#4 U. S. 101 Traffic Volumes in Willits & Vicinity

A table has been prepared to illustrate volume trends on U.S. 101 in Willits and vicinity over the past 15 years. The Average Annual Daily Traffic (AADT) and Peak Month traffic is depicted for three locations. Post mile 45.17 is generally at the south city limit. Post mile 46.36 is at the junction of State Route 20. Post mile 47.42 is at the north city limit. For 2004 volumes, the Peak Hour traffic is also shown.

Definitions:

Average Annual Daily Traffic (AADT) is the total traffic volume for the year divided by 365 days. Traffic counting is generally performed by electronic counting instruments moved from location to location around the state in a program of continuous traffic count sampling. The resulting counts are adjusted to an estimate of annual average daily traffic by compensating for seasonal influence, weekly variation and other variables that may be present.

Peak Month ADT is the average daily traffic for the month of heaviest traffic flow. This data is obtained because on many routes, high traffic volumes which occur during a certain season of the year are more representative of traffic conditions than annual ADT.

Peak Hour is useful to traffic engineers in estimating the amount of congestion experienced, and shows how near capacity the highway is operating. Peak hour indicates the volume in both directions of a two lane highway. A few hours each year are higher than the "peak hour", but not many. In urban and suburban areas, the peak hour normally occurs every weekday, and 200 or more hours will be about the same. On roads with large seasonal variations in traffic, the peak hour is the hour near the maximum for the year but excluding a few (30 to 50 hours) that are exceedingly high and are not typical of the frequency of the high hours occurring during the season.

Trends:

Inspection of the attached table shows that traffic volumes continued to grow through the 15-year period at the south location and at mid-town. Volumes decreased in 1994 and again in 1999 at the north end. This is likely due to the dramatic decline of the North Coast timber industry. However, peak month traffic continued to climb through the period.

Relationship to Level of Service:

Peak hour information is needed to determine level of service and roadway capacity. Although computations are made based on hourly flows, a **general understanding** of the relationship between AADT and Level of Service can be obtained by inspecting the attached Table 8-10 Maximum AADT's vs. Level of Service and Type of Terrain for Two-Lane Rural Highways (Highway Capacity Manual, 1985).

Referring to Table 8-10, the highest K-Factors generally occur on recreational facilities, followed by rural, suburban, and urban facilities in descending order. Since U.S. 101 is a rural highway that is highly impacted by recreational traffic, an appropriate K-Factor for the area would likely by 0.12 or higher. K-Factor is merely the proportion of AADT expected to occur in the design hour.

On level terrain, for a K-Factor of 0.12, the maximum AADT on a two-lane roadway that can be accommodated in Level of Service C is approximately 6,600. The current (2004) AADT for the two-lane segment north of Willits is 7,100. Therefore visual inspection of AADTs alone indicates that the two-lane roadway north of Willits is probably already operating within Level of Service D. A return of through traffic on U.S. 101 to 1989 AADT levels at Post mile 47.42 would indicate Level of Service D regardless of K-Factor selected.

U.S. 101 Traffic Volumes in Willits & Vicinity (1989-2004)

		1989		1994		1999		2004		
Postmile	