconds)	0.00 - 0.60 0.0 - 10.0	Free flow. If signalized, conditions are such that no vehicle phase is fully utilized and no vehicle waits through more than one red indication. Very slight or no delay.
<b>LOS “B”</b>	V/C Range Average Stop Delay (seconds)	0.61 - 0.70 10.1 - 20.0	Stable flow. If signalized, an occasional approach phase is fully utilized; vehicle platoons are formed. Slight delay.
<b>LOS “C”</b>	V/C Range Average Stop Delay (seconds)	0.71 - 0.80 20.1 – 35.0	Stable flow or operation. If signalized, drivers occasionally may have to wait through more than one red indication. Acceptable delay.
<b>LOS “D”</b>	V/C Range Average Stop Delay (seconds)	0.81 - 0.90 35.1 - 55.0	Approaching unstable flow or operation; queues develop but quickly clear. Tolerable delay.
<b>LOS “E”</b>	V/C Range Average Stop Delay (seconds)	0.91 - 1.00 55.1 - 80.0	Unstable flow or operation; the intersection has reached ultimate capacity; Congestion and intolerable delay.
<b>LOS “F”</b>	V/C Range <sup>9</sup> - Measured - Forecast Average Stop Delay (seconds)	1.00 or less 1.01 or more > 80	Forced flow or operation. Intersection operates below capacity. Jammed

<sup>8</sup> Source: “Planning Level Methodology - Signalized Intersections” *Circular 212*, Transportation Research Board, Washington D.C., January, 1980

<sup>9</sup> While forecast demands can exceed maximum capacity, actual measured volumes theoretically cannot. Since traffic inefficiencies arise at capacity demand conditions, the calculated V/C ratios for LOS “F” conditions can be substantially below a V/C of 1.00.



conditions and the driver's perception of those conditions. The Level of Service for a freeway segment is based on density given in units of passenger cars per mile per lane. The 2000 HCM freeway LOS thresholds are given in **Table 2** and these are all based on density.

**Table 2**  
**Level-of-Service for Basic Freeway Segments**

<b>Level of Service (LOS)</b>	<b>Density (pc/mi/ln)</b>	<b>Traffic Condition</b>
A	< 11	No Delay
B	>11 – 18	Short Delay
C	>18 – 26	Moderate Delay
D	>26 – 35	Long Delay
E	>35 – 45	Very Long Delay
F	>45	Volume>Capacity

Source: Exhibit 23-2 of the 2000 Highway Capacity Manual

### **Pt. Molate Casino/Resort Project Trip Generation and Trip Distribution**

An extensive review of the project trip generation from the previously referenced DMJM Harris Study has been conducted and that analysis concluded that the project trip generation estimates were accurate. However, based on our review of the San Francisco Bay Area Water Emergency Transportation Authority (WETA) plans for future ferry service in the area the reduction in project trips due to ferry service was reduced to 15 percent. As a result, we have revisited the distribution of gaming patrons from the San Francisco and northern San Mateo regions and increased the percent of project traffic added to Sir Francis Drake Boulevard from about 3 percent to 6.3 percent. As per the comments received this also reflects an adjustment to assume that 50 percent of this traffic would travel to the project via the Golden Gate Bridge and 50% would take the Bay Bridge. In addition, it should be noted that 10 percent of the employee trips are assumed to travel to the site via Sir Francis Drake Boulevard. Therefore, the analysis of potential impacts on the Sir Francis Drake Boulevard corridor and the intersections in Larkspur are based on these assumptions.

### **Description of Additional Transportation Facilities Being Studied as Part of this Analysis**

A brief description of the additional roadway facilities being studied in this analysis is provided below:

SR 4 extends from Interstate 80 (I-80) in Hercules east to SR 89 in the Sierra. In the vicinity of I-80, SR 4 is a freeway with full or partial interchanges at Willow Avenue and Sycamore Avenue.

*Sir Francis Drake Boulevard* extends from the San Quentin Peninsula in the east to its terminus at Shoreline Highway near the Point Reyes National Forest, in the west. In the vicinity of SQSP, Sir Francis Drake Boulevard is a two-lane undivided roadway (one lane in each direction) and has a posted speed limit of 45 miles per hour (mph). In the city of Larkspur, Sir Francis Drake Boulevard is a four-lane (two lanes in each direction) principal arterial with a posted speed limit of 40 mph. This roadway is part of the Marin County Congestion Management Agency's 2003 CMP network.

### **Analysis of Project Impacts on State Route 4 near Hercules**

Existing and cumulative traffic volumes for I-80 were taken from the freeway analysis included in the Transportation Impact Analysis for the DEIR on the Hercules New Town Center Project.<sup>10</sup> The resulting traffic volume forecasts used in the analysis were based on the City of Hercules Traffic Model. The City of Hercules Traffic Model is a detailed citywide travel demand forecasting model that is derived from, and is consistent with, the Contra Costa Transportation Authority (CCTA) Countywide travel demand forecasting model. The Hercules Model uses the Countywide Model as a basis for regional trip generation, distribution, and modal split. However, it incorporates greater land use and roadway network detail within the City and runs trip assignment on a "windowed" subarea network that includes only the City and major regional gateways. The Hercules Model meets most Caltrans and CCTA validation criteria, and has been approved for use on projects such as Hercules' Draft Ramp Relocation PSR. The CCTA has also approved the Hercules Model for use on projects within the City for a period of five years (the time until the next major Decennial Update of the Countywide Model). Project trips were manually distributed to SR 4 (approximately 11%) using the trip distribution assumptions previously discussed.

According to the previously mentioned 2008 WCCTAC Action Plan Update a project would be considered to have a significant impact (in West Contra Costa County) if it would cause:

- 1) A roadway segment to degrade from LOS E or better to LOS F; or
- 2) Increase the traffic volumes by more than 2 percent for a roadway segment that would operate at LOS F without the project.

The background and cumulative LOS conditions on SR 4 are presented in Tables 3 through 11 which are at the end of this memorandum. A complete set of the LOS calculations used in these tables is included in the appendix to this memorandum.

Based on the results of the LOS analysis summarized in Tables 3 through 11 (attached to this memorandum) the study segments of SR 4 studied would continue to meet the LOS standards (LOS E) under all scenarios and the proposed project would not cause any significant impacts to SR 4 in the Hercules area. As a result, no project mitigations on SR 4 would be required.

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<sup>10</sup> *Hercules New Town Center DEIR*, RBF Consulting, Walnut Creek, CA, October 2008.

### Analysis of Project Impacts on Sir Francis Drake Boulevard

Existing and cumulative traffic volumes for Sir Francis Drake Boulevard were determined from the analysis included in the Transportation Impact Analysis for the San Quentin State Prison Central Health Services Center Project DEIR<sup>11</sup> and also the Sonoma-Marín Area Rail Transit (SMART) project FEIR.<sup>12</sup>

The Cumulative scenario includes the background conditions traffic generated by approved and planned projects prior to completion of the proposed project (2010), plus anticipated traffic from the San Quentin State Prison Condemned Inmate Project. Planned and approved projects included in the Cumulative scenario are similar to those described previously in the Background conditions scenario. However, both the San Quentin State Prison Condemned Inmate Project and the Central Health Services Project are also included in the Cumulative scenario to illustrate the future operating conditions in the area, including potential traffic growth from San Quentin.

The FEIR from the SMART train project included an analysis of intersection #3 (Larkspur Landing Circle West and the Ferry Terminal Entrance at Sir Francis Drake Boulevard). This project was subsequently approved by the voters and a rail terminus in Larkspur is currently being studied. It is expected that this project will ultimately include some additional transit, pedestrian, and bicycle improvements. Project trips were distributed to using the trip distribution assumptions previously discussed which resulted in an estimated total of 114 PM peak hour project trips being added to Sir Francis Drake Boulevard in Larkspur.

Based on the City of Larkspur and Caltrans Standards a project would be considered to have a significant impact at these intersections if it would cause:

- 1) A roadway segment to degrade from LOS D or better to LOS E or F; or
- 2) The addition of the project's peak hour traffic causes an increase of traffic volumes on any intersection approach by more than ten vehicles or one percent of the existing volume, whichever is less.

As described in the Final Transportation Impact Analysis for the San Quentin State Prison CIC project there are two intersections in Larkspur that would exceed the City's LOS Standards under both the background plus project and cumulative plus project scenarios. These intersections include 1) Sir Francis Drake Boulevard at the U.S. 101 Northbound ramps and 2) Sir Francis Drake Boulevard at the Larkspur Ferry Terminal Entrance/Larkspur Landing Circle (west).

These intersections are part of a segment that has been "grandfathered" at LOS F by the Marin Congestion Management Program.<sup>13</sup> However, comments received from the Transportation Authority of Marin (TAM) included the following statements: "While a neighboring County would be excluded from

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<sup>11</sup> *San Quentin State Prison Central Health Services Center Project FEIR and Addendum*, EDAW, Sacramento, CA, June 26, 2009.

<sup>12</sup> *Sonoma-Marín Area Rail Transit FEIR*, Aspen Environmental Group, San Francisco, CA, June, 2006.

<sup>13</sup> *2009 Update to the Marin Congestion Management Program*, DKS Associates, Oakland, 2009.

addressing the County’s conformance requirements per enabling CMP legislation, the CMP monitoring data provides an indicator that the Point Molate project would most likely contribute to existing significant traffic congestion (on Sir Francis Drake Boulevard in Larkspur).<sup>14</sup> It was subsequently determined that the project would add more than ten vehicles to the approaches at the two intersections (listed above) that exceed the City’s LOS standards.. Therefore, based on the City of Larkspur’s significance criteria and the comments from TAM the project’s impacts at these intersections would be considered significant. The worst-case LOS at each of the project study intersections for both baseline plus project and cumulative plus project conditions are listed below:

1. U.S. 101 Southbound Off-Ramp at Sir Francis Drake Boulevard – LOS B or better
2. U.S. 101 Northbound Ramps at Sir Francis Drake Boulevard – **LOS F (PM peak hour)**
3. Larkspur Landing Circle (west) at Sir Francis Drake Boulevard – **LOS E (PM Peak Hour)**
4. Larkspur Landing Circle (east) at Sir Francis Drake Boulevard – LOS C or better

As noted above, the project is forecast to cause significant impacts to traffic operations on Sir Francis Drake Boulevard at two of the four project study intersections. As a result, payment of the Larkspur Traffic Impact Fee would be required as mitigation.

**Project Impact at the U.S. 101 Northbound On- and Off-Ramps at Sir Francis Drake Boulevard (Intersection #2):** During the PM peak hour the intersection of the U.S. 101 Northbound On- and Off-Ramps at Sir Francis Drake Boulevard (Intersections #2) is forecast to operate at LOS F during the PM peak hour under both the baseline and cumulative plus project conditions.

**Project Mitigation:** As mitigation for the impacts at this intersection the project shall be required to pay the Traffic Impact Fees established by the City of Larkspur. Finding D of Chapter 18.15.040.A (1) of the Larkspur Municipal Code required that a traffic impact fee be paid for any new use that exceeds the former use by ten or more trips. The fee provided for a proportionate share of funds necessary to construct transportation improvements as shown on the programmed transportation improvements list and would be considered as mitigation for the project’s impacts on the City of Larkspur’s primary circulation system. The fee is currently established at \$3,399 per PM peak hour trip increase (CC Resolution No. 39/92) which (at 114 PM peak hour trips) would equate to a fee of \$386,486.

Larkspur has a General Plan Policy (Policy M) that states that “Sir Francis Drake Boulevard shall not be widened to allow additional through traffic lanes.” Based on the Larkspur General Plan it is expected that the traffic impact fees would be utilized mainly to reduce trips in the area through transit, bicycle, and pedestrian improvements. The traffic impact fees may also ultimately be used for some roadway improvements along Sir Francis Drake Boulevard, as specified in the programmed transportation improvements list. However, it is expected that the project’s impacts will be mitigated primarily by building on the current plans for improving transit, pedestrian, and bicycle access in the area. Current plans for the area include the Central Marin Ferry Connection Project and the SMART Train Project. It should also be noted that a substantial improvement to bus transit in the area is expected to be

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<sup>14</sup> Letter from Karita Zimmerman, Planning Manager, Transportation Authority of Marin, San Rafael, October 21, 2009.

implemented as part of a shuttle system proposed for the SMART train project. The Marin County Transportation Plan (2035) has also identified a project to improve local access to US 101 (from Tamalpais Drive to just north of Sir Francis Drake Blvd). This project may also include improvements at this ramp intersection. This project has an overall estimated cost of 120.7 million and includes funding from Regional Measure 2. Implementation of this mitigation (payment of the Larkspur Traffic Impact Fees) would reduce the impact to a **less than significant level**.

**Project Impact at the Larkspur Landing Circle (west) and the Ferry Terminal Entrance at Sir Francis Drake Boulevard (Intersection #3):** During the PM peak hour the intersection of the Larkspur Landing Circle (west) and the Ferry Terminal Entrance at Sir Francis Drake Boulevard is forecast to operate at LOS E during the PM peak hour under baseline plus project conditions. In addition to this, according to the information in the SMART Train DEIR this intersection would operate at LOS F under cumulative plus project conditions. Please note that this assumes implementation of the planned SMART Train Project.

**Project Mitigation:** As mitigation for the impacts at this intersection the project shall be required to pay the Traffic Impact Fees established by the City of Larkspur. As described above, Finding D of Chapter 18.15.040.A (1) of the Larkspur Municipal Code required that a traffic impact fee be paid for any new use that exceeds the former use by ten or more trips. The fee provided for a proportionate share of funds necessary to construct transportation improvements as shown on the programmed transportation improvements list and would be considered as mitigation for the project's impacts on the City of Larkspur's primary circulation system. The fee is currently established at \$3,399 per PM peak hour trip increase (CC Resolution No. 39/92) which (at 114 PM peak hour trips) would equate to a fee of \$386,486.

Based on the Larkspur General Plan it is expected that the traffic impact fees would be utilized mainly to reduce trips in the area through transit, bicycle, and pedestrian improvements. The traffic impact fees may also ultimately be used for some roadway improvements along Sir Francis Drake Boulevard, as specified in the programmed transportation improvements list. However, it is expected that the project's impacts will be mitigated primarily by building on the current plans for improving transit, pedestrian, and bicycle access in the area. Current plans for the area include the Central Marin Ferry Connection Project and the SMART Train Project. It should also be noted that a substantial improvement to bus transit in the area is expected to be implemented as part of a shuttle system proposed for the SMART train project. Implementation of this mitigation (payment of the Larkspur Traffic Impact Fees) would reduce the impact to a **less than significant level**.

Please contact us if there are any questions or comments.

**Table 3**  
**State Route 4 Existing LOS Analysis - AM Peak Hour**

	Facility Type	Segment Limits		No Project Conditions			With Project Conditions			Percent Increase in Volume	Impact
		From	To	Volume	Density	LOS	Volume	Density	LOS		
Alt A	Segment	I-80 EB Off-Ramp	Willow Ave	1,696	14.5	B	1,718	14.7	B	1.3%	No
	Segment	Willow Ave	Sycamore Ave	1,696	14.5	B	1,718	14.7	B	1.3%	No
	Segment	Sycamore Ave	Willow Ave	1,682	14.4	B	1,724	14.8	B	2.5%	No
	Segment	Willow Ave	I-80 On-Ramps	1,209	10.4	A	1,251	10.7	A	3.5%	No
Alt B	Segment	I-80 EB Off-Ramp	Willow Ave	1,696	14.5	B	1,732	14.8	B	2.1%	No
	Segment	Willow Ave	Sycamore Ave	1,696	14.5	B	1,732	14.8	B	2.1%	No
	Segment	Sycamore Ave	Willow Ave	1,682	14.4	B	1,727	14.8	B	2.7%	No
	Segment	Willow Ave	I-80 On-Ramps	1,209	10.4	A	1,254	10.8	A	3.7%	No
Alt C	Segment	I-80 EB Off-Ramp	Willow Ave	1,696	14.5	B	1,710	14.7	B	0.8%	No
	Segment	Willow Ave	Sycamore Ave	1,696	14.5	B	1,710	14.7	B	0.8%	No
	Segment	Sycamore Ave	Willow Ave	1,682	14.4	B	1,710	14.6	B	1.7%	No
	Segment	Willow Ave	I-80 On-Ramps	1,209	10.4	A	1,237	10.6	A	2.3%	No
Alt D	Segment	I-80 EB Off-Ramp	Willow Ave	1,696	14.5	B	1,744	15.0	B	2.8%	No
	Segment	Willow Ave	Sycamore Ave	1,696	14.5	B	1,744	15.0	B	2.8%	No
	Segment	Sycamore Ave	Willow Ave	1,682	14.4	B	1,708	14.6	B	1.5%	No
	Segment	Willow Ave	I-80 On-Ramps	1,209	10.4	A	1,235	10.6	A	2.2%	No

Net total assignment to SR-4 Freeway of 10.9%

**Table 4**  
**State Route 4 Existing LOS Analysis - PM Peak Hour**

	Facility Type	Segment Limits		No Project Conditions			With Project Conditions			Percent Increase in Volume	Impact
		From	To	Volume	Density	LOS	Volume	Density	LOS		
Alt A	Segment	I-80 EB Off-Ramp	Willow Ave	2,079	17.8	B	2,151	18.4	C	3.5%	No
	Segment	Willow Ave	Sycamore Ave	2,079	17.8	B	2,151	18.4	C	3.5%	No
	Segment	Sycamore Ave	Willow Ave	2,454	21.0	C	2,529	21.7	C	3.1%	No
	Segment	Willow Ave	I-80 On-Ramps	1,424	12.2	B	1,499	12.8	B	5.3%	No
Alt B	Segment	I-80 EB Off-Ramp	Willow Ave	2,079	17.8	B	2,158	18.5	C	3.8%	No
	Segment	Willow Ave	Sycamore Ave	2,079	17.8	B	2,158	18.5	C	3.8%	No
	Segment	Sycamore Ave	Willow Ave	2,454	21.0	C	2,542	21.8	C	3.6%	No
	Segment	Willow Ave	I-80 On-Ramps	1,424	12.2	B	1,512	13.0	B	6.2%	No
Alt C	Segment	I-80 EB Off-Ramp	Willow Ave	2,079	17.8	B	2,123	18.2	C	2.1%	No
	Segment	Willow Ave	Sycamore Ave	2,079	17.8	B	2,123	18.2	C	2.1%	No
	Segment	Sycamore Ave	Willow Ave	2,454	21.0	C	2,503	21.4	C	2.0%	No
	Segment	Willow Ave	I-80 On-Ramps	1,424	12.2	B	1,473	12.6	B	3.4%	No
Alt D	Segment	I-80 EB Off-Ramp	Willow Ave	2,079	17.8	B	2,113	18.1	C	1.6%	No
	Segment	Willow Ave	Sycamore Ave	2,079	17.8	B	2,113	18.1	C	1.6%	No
	Segment	Sycamore Ave	Willow Ave	2,454	21.0	C	2,509	21.5	C	2.2%	No
	Segment	Willow Ave	I-80 On-Ramps	1,424	12.2	B	1,479	12.7	B	3.9%	No

Net total assignment to SR-4 Freeway of 10.9%

**Table 5**  
**State Route 4 Existing LOS Analysis - SAT Peak Hour**

	Facility Type	Segment Limits		No Project Conditions			With Project Conditions			Percent Increase in Volume	Impact
		From	To	Volume	Density	LOS	Volume	Density	LOS		
Alt A	Segment	I-80 EB Off-Ramp	Willow Ave	1,559	13.4	B	1,661	14.2	B	6.5%	No
	Segment	Willow Ave	Sycamore Ave	1,559	13.4	B	1,661	14.2	B	6.5%	No
	Segment	Sycamore Ave	Willow Ave	1,841	15.8	B	1,939	16.6	B	5.3%	No
	Segment	Willow Ave	I-80 On-Ramps	1,068	9.2	A	1,166	10.0	A	9.2%	No
Alt B	Segment	I-80 EB Off-Ramp	Willow Ave	1,559	13.4	B	1,669	14.3	B	7.1%	No
	Segment	Willow Ave	Sycamore Ave	1,559	13.4	B	1,669	14.3	B	7.1%	No
	Segment	Sycamore Ave	Willow Ave	1,841	15.8	B	1,949	16.7	B	5.9%	No
	Segment	Willow Ave	I-80 On-Ramps	1,068	9.2	A	1,176	10.1	A	10.1%	No
Alt C	Segment	I-80 EB Off-Ramp	Willow Ave	1,559	13.4	B	1,627	13.9	B	4.4%	No
	Segment	Willow Ave	Sycamore Ave	1,559	13.4	B	1,627	13.9	B	4.4%	No
	Segment	Sycamore Ave	Willow Ave	1,841	15.8	B	1,901	16.3	B	3.3%	No
	Segment	Willow Ave	I-80 On-Ramps	1,068	9.2	A	1,128	9.7	A	5.6%	No
Alt D	Segment	I-80 EB Off-Ramp	Willow Ave	1,559	13.4	B	1,604	13.8	B	2.9%	No
	Segment	Willow Ave	Sycamore Ave	1,559	13.4	B	1,604	13.8	B	2.9%	No
	Segment	Sycamore Ave	Willow Ave	1,841	15.8	B	1,905	16.3	B	3.5%	No
	Segment	Willow Ave	I-80 On-Ramps	1,068	9.2	A	1,132	9.7	A	6.0%	No

Net total assignment to SR-4 Freeway of 10.9%



**Table 6**  
**State Route 4 Background LOS Analysis - AM Peak Hour**

	Facility Type	Segment Limits		No Project Conditions			With Project Conditions			Percent Increase in Volume	Impact
		From	To	Volume	Density	LOS	Volume	Density	LOS		
Alt A	Weaving	I-80 EB Off-Ramp	Willow Ave	2,673	18.9	B	2,695	19.1	B	0.8%	No
	Segment	Willow Ave	Sycamore Ave	1,888	16.2	B	1,910	16.4	B	1.2%	No
	Segment	Sycamore Ave	Willow Ave	1,780	15.3	B	1,822	15.6	B	2.4%	No
	Segment	Willow Ave	I-80 On-Ramps	1,296	11.1	B	1,338	11.5	B	3.2%	No
Alt B	Weaving	I-80 EB Off-Ramp	Willow Ave	2,673	18.9	C	2,709	19.2	B	1.3%	No
	Segment	Willow Ave	Sycamore Ave	1,888	16.2	B	1,924	16.5	B	1.9%	No
	Segment	Sycamore Ave	Willow Ave	1,780	15.3	B	1,825	15.6	B	2.5%	No
	Segment	Willow Ave	I-80 On-Ramps	1,296	11.1	B	1,341	11.5	B	3.5%	No
Alt C	Weaving	I-80 EB Off-Ramp	Willow Ave	2,673	18.9	C	2,687	19.0	B	0.5%	No
	Segment	Willow Ave	Sycamore Ave	1,888	16.2	B	1,902	16.3	B	0.7%	No
	Segment	Sycamore Ave	Willow Ave	1,780	15.3	B	1,808	15.5	B	1.6%	No
	Segment	Willow Ave	I-80 On-Ramps	1,296	11.1	B	1,324	11.4	B	2.2%	No
Alt D	Weaving	I-80 EB Off-Ramp	Willow Ave	2,673	18.9	C	2,721	19.2	B	1.8%	No
	Segment	Willow Ave	Sycamore Ave	1,888	16.2	B	1,936	16.6	B	2.5%	No
	Segment	Sycamore Ave	Willow Ave	1,780	15.3	B	1,806	15.5	B	1.5%	No
	Segment	Willow Ave	I-80 On-Ramps	1,296	11.1	B	1,322	11.3	B	2.0%	No

Net total assignment to SR-4 Freeway of 10.9%

**Table 7**  
**State Route 4 Background LOS Analysis - PM Peak Hour**

	Facility Type	Segment Limits		No Project Conditions			With Project Conditions			Percent Increase in Volume	Impact
		From	To	Volume	Density	LOS	Volume	Density	LOS		
Alt A	Weaving	I-80 EB Off-Ramp	Willow Ave	3,304	24.7	C	3,376	25.2	C	2.2%	No
	Segment	Willow Ave	Sycamore Ave	2,202	18.9	C	2,274	19.5	C	3.3%	No
	Segment	Sycamore Ave	Willow Ave	2,590	22.2	C	2,665	22.8	C	2.9%	No
	Segment	Willow Ave	I-80 On-Ramps	1,534	13.2	B	1,609	13.8	B	4.9%	No
Alt B	Weaving	I-80 EB Off-Ramp	Willow Ave	3,304	24.7	C	3,383	25.3	C	2.4%	No
	Segment	Willow Ave	Sycamore Ave	2,202	18.9	C	2,281	19.6	C	3.6%	No
	Segment	Sycamore Ave	Willow Ave	2,590	22.2	C	2,678	23.0	C	3.4%	No
	Segment	Willow Ave	I-80 On-Ramps	1,534	13.2	B	1,622	13.9	B	5.7%	No
Alt C	Weaving	I-80 EB Off-Ramp	Willow Ave	3,304	24.7	C	3,348	25.0	C	1.3%	No
	Segment	Willow Ave	Sycamore Ave	2,202	18.9	C	2,246	19.2	C	2.0%	No
	Segment	Sycamore Ave	Willow Ave	2,590	22.2	C	2,639	22.6	C	1.9%	No
	Segment	Willow Ave	I-80 On-Ramps	1,534	13.2	B	1,583	13.6	B	3.2%	No
Alt D	Weaving	I-80 EB Off-Ramp	Willow Ave	3,304	24.7	C	3,338	25.0	C	1.0%	No
	Segment	Willow Ave	Sycamore Ave	2,202	18.9	C	2,236	19.2	C	1.5%	No
	Segment	Sycamore Ave	Willow Ave	2,590	22.2	C	2,645	22.7	C	2.1%	No
	Segment	Willow Ave	I-80 On-Ramps	1,534	13.2	B	1,589	13.6	B	3.6%	No

Net total assignment to SR-4 Freeway of 10.9%

**Table 8**  
**State Route 4 Background LOS Analysis - SAT Peak Hour**

	Facility Type	Segment Limits		No Project Conditions			With Project Conditions			Percent Increase in Volume	Impact
		From	To	Volume	Density	LOS	Volume	Density	LOS		
Alt A	Weaving	I-80 EB Off-Ramp	Willow Ave	2,478	17.4	B	2,580	18.0	B	4.1%	No
	Segment	Willow Ave	Sycamore Ave	1,652	14.2	B	1,754	15.0	B	6.2%	No
	Segment	Sycamore Ave	Willow Ave	1,943	16.6	B	2,041	17.5	B	5.0%	No
	Segment	Willow Ave	I-80 On-Ramps	1,151	9.9	A	1,249	10.7	A	8.5%	No
Alt B	Weaving	I-80 EB Off-Ramp	Willow Ave	2,478	17.4	B	2,588	18.1	B	4.4%	No
	Segment	Willow Ave	Sycamore Ave	1,652	14.2	B	1,762	15.1	B	6.7%	No
	Segment	Sycamore Ave	Willow Ave	1,943	16.6	B	2,051	17.6	B	5.6%	No
	Segment	Willow Ave	I-80 On-Ramps	1,151	9.9	A	1,259	10.8	A	9.4%	No
Alt C	Weaving	I-80 EB Off-Ramp	Willow Ave	2,478	17.4	B	2,546	17.8	B	2.7%	No
	Segment	Willow Ave	Sycamore Ave	1,652	14.2	B	1,720	14.7	B	4.1%	No
	Segment	Sycamore Ave	Willow Ave	1,943	16.6	B	2,003	17.2	B	3.1%	No
	Segment	Willow Ave	I-80 On-Ramps	1,151	9.9	A	1,211	10.4	A	5.2%	No
Alt D	Weaving	I-80 EB Off-Ramp	Willow Ave	2,478	17.4	B	2,523	17.6	B	1.8%	No
	Segment	Willow Ave	Sycamore Ave	1,652	14.2	B	1,697	14.5	B	2.7%	No
	Segment	Sycamore Ave	Willow Ave	1,943	16.6	B	2,007	17.2	B	3.3%	No
	Segment	Willow Ave	I-80 On-Ramps	1,151	9.9	A	1,215	10.4	A	5.6%	No

Net total assignment to SR-4 Freeway of 10.9%

**Table 9**  
**State Route 4 Cumulative LOS Analysis - AM Peak Hour**

	Facility Type	Segment Limits		No Project Conditions			With Project Conditions			Percent Increase in Volume	Impact
		From	To	Volume	Density	LOS	Volume	Density	LOS		
Alt A	Weaving	I-80 EB Off-Ramp	Willow Ave	2,850	20.4	C	2,872	20.6	C	0.8%	No
	Segment	Willow Ave	Sycamore Ave	2,150	18.4	C	2,172	18.6	C	1.0%	No
	Segment	Sycamore Ave	Willow Ave	2,290	19.6	C	2,332	20.0	C	1.8%	No
	Segment	Willow Ave	I-80 On-Ramps	1,340	11.5	B	1,382	11.8	B	3.1%	No
Alt B	Weaving	I-80 EB Off-Ramp	Willow Ave	2,850	20.4	C	2,886	20.7	C	1.3%	No
	Segment	Willow Ave	Sycamore Ave	2,150	18.4	C	2,186	18.7	C	1.7%	No
	Segment	Sycamore Ave	Willow Ave	2,290	19.6	C	2,335	20.0	C	2.0%	No
	Segment	Willow Ave	I-80 On-Ramps	1,340	11.5	B	1,385	11.9	B	3.4%	No
Alt C	Weaving	I-80 EB Off-Ramp	Willow Ave	2,850	20.4	C	2,864	20.5	C	0.5%	No
	Segment	Willow Ave	Sycamore Ave	2,150	18.4	C	2,164	18.5	C	0.7%	No
	Segment	Sycamore Ave	Willow Ave	2,290	19.6	C	2,318	19.9	C	1.2%	No
	Segment	Willow Ave	I-80 On-Ramps	1,340	11.5	B	1,368	11.7	B	2.1%	No
Alt D	Weaving	I-80 EB Off-Ramp	Willow Ave	2,850	20.4	C	2,898	20.7	C	1.7%	No
	Segment	Willow Ave	Sycamore Ave	2,150	18.4	C	2,198	18.8	C	2.2%	No
	Segment	Sycamore Ave	Willow Ave	2,290	19.6	C	2,316	19.8	C	1.1%	No
	Segment	Willow Ave	I-80 On-Ramps	1,340	11.5	B	1,366	11.7	B	1.9%	No

Net total assignment to SR-4 Freeway of 10.9%

**Table 10**  
**State Route 4 Cumulative LOS Analysis - PM Peak Hour**

	Facility Type	Segment Limits		No Project Conditions			With Project Conditions			Percent Increase in Volume	Impact
		From	To	Volume	Density	LOS	Volume	Density	LOS		
Alt A	Weaving	I-80 EB Off-Ramp	Willow Ave	4,670	38.6	E	4,742	39.1	E	1.5%	No
	Segment	Willow Ave	Sycamore Ave	3,020	26.0	C	3,092	26.7	D	2.4%	No
	Segment	Sycamore Ave	Willow Ave	2,920	25.1	C	2,995	25.8	C	2.6%	No
	Segment	Willow Ave	I-80 On-Ramps	2,104	18.0	B	2,179	18.7	C	3.6%	No
Alt B	Weaving	I-80 EB Off-Ramp	Willow Ave	4,670	38.6	E	4,749	39.1	E	1.7%	No
	Segment	Willow Ave	Sycamore Ave	3,020	26.0	C	3,099	26.8	D	2.6%	No
	Segment	Sycamore Ave	Willow Ave	2,920	25.1	C	3,008	25.9	C	3.0%	No
	Segment	Willow Ave	I-80 On-Ramps	2,104	18.0	B	2,192	18.8	C	4.2%	No
Alt C	Weaving	I-80 EB Off-Ramp	Willow Ave	4,670	38.6	E	4,714	38.9	E	0.9%	No
	Segment	Willow Ave	Sycamore Ave	3,020	26.0	C	3,064	26.5	D	1.5%	No
	Segment	Sycamore Ave	Willow Ave	2,920	25.1	C	2,969	25.6	C	1.7%	No
	Segment	Willow Ave	I-80 On-Ramps	2,104	18.0	B	2,153	18.4	C	2.3%	No
Alt D	Weaving	I-80 EB Off-Ramp	Willow Ave	4,670	38.6	E	4,704	38.8	E	0.7%	No
	Segment	Willow Ave	Sycamore Ave	3,020	26.0	C	3,054	26.4	D	1.1%	No
	Segment	Sycamore Ave	Willow Ave	2,920	25.1	C	2,975	25.6	C	1.9%	No
	Segment	Willow Ave	I-80 On-Ramps	2,104	18.0	B	2,159	18.5	C	2.6%	No

Net total assignment to SR-4 Freeway of 10.9%

**Table 11**  
**State Route 4 Cumulative LOS Analysis - SAT Peak Hour**

	Facility Type	Segment Limits		No Project Conditions			With Project Conditions			Percent Increase in Volume	Impact
		From	To	Volume	Density	LOS	Volume	Density	LOS		
Alt A	Weaving	I-80 EB Off-Ramp	Willow Ave	3,503	26.7	C	3,605	27.4	C	2.9%	No
	Segment	Willow Ave	Sycamore Ave	2,265	19.4	C	2,367	20.3	C	4.5%	No
	Segment	Sycamore Ave	Willow Ave	2,190	18.8	C	2,288	19.6	C	4.5%	No
	Segment	Willow Ave	I-80 On-Ramps	1,578	13.5	B	1,676	14.4	B	6.2%	No
Alt B	Weaving	I-80 EB Off-Ramp	Willow Ave	3,503	26.7	D	3,613	27.5	C	3.1%	No
	Segment	Willow Ave	Sycamore Ave	2,265	19.4	C	2,375	20.4	C	4.9%	No
	Segment	Sycamore Ave	Willow Ave	2,190	18.8	C	2,298	19.7	C	4.9%	No
	Segment	Willow Ave	I-80 On-Ramps	1,578	13.5	B	1,686	14.4	B	6.8%	No
Alt C	Weaving	I-80 EB Off-Ramp	Willow Ave	3,503	26.7	D	3,571	27.2	C	1.9%	No
	Segment	Willow Ave	Sycamore Ave	2,265	19.4	C	2,333	20.0	C	3.0%	No
	Segment	Sycamore Ave	Willow Ave	2,190	18.8	C	2,250	19.3	C	2.7%	No
	Segment	Willow Ave	I-80 On-Ramps	1,578	13.5	B	1,638	14.0	B	3.8%	No
Alt D	Weaving	I-80 EB Off-Ramp	Willow Ave	3,503	26.7	D	3,548	27.0	C	1.3%	No
	Segment	Willow Ave	Sycamore Ave	2,265	19.4	C	2,310	19.8	C	2.0%	No
	Segment	Sycamore Ave	Willow Ave	2,190	18.8	C	2,254	19.3	C	2.9%	No
	Segment	Willow Ave	I-80 On-Ramps	1,578	13.5	B	1,642	14.1	B	4.1%	No

Net total assignment to SR-4 Freeway of 10.9%

**TECHNICAL  
MEMORANDUM  
APPENDIX**

**ADDITIONAL TRAFFIC ANALYSIS  
FOR POINT MOLATE  
CASINO/RESORT**  
In the City of Richmond

**Prepared for:**

Mike Taggart  
Analytical Environmental Services  
1801 7th Street, Suite 100  
Sacramento, CA 95811

**Prepared by:**

Abrams Associates  
1660 Olympic Boulevard, Suite 210  
Walnut Creek, CA 94596  
Tel: 925.945.0201



**Abrams Associates**  
TRAFFIC ENGINEERING, INC.

**DECEMBER, 2009**

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1696	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	461	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	945	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

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Flow rate, vp	945	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.5	pc/mi/ln



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing  
 Description: Point Molate Analysis

---

 Flow Inputs and Adjustments
 

---

Volume, V	1696	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	461	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	945	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

---

Flow rate, vp	945	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: AM  
Freeway/Direction: SR-4 WB  
From/To: Sycamore Ave to Willow Ave  
Jurisdiction: City of Hercules  
Analysis Year: Existing  
Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1682	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	457	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	937	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

---

Flow rate, vp	937	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1209	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	329	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	673	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	673	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	10.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: PM  
Freeway/Direction: SR-4 EB  
From/To: I-80 Ramps to Willow Ave  
Jurisdiction: City of Hercules  
Analysis Year: Existing  
Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	2079	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	565	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1158	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1158	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	17.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2079	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	565	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1158	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1158	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	17.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2454	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	667	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1367	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1367	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	21.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1424	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	387	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	793	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	793	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	12.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1559	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	424	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	868	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	868	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.4	pc/mi/ln



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1559	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	424	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	868	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	868	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1841	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	500	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1026	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1026	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	15.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing  
 Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1068	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	290	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	595	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	595	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	9.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1718	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	467	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	957	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	957	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing Alta  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1718	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	467	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	957	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	957	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.7	pc/mi/ln



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1251	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	340	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	697	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	697	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	10.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2151	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	585	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1198	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1198	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.4	pc/mi/ln



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2151	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	585	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1198	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1198	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2529	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	687	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1409	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1409	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	21.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1499	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	407	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	835	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	835	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	12.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing Alta  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1661	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	451	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	925	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	925	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1661	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	451	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	925	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	925	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1939	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	527	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1080	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1080	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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Operational Analysis  
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Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: SAT  
Freeway/Direction: SR-4 WB Connector  
From/To: Willow Ave on to I-80 Ramps  
Jurisdiction: City of Hercules  
Analysis Year: Existing AltA  
Description: Point Molate Analysis

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Flow Inputs and Adjustments  
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Volume, V	1166	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	317	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	650	pc/h/ln

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Speed Inputs and Adjustments  
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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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LOS and Performance Measures  
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Flow rate, vp	650	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	10.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1732	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	471	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	965	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	965	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.8	pc/mi/ln



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1732	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	471	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	965	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	965	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1727	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	469	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	962	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	962	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1254	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	341	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	699	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	699	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	10.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2158	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	586	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1202	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1202	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2158	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	586	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1202	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1202	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2542	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	691	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1416	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1416	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	21.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1512	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	411	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	842	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	842	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1669	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	454	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	930	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	930	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.3	pc/mi/ln



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1669	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	454	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	930	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	930	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1949	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	530	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1086	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1086	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: SAT  
Freeway/Direction: SR-4 WB Connector  
From/To: Willow Ave on to I-80 Ramps  
Jurisdiction: City of Hercules  
Analysis Year: Existing AltB  
Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1176	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	320	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	655	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	655	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	10.1	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: AM  
Freeway/Direction: SR-4 EB  
From/To: I-80 Ramps to Willow Ave  
Jurisdiction: City of Hercules  
Analysis Year: Existing AltC  
Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1710	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	465	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	953	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	953	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: AM  
Freeway/Direction: SR-4 EB  
From/To: Willow Ave to Sycamore Ave  
Jurisdiction: City of Hercules  
Analysis Year: Existing AltC  
Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1732	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	471	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	965	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	965	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1710	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	465	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	953	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	953	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: AM  
Freeway/Direction: SR-4 WB Connector  
From/To: Willow Ave on to I-80 Ramps  
Jurisdiction: City of Hercules  
Analysis Year: Existing AltC  
Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1237	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	336	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	689	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	689	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	10.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2123	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	577	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1183	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1183	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.2	pc/mi/ln



Overall results are not computed when free-flow speed is less than 55 mph.

Phone:  
E-mail:

Fax:

Operational Analysis

Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: PM  
Freeway/Direction: SR-4 EB  
From/To: Willow Ave to Sycamore Ave  
Jurisdiction: City of Hercules  
Analysis Year: Existing AltC  
Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	2123	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	577	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1183	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h

Urban Freeway

LOS and Performance Measures

Flow rate, vp	1183	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2503	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	680	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1394	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1394	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	21.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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Operational Analysis  
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Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: PM  
Freeway/Direction: SR-4 WB Connector  
From/To: Willow Ave on to I-80 Ramps  
Jurisdiction: City of Hercules  
Analysis Year: Existing AltC  
Description: Point Molate Analysis

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Flow Inputs and Adjustments  
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Volume, V	1473	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	400	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	821	pc/h/ln

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Speed Inputs and Adjustments  
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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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LOS and Performance Measures  
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Flow rate, vp	821	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	12.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1627	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	442	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	906	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	906	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.9	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1627	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	442	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	906	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	906	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.9	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1901	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	517	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1059	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1059	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone:   
 E-mail:   
 Fax:

Operational Analysis

Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltC  
 Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1128	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	307	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	628	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	628	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	9.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1744	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	474	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	972	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	972	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	15.0	pc/mi/ln



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1744	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	474	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	972	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	972	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	15.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1708	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	464	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	951	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	951	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1235	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	336	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	688	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	688	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	10.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2113	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	574	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1177	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1177	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.1	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	2113	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	574	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1177	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1177	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.1	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2509	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	682	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1398	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1398	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	21.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1479	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	402	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	824	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	824	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	12.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: SAT  
Freeway/Direction: SR-4 EB  
From/To: I-80 Ramps to Willow Ave  
Jurisdiction: City of Hercules  
Analysis Year: Existing AltD  
Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1604	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	436	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	894	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	894	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.8	pc/mi/ln



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1604	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	436	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	894	pc/h/ln

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 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

---

Flow rate, vp	894	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone:  
E-mail:

Fax:

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Operational Analysis

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

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Flow Inputs and Adjustments

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Volume, V	1905	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	518	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1061	pc/h/ln

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Speed Inputs and Adjustments

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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LOS and Performance Measures

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Flow rate, vp	1061	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave on to I-80 Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Existing AltD  
 Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1132	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	308	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	631	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	631	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	9.7	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.16

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	1419	123	946	185	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	386	33	257	50	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1580	137	1053	206	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.56	0.41
Weaving and non-weaving speeds, Si	50.29	54.06
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 52.40 mph  
 Weaving segment density, D 18.93 pc/mi/ln  
 Level of service, LOS B  
 Capacity of base condition, cb 5715 pc/h  
 Capacity as a 15-minute flow rate, c 5576 pc/h  
 Capacity as a full-hour volume, ch 5130 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1259	3500	a
Average flow rate (pcphpl)	992	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.16	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1888	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	513	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1052	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1052	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1780	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	484	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	992	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	992	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	15.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1296	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	352	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	722	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	722	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.1	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.80  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.43  
 Weaving ratio, R 0.21

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	457	54	305	82	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1873	222	1248	335	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.67	0.53
Weaving and non-weaving speeds, Si	47.94	50.91
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 49.59 mph  
 Weaving segment density, D 24.72 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5685 pc/h  
 Capacity as a 15-minute flow rate, c 5546 pc/h  
 Capacity as a full-hour volume, ch 5102 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1583	3500	a
Average flow rate (pcphpl)	1226	2350	b
Volume ratio, VR	0.43	0.50	c
Weaving ratio, R	0.21	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2202	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	598	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1227	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1227	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.9	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2590	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	704	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1443	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1443	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	22.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1534	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	417	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	855	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	855	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.2	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.43  
 Weaving ratio, R 0.21

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	1261	150	841	226	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	343	41	229	61	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1404	167	936	251	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.53	0.39
Weaving and non-weaving speeds, Si	50.91	54.65
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 52.97 mph  
 Weaving segment density, D 17.36 pc/mi/ln  
 Level of service, LOS B  
 Capacity of base condition, cb 5685 pc/h  
 Capacity as a 15-minute flow rate, c 5546 pc/h  
 Capacity as a full-hour volume, ch 5102 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1187	3500	a
Average flow rate (pcphpl)	919	2350	b
Volume ratio, VR	0.43	0.50	c
Weaving ratio, R	0.21	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1652	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	449	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	920	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	920	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1943	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	528	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1082	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1082	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background  
 Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1151	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	313	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	641	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	641	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	9.9	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

\_\_\_\_\_Weaving Segment Speed, Density, Level of Service and Capacity\_\_\_\_\_

Weaving segment speed, S 52.44 mph  
 Weaving segment density, D 19.08 pc/mi/ln  
 Level of service, LOS B  
 Capacity of base condition, cb 5730 pc/h  
 Capacity as a 15-minute flow rate, c 5590 pc/h  
 Capacity as a full-hour volume, ch 5143 pc/h

\_\_\_\_\_Limitations on Weaving Segments\_\_\_\_\_

	Analyzed	If Max Exceeded	See Note
	Maximum		Note
Weaving flow rate, Vw	1259	3500	a
Average flow rate (pcphpl)	1000	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.16	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:  
 E-mail:

\_\_\_\_\_Operational Analysis\_\_\_\_\_

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

\_\_\_\_\_Inputs\_\_\_\_\_

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1500	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	C	
Volume ratio, VR	0.42	
Weaving ratio, R	0.16	

\_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	1441	123	946	185	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	392	33	257	50	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1605	137	1053	206	pc/h

\_\_\_\_\_Weaving and Non-Weaving Speeds\_\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.56	0.41
Weaving and non-weaving speeds, Si	50.28	54.12
Number of lanes required for		



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1910	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	519	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1064	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1064	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1822	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	495	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1015	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1015	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	15.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1338	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	364	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	745	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	745	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.5	pc/mi/ln

unconstrained operation, Nw (Exhibit 24-7) 1.80  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

\_\_\_\_\_ Weaving Segment Speed, Density, Level of Service and Capacity \_\_\_\_\_

Weaving segment speed, S 49.71 mph  
 Weaving segment density, D 25.21 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5723 pc/h  
 Capacity as a 15-minute flow rate, c 5583 pc/h  
 Capacity as a full-hour volume, ch 5136 pc/h

\_\_\_\_\_ Limitations on Weaving Segments \_\_\_\_\_

	Analyzed	If Max Exceeded	See Note
	Maximum		Note
Weaving flow rate, Vw	1583	3500	a
Average flow rate (pcphpl)	1253	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.21	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:  
 E-mail:

\_\_\_\_\_ Operational Analysis \_\_\_\_\_

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

\_\_\_\_\_ Inputs \_\_\_\_\_

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.21

\_\_\_\_\_ Conversion to pc/h Under Base Conditions \_\_\_\_\_

	Non-Weaving		Weaving		
	V	V	V	V	
	A-C	B-D	A-D	B-C	
Volume, V	1754	200	1121	301	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	477	54	305	82	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1954	222	1248	335	pc/h

\_\_\_\_\_ Weaving and Non-Weaving Speeds \_\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.67	0.52
Weaving and non-weaving speeds, Si	47.91	51.10
Number of lanes required for		

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2274	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	618	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1267	pc/h/ln

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 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1267	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2665	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	724	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1485	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1485	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	22.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1609	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	437	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	896	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	896	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.8	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.78  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

\_\_\_\_\_ Weaving Segment Speed, Density, Level of Service and Capacity \_\_\_\_\_

Weaving segment speed, S 53.18 mph  
 Weaving segment density, D 18.00 pc/mi/ln  
 Level of service, LOS B  
 Capacity of base condition, cb 5755 pc/h  
 Capacity as a 15-minute flow rate, c 5615 pc/h  
 Capacity as a full-hour volume, ch 5166 pc/h

\_\_\_\_\_ Limitations on Weaving Segments \_\_\_\_\_

	Analyzed	If Max Exceeded	See Note
	Maximum		Note
Weaving flow rate, Vw	1187	3500	a
Average flow rate (pcphpl)	957	2350	b
Volume ratio, VR	0.41	0.50	c
Weaving ratio, R	0.21	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:  
 E-mail:

\_\_\_\_\_ Operational Analysis \_\_\_\_\_

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

\_\_\_\_\_ Inputs \_\_\_\_\_

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1500	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	C	
Volume ratio, VR	0.41	
Weaving ratio, R	0.21	

\_\_\_\_\_ Conversion to pc/h Under Base Conditions \_\_\_\_\_

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	370	41	229	61	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1518	167	936	251	pc/h

\_\_\_\_\_ Weaving and Non-Weaving Speeds \_\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.53	0.38
Weaving and non-weaving speeds, Si	50.85	54.95
Number of lanes required for		



Overall results are not computed when free-flow speed is less than 55 mph.

Phone:  
E-mail:

Fax:

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Operational Analysis

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

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Flow Inputs and Adjustments

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Volume, V	1754	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	477	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	977	pc/h/ln

---

Speed Inputs and Adjustments

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

LOS and Performance Measures

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Flow rate, vp	977	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	15.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	2041	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	555	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1137	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

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Flow rate, vp	1137	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	17.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: SAT  
Freeway/Direction: SR-4 WB Connector  
From/To: Willow Ave to I-80 On-Ramps  
Jurisdiction: City of Hercules  
Analysis Year: Background AltA  
Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1249	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	339	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	696	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	696	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	10.7	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltB  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.16

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	395	33	257	50	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1621	137	1053	206	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.56	0.40
Weaving and non-weaving speeds, Si	50.27	54.16
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 52.47 mph  
 Weaving segment density, D 19.17 pc/mi/ln  
 Level of service, LOS B  
 Capacity of base condition, cb 5739 pc/h  
 Capacity as a 15-minute flow rate, c 5599 pc/h  
 Capacity as a full-hour volume, ch 5151 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1259	3500	a
Average flow rate (pcphpl)	1005	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.16	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1924	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	523	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1072	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1072	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1825	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	496	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1017	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1017	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	15.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1341	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	364	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	747	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	747	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.5	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.80  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltB  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.21

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	1761	200	1121	301	
Peak 15-min volume, v15	0.92	0.92	0.92	0.92	
Trucks and buses	479	54	305	82	v
Recreational vehicles	5	5	5	5	%
Trucks and buses PCE, ET	0	0	0	0	%
Recreational vehicle PCE, ER	1.5	1.5	1.5	1.5	
Heavy vehicle adjustment, fHV	1.2	1.2	1.2	1.2	
Driver population adjustment, fP	0.976	0.976	0.976	0.976	
Flow rate, v	1.00	1.00	1.00	1.00	
	1961	222	1248	335	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.67	0.52
Weaving and non-weaving speeds, Si	47.91	51.12
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 49.72 mph  
 Weaving segment density, D 25.25 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5727 pc/h  
 Capacity as a 15-minute flow rate, c 5587 pc/h  
 Capacity as a full-hour volume, ch 5140 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1583	3500	a
Average flow rate (pcphpl)	1255	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.21	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: PM  
Freeway/Direction: SR-4 EB  
From/To: Willow Ave to Sycamore Ave  
Jurisdiction: City of Hercules  
Analysis Year: Background AltB  
Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2281	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	620	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1271	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1271	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	2678	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	728	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1492	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1492	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	23.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: PM  
Freeway/Direction: SR-4 WB Connector  
From/To: Willow Ave to I-80 On-Ramps  
Jurisdiction: City of Hercules  
Analysis Year: Background AltB  
Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1622	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	441	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	904	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	904	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.9	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.78  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

\_\_\_\_\_Weaving Segment Speed, Density, Level of Service and Capacity\_\_\_\_\_

Weaving segment speed, S 53.19 mph  
 Weaving segment density, D 18.05 pc/mi/ln  
 Level of service, LOS B  
 Capacity of base condition, cb 5761 pc/h  
 Capacity as a 15-minute flow rate, c 5620 pc/h  
 Capacity as a full-hour volume, ch 5170 pc/h

\_\_\_\_\_Limitations on Weaving Segments\_\_\_\_\_

	Analyzed	If Max Exceeded	See Note
	Maximum		Note
Weaving flow rate, Vw	1187	3500	a
Average flow rate (pcphpl)	960	2350	b
Volume ratio, VR	0.41	0.50	c
Weaving ratio, R	0.21	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:  
 E-mail:

\_\_\_\_\_Operational Analysis\_\_\_\_\_

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltB  
 Description: Point Molate Analysis

\_\_\_\_\_Inputs\_\_\_\_\_

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1500	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	C	
Volume ratio, VR	0.41	
Weaving ratio, R	0.21	

\_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

	Non-Weaving		Weaving		
	V	V	V	V	
	A-C	B-D	A-D	B-C	
Volume, V	1371	150	841	226	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	373	41	229	61	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1527	167	936	251	pc/h

\_\_\_\_\_Weaving and Non-Weaving Speeds\_\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.53	0.38
Weaving and non-weaving speeds, Si	50.84	54.97
Number of lanes required for		

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1762	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	479	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	982	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	982	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	15.1	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	2051	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	557	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1143	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1143	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	17.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone:  
E-mail:

Fax:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1259	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	342	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	701	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	701	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	10.8	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.16

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	1433	123	946	185	
Peak 15-min volume, v15	0.92	0.92	0.92	0.92	
Trucks and buses	389	33	257	50	v
Recreational vehicles	5	5	5	5	%
Trucks and buses PCE, ET	0	0	0	0	%
Recreational vehicle PCE, ER	1.5	1.5	1.5	1.5	
Heavy vehicle adjustment, fHV	1.2	1.2	1.2	1.2	
Driver population adjustment, fP	0.976	0.976	0.976	0.976	
Flow rate, v	1.00	1.00	1.00	1.00	pc/h
	1596	137	1053	206	

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.56	0.41
Weaving and non-weaving speeds, Si	50.28	54.10
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 52.42 mph  
 Weaving segment density, D 19.02 pc/mi/ln  
 Level of service, LOS B  
 Capacity of base condition, cb 5725 pc/h  
 Capacity as a 15-minute flow rate, c 5585 pc/h  
 Capacity as a full-hour volume, ch 5138 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1259	3500	a
Average flow rate (pcphpl)	997	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.16	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

---

 Flow Inputs and Adjustments
 

---

Volume, V	1902	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	517	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1060	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

---

Flow rate, vp	1060	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1808	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	491	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1007	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

---

Flow rate, vp	1007	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	15.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

---

Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

---

 Flow Inputs and Adjustments
 

---

Volume, V	1324	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	360	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	738	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

---

Flow rate, vp	738	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.4	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.80  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.21

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	469	54	305	82	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1922	222	1248	335	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.67	0.53
Weaving and non-weaving speeds, Si	47.92	51.03
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 49.66 mph  
 Weaving segment density, D 25.02 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5709 pc/h  
 Capacity as a 15-minute flow rate, c 5570 pc/h  
 Capacity as a full-hour volume, ch 5124 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1583	3500	a
Average flow rate (pcphpl)	1242	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.21	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2246	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	610	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1251	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

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Flow rate, vp	1251	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

---

 Flow Inputs and Adjustments
 

---

Volume, V	2639	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	717	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1470	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

---

Flow rate, vp	1470	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	22.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1583	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	430	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	882	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	882	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.6	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

\_\_\_\_\_Weaving Segment Speed, Density, Level of Service and Capacity\_\_\_\_\_

Weaving segment speed, S 53.11 mph  
 Weaving segment density, D 17.79 pc/mi/ln  
 Level of service, LOS B  
 Capacity of base condition, cb 5733 pc/h  
 Capacity as a 15-minute flow rate, c 5593 pc/h  
 Capacity as a full-hour volume, ch 5146 pc/h

\_\_\_\_\_Limitations on Weaving Segments\_\_\_\_\_

	Analyzed	If Max Exceeded	See Note
	Maximum		Note
Weaving flow rate, Vw	1187	3500	a
Average flow rate (pcphpl)	944	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.21	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:  
 E-mail:

\_\_\_\_\_Operational Analysis\_\_\_\_\_

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

\_\_\_\_\_Inputs\_\_\_\_\_

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1500	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	C	
Volume ratio, VR	0.42	
Weaving ratio, R	0.21	

\_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	1329	150	841	226	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	361	41	229	61	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1480	167	936	251	pc/h

\_\_\_\_\_Weaving and Non-Weaving Speeds\_\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.53	0.38
Weaving and non-weaving speeds, Si	50.87	54.85
Number of lanes required for		



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

---

 Flow Inputs and Adjustments
 

---

Volume, V	1720	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	467	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	958	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	958	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2003	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	544	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1116	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1116	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	17.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1211	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	329	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	675	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	675	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	10.4	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

\_\_\_\_\_ Weaving Segment Speed, Density, Level of Service and Capacity \_\_\_\_\_

Weaving segment speed, S 52.49 mph  
 Weaving segment density, D 19.24 pc/mi/ln  
 Level of service, LOS B  
 Capacity of base condition, cb 5746 pc/h  
 Capacity as a 15-minute flow rate, c 5606 pc/h  
 Capacity as a full-hour volume, ch 5158 pc/h

\_\_\_\_\_ Limitations on Weaving Segments \_\_\_\_\_

	Analyzed	If Max Exceeded	See Note
	Maximum		Note
Weaving flow rate, Vw	1259	3500	a
Average flow rate (pcphpl)	1010	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.16	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:  
 E-mail:

\_\_\_\_\_ Operational Analysis \_\_\_\_\_

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

\_\_\_\_\_ Inputs \_\_\_\_\_

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.16

\_\_\_\_\_ Conversion to pc/h Under Base Conditions \_\_\_\_\_

	Non-Weaving		Weaving		
	V	V	V	V	
	A-C	B-D	A-D	B-C	
Volume, V	1467	123	946	185	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	399	33	257	50	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1634	137	1053	206	pc/h

\_\_\_\_\_ Weaving and Non-Weaving Speeds \_\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.56	0.40
Weaving and non-weaving speeds, Si	50.26	54.19
Number of lanes required for		

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1936	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	526	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1078	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1078	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	16.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1806	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	491	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1006	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1006	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	15.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1322	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	359	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	736	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	736	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.3	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.80  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.43  
 Weaving ratio, R 0.21

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	466	54	305	82	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1911	222	1248	335	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.67	0.53
Weaving and non-weaving speeds, Si	47.93	51.00
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 49.65 mph  
 Weaving segment density, D 24.95 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5703 pc/h  
 Capacity as a 15-minute flow rate, c 5564 pc/h  
 Capacity as a full-hour volume, ch 5119 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1583	3500	a
Average flow rate (pcphpl)	1238	2350	b
Volume ratio, VR	0.43	0.50	c
Weaving ratio, R	0.21	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2236	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	608	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1246	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1246	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2645	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	719	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1473	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

---

Flow rate, vp	1473	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	22.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1589	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	432	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	885	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	885	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.6	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

\_\_\_\_\_Weaving Segment Speed, Density, Level of Service and Capacity\_\_\_\_\_

Weaving segment speed, S 53.07 mph  
 Weaving segment density, D 17.64 pc/mi/ln  
 Level of service, LOS B  
 Capacity of base condition, cb 5717 pc/h  
 Capacity as a 15-minute flow rate, c 5578 pc/h  
 Capacity as a full-hour volume, ch 5132 pc/h

\_\_\_\_\_Limitations on Weaving Segments\_\_\_\_\_

	Analyzed	If Max Exceeded	See Note
	Maximum		Note
Weaving flow rate, Vw	1187	3500	a
Average flow rate (pcphpl)	936	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.21	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:  
 E-mail:

\_\_\_\_\_Operational Analysis\_\_\_\_\_

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

\_\_\_\_\_Inputs\_\_\_\_\_

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1500	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	C	
Volume ratio, VR	0.42	
Weaving ratio, R	0.21	

\_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	355	41	229	61	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1455	167	936	251	pc/h

\_\_\_\_\_Weaving and Non-Weaving Speeds\_\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.53	0.38
Weaving and non-weaving speeds, Si	50.88	54.79
Number of lanes required for		

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1697	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	461	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	945	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	945	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Background AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2007	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	545	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1118	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1118	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	17.2	pc/mi/ln



unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

\_\_\_\_\_Weaving Segment Speed, Density, Level of Service and Capacity\_\_\_\_\_

Weaving segment speed, S 51.79 mph  
 Weaving segment density, D 20.42 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5729 pc/h  
 Capacity as a 15-minute flow rate, c 5589 pc/h  
 Capacity as a full-hour volume, ch 5142 pc/h

\_\_\_\_\_Limitations on Weaving Segments\_\_\_\_\_

	Analyzed	If Max Exceeded	See Note
	Maximum		Note
Weaving flow rate, Vw	1332	3500	a
Average flow rate (pcphpl)	1057	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.14	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:  
 E-mail:

\_\_\_\_\_Operational Analysis\_\_\_\_\_

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative  
 Description: Point Molate Analysis

\_\_\_\_\_Inputs\_\_\_\_\_

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.14

\_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

	Non-Weaving		Weaving		
	V	V	V	V	
	A-C	B-D	A-D	B-C	
Volume, V	1542	112	1028	168	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	419	30	279	46	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1717	124	1145	187	pc/h

\_\_\_\_\_Weaving and Non-Weaving Speeds\_\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.58	0.43
Weaving and non-weaving speeds, Si	49.70	53.41
Number of lanes required for		



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2150	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	584	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1198	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1198	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2290	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	622	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1276	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1276	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative  
 Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1340	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	364	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	746	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	746	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.5	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.83  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.44  
 Weaving ratio, R 0.24

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	2304	332	1536	498	
Peak 15-min volume, v15	0.92	0.92	0.92	0.92	
Trucks and buses	626	90	417	135	v
Recreational vehicles	5	5	5	5	%
Trucks and buses PCE, ET	0	0	0	0	%
Recreational vehicle PCE, ER	1.5	1.5	1.5	1.5	
Heavy vehicle adjustment, fHV	1.2	1.2	1.2	1.2	
Driver population adjustment, fP	0.976	0.976	0.976	0.976	
Flow rate, v	1.00	1.00	1.00	1.00	pc/h
	2566	369	1711	554	

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.89	0.79
Weaving and non-weaving speeds, Si	44.09	45.64
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 44.95 mph  
 Weaving segment density, D 38.56 pc/mi/ln  
 Level of service, LOS E  
 Capacity of base condition, cb 5664 pc/h  
 Capacity as a 15-minute flow rate, c 5526 pc/h  
 Capacity as a full-hour volume, ch 5084 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	2265	3500	a
Average flow rate (pcphpl)	1733	2350	b
Volume ratio, VR	0.44	0.50	c
Weaving ratio, R	0.24	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	3020	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	821	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1682	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

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Flow rate, vp	1682	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.6	mi/h
Number of lanes, N	2	
Density, D	26.0+	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: PM  
Freeway/Direction: SR-4 WB  
From/To: Sycamore Ave to Willow Ave  
Jurisdiction: City of Hercules  
Analysis Year: Cumulative  
Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	2920	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	793	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1627	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1627	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.8	mi/h
Number of lanes, N	2	
Density, D	25.1	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

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E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: PM  
Freeway/Direction: SR-4 WB Connector  
From/To: Willow Ave to I-80 On-Ramps  
Jurisdiction: City of Hercules  
Analysis Year: Cumulative  
Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	2104	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	572	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1172	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1172	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.0+	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.81  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.44  
 Weaving ratio, R 0.24

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	470	68	313	102	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1925	277	1283	416	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.71	0.58
Weaving and non-weaving speeds, Si	47.21	49.83
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 48.65 mph  
 Weaving segment density, D 26.73 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5664 pc/h  
 Capacity as a 15-minute flow rate, c 5526 pc/h  
 Capacity as a full-hour volume, ch 5084 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1699	3500	a
Average flow rate (pcphpl)	1300	2350	b
Volume ratio, VR	0.44	0.50	c
Weaving ratio, R	0.24	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative  
 Description: Point Molate Analysis

---

 Flow Inputs and Adjustments
 

---

Volume, V	2265	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	615	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1262	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1262	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2190	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	595	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1220	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1220	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1578	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	429	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	879	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	879	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.5	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

\_\_\_\_\_ Weaving Segment Speed, Density, Level of Service and Capacity \_\_\_\_\_

Weaving segment speed, S 51.83 mph  
 Weaving segment density, D 20.57 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5742 pc/h  
 Capacity as a 15-minute flow rate, c 5602 pc/h  
 Capacity as a full-hour volume, ch 5154 pc/h

\_\_\_\_\_ Limitations on Weaving Segments \_\_\_\_\_

	Analyzed	If Max Exceeded	See Note
	Maximum		Note
Weaving flow rate, Vw	1332	3500	a
Average flow rate (pcphpl)	1066	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.14	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:  
 E-mail:

\_\_\_\_\_ Operational Analysis \_\_\_\_\_

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

\_\_\_\_\_ Inputs \_\_\_\_\_

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1500	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	C	
Volume ratio, VR	0.42	
Weaving ratio, R	0.14	

\_\_\_\_\_ Conversion to pc/h Under Base Conditions \_\_\_\_\_

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	1564	112	1028	168	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	425	30	279	46	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1742	124	1145	187	pc/h

\_\_\_\_\_ Weaving and Non-Weaving Speeds \_\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.59	0.43
Weaving and non-weaving speeds, Si	49.69	53.47
Number of lanes required for		

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2172	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	590	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1210	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

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Flow rate, vp	1210	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2332	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	634	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1299	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

---

Flow rate, vp	1299	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	20.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1382	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	376	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	770	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	770	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.8	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.82  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.43  
 Weaving ratio, R 0.24

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	646	90	417	135	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2647	369	1711	554	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.89	0.79
Weaving and non-weaving speeds, Si	44.07	45.79
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 45.04 mph  
 Weaving segment density, D 39.09 pc/mi/ln  
 Level of service, LOS E  
 Capacity of base condition, cb 5692 pc/h  
 Capacity as a 15-minute flow rate, c 5553 pc/h  
 Capacity as a full-hour volume, ch 5109 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	2265	3500	a
Average flow rate (pcphpl)	1760	2350	b
Volume ratio, VR	0.43	0.50	c
Weaving ratio, R	0.24	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	3092	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	840	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1722	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1722	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.4	mi/h
Number of lanes, N	2	
Density, D	26.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2295	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	624	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1278	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

---

Flow rate, vp	1278	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	2179	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	592	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1214	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

---

Flow rate, vp	1214	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.7	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.80  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.24

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	1830	249	1152	374	
Peak 15-min volume, v15	0.92	0.92	0.92	0.92	
Trucks and buses	497	68	313	102	v
Recreational vehicles	5	5	5	5	%
Trucks and buses PCE, ET	0	0	0	0	%
Recreational vehicle PCE, ER	1.5	1.5	1.5	1.5	
Heavy vehicle adjustment, fHV	1.2	1.2	1.2	1.2	
Driver population adjustment, fP	0.976	0.976	0.976	0.976	
Flow rate, v	1.00	1.00	1.00	1.00	
	2038	277	1283	416	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.71	0.57
Weaving and non-weaving speeds, Si	47.17	50.08
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 48.80 mph  
 Weaving segment density, D 27.42 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5715 pc/h  
 Capacity as a 15-minute flow rate, c 5576 pc/h  
 Capacity as a full-hour volume, ch 5130 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1699	3500	a
Average flow rate (pcphpl)	1338	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.24	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	2367	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	643	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1319	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

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Flow rate, vp	1319	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	20.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2288	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	622	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1275	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1275	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltA  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1676	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	455	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	934	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	934	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.4	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.41  
 Weaving ratio, R 0.14

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	429	30	279	46	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1758	124	1145	187	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.59	0.43
Weaving and non-weaving speeds, Si	49.68	53.51
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 51.85 mph  
 Weaving segment density, D 20.66 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5751 pc/h  
 Capacity as a 15-minute flow rate, c 5611 pc/h  
 Capacity as a full-hour volume, ch 5162 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1332	3500	a
Average flow rate (pcphpl)	1071	2350	b
Volume ratio, VR	0.41	0.50	c
Weaving ratio, R	0.14	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2186	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	594	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1218	pc/h/ln

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 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1218	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	2335	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	635	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1301	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1301	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	20.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1385	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	376	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	772	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	772	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.9	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.82  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.43  
 Weaving ratio, R 0.24

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	648	90	417	135	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2654	369	1711	554	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.89	0.79
Weaving and non-weaving speeds, Si	44.07	45.80
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 45.04 mph  
 Weaving segment density, D 39.13 pc/mi/ln  
 Level of service, LOS E  
 Capacity of base condition, cb 5694 pc/h  
 Capacity as a 15-minute flow rate, c 5555 pc/h  
 Capacity as a full-hour volume, ch 5111 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	2265	3500	a
Average flow rate (pcphpl)	1762	2350	b
Volume ratio, VR	0.43	0.50	c
Weaving ratio, R	0.24	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	3099	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	842	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1726	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1726	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.4	mi/h
Number of lanes, N	2	
Density, D	26.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	3008	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	817	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1676	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1676	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.6	mi/h
Number of lanes, N	2	
Density, D	25.9	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2192	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	596	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1221	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1221	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.8	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.80  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.24

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	499	68	313	102	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2047	277	1283	416	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.71	0.57
Weaving and non-weaving speeds, Si	47.16	50.10
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 48.82 mph  
 Weaving segment density, D 27.47 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5718 pc/h  
 Capacity as a 15-minute flow rate, c 5579 pc/h  
 Capacity as a full-hour volume, ch 5133 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1699	3500	a
Average flow rate (pcphpl)	1341	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.24	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2375	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	645	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1323	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1323	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	20.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltB  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	2298	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	624	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1280	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1280	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.7	pc/mi/ln



HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

\_\_\_\_\_ Weaving Segment Speed, Density, Level of Service and Capacity \_\_\_\_\_

Weaving segment speed, S 51.81 mph  
 Weaving segment density, D 20.52 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5737 pc/h  
 Capacity as a 15-minute flow rate, c 5597 pc/h  
 Capacity as a full-hour volume, ch 5149 pc/h

\_\_\_\_\_ Limitations on Weaving Segments \_\_\_\_\_

	Analyzed	If Max Exceeded	See Note
	Maximum		Note
Weaving flow rate, Vw	1332	3500	a
Average flow rate (pcphpl)	1063	2350	b
Volume ratio, VR	0.42	0.50	c
Weaving ratio, R	0.14	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:  
 E-mail:

\_\_\_\_\_ Operational Analysis \_\_\_\_\_

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

\_\_\_\_\_ Inputs \_\_\_\_\_

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.42  
 Weaving ratio, R 0.14

\_\_\_\_\_ Conversion to pc/h Under Base Conditions \_\_\_\_\_

	Non-Weaving		Weaving		
	V	V	V	V	
	A-C	B-D	A-D	B-C	
Volume, V	1556	112	1028	168	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	423	30	279	46	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1733	124	1145	187	pc/h

\_\_\_\_\_ Weaving and Non-Weaving Speeds \_\_\_\_\_

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.59	0.43
Weaving and non-weaving speeds, Si	49.70	53.45
Number of lanes required for		

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2164	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	588	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1205	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1205	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2318	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	630	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1291	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1291	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.9	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1368	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	372	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	762	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	762	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.7	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.82  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.43  
 Weaving ratio, R 0.24

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	638	90	417	135	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2615	369	1711	554	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.89	0.79
Weaving and non-weaving speeds, Si	44.08	45.73
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 45.00 mph  
 Weaving segment density, D 38.88 pc/mi/ln  
 Level of service, LOS E  
 Capacity of base condition, cb 5681 pc/h  
 Capacity as a 15-minute flow rate, c 5542 pc/h  
 Capacity as a full-hour volume, ch 5099 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	2265	3500	a
Average flow rate (pcphpl)	1749	2350	b
Volume ratio, VR	0.43	0.50	c
Weaving ratio, R	0.24	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	3064	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	833	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1707	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1707	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.5	mi/h
Number of lanes, N	2	
Density, D	26.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2969	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	807	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1654	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1654	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	2	
Density, D	25.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2153	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	585	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1199	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1199	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.4	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.81  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.43  
 Weaving ratio, R 0.24

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	1796	249	1152	374	
Peak 15-min volume, v15	0.92	0.92	0.92	0.92	
Trucks and buses	488	68	313	102	v
Recreational vehicles	5	5	5	5	%
Trucks and buses PCE, ET	0	0	0	0	%
Recreational vehicle PCE, ER	1.5	1.5	1.5	1.5	
Heavy vehicle adjustment, fHV	1.2	1.2	1.2	1.2	
Driver population adjustment, fP	0.976	0.976	0.976	0.976	
Flow rate, v	1.00	1.00	1.00	1.00	
	2000	277	1283	416	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.71	0.57
Weaving and non-weaving speeds, Si	47.18	50.00
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 48.75 mph  
 Weaving segment density, D 27.18 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5698 pc/h  
 Capacity as a 15-minute flow rate, c 5559 pc/h  
 Capacity as a full-hour volume, ch 5114 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1699	3500	a
Average flow rate (pcphpl)	1325	2350	b
Volume ratio, VR	0.43	0.50	c
Weaving ratio, R	0.24	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2333	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	634	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1300	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1300	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	20.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2250	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	611	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1253	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1253	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltC  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	1638	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	445	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	912	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	912	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.0	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.79  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.41  
 Weaving ratio, R 0.14

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	432	30	279	46	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1771	124	1145	187	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.59	0.43
Weaving and non-weaving speeds, Si	49.68	53.54
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 51.87 mph  
 Weaving segment density, D 20.74 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5758 pc/h  
 Capacity as a 15-minute flow rate, c 5618 pc/h  
 Capacity as a full-hour volume, ch 5169 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1332	3500	a
Average flow rate (pcphpl)	1075	2350	b
Volume ratio, VR	0.41	0.50	c
Weaving ratio, R	0.14	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2198	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	597	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1224	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1224	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2316	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	629	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1290	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1290	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: AM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

---

Volume, V	1336	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	363	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	744	pc/h/ln

---

 Speed Inputs and Adjustments
 

---

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

---

 LOS and Performance Measures
 

---

Flow rate, vp	744	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.4	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.82  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.43  
 Weaving ratio, R 0.24

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	A-C	B-D	A-D	B-C	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	635	90	417	135	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2604	369	1711	554	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.89	0.79
Weaving and non-weaving speeds, Si	44.08	45.71
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 44.99 mph  
 Weaving segment density, D 38.81 pc/mi/ln  
 Level of service, LOS E  
 Capacity of base condition, cb 5677 pc/h  
 Capacity as a 15-minute flow rate, c 5539 pc/h  
 Capacity as a full-hour volume, ch 5096 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	2265	3500	a
Average flow rate (pcphpl)	1746	2350	b
Volume ratio, VR	0.43	0.50	c
Weaving ratio, R	0.24	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
Agency or Company: Abrams Associates  
Date Performed: 11/20/2009  
Analysis Time Period: PM  
Freeway/Direction: SR-4 EB  
From/To: Willow Ave to Sycamore Ave  
Jurisdiction: City of Hercules  
Analysis Year: Cumulative AltD  
Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	3054	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	830	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1701	pc/h/ln

---

 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1701	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.5	mi/h
Number of lanes, N	2	
Density, D	26.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2975	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	808	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1657	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1657	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	64.7	mi/h
Number of lanes, N	2	
Density, D	25.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: PM  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2159	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	587	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1203	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1203	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	18.5	pc/mi/ln

HCS+: Freeway Weaving Release 5.21

unconstrained operation, Nw (Exhibit 24-7) 1.81  
 Maximum number of lanes, Nw (max) (Exhibit 24-7) 3.00  
 Type of operation is Unconstrained

Phone: Fax:  
 E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency/Co.: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Dir of Travel: SR-4 EB  
 Weaving Location: I-80 Ramps to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

Inputs

Freeway free-flow speed, SFF 65 mph  
 Weaving number of lanes, N 3  
 Weaving segment length, L 1500 ft  
 Terrain type Level  
 Grade %  
 Length mi  
 Weaving type C  
 Volume ratio, VR 0.43  
 Weaving ratio, R 0.24

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V	V	V	V	
Volume, V	1773	249	1152	374	veh/h
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	
Peak 15-min volume, v15	482	68	313	102	v
Trucks and buses	5	5	5	5	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.976	0.976	0.976	0.976	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1975	277	1283	416	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.71	0.57
Weaving and non-weaving speeds, Si	47.19	49.94
Number of lanes required for		

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S 48.72 mph  
 Weaving segment density, D 27.03 pc/mi/ln  
 Level of service, LOS C  
 Capacity of base condition, cb 5687 pc/h  
 Capacity as a 15-minute flow rate, c 5548 pc/h  
 Capacity as a full-hour volume, ch 5104 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded	See Note
Weaving flow rate, Vw	1699	3500	a
Average flow rate (pcphpl)	1317	2350	b
Volume ratio, VR	0.43	0.50	c
Weaving ratio, R	0.24	0.40	d
Weaving length (ft)	1500	2500	e

Notes:

- Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
- Capacity constrained by basic freeway capacity.
- Capacity occurs under constrained operating conditions.
- Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
- Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
- Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
- Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
- Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
- Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.



Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 EB  
 From/To: Willow Ave to Sycamore Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2310	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	628	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1287	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1287	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

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 Operational Analysis
 

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Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB  
 From/To: Sycamore Ave to Willow Ave  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

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 Flow Inputs and Adjustments
 

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Volume, V	2254	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	612	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	1256	pc/h/ln

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 Speed Inputs and Adjustments
 

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Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

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 LOS and Performance Measures
 

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Flow rate, vp	1256	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	19.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:  
E-mail:

Operational Analysis

Analyst: Steve Abrams  
 Agency or Company: Abrams Associates  
 Date Performed: 11/20/2009  
 Analysis Time Period: SAT  
 Freeway/Direction: SR-4 WB Connector  
 From/To: Willow Ave to I-80 On-Ramps  
 Jurisdiction: City of Hercules  
 Analysis Year: Cumulative AltD  
 Description: Point Molate Analysis

Flow Inputs and Adjustments

Volume, V	1642	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	446	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	915	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	915	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	14.1	pc/mi/ln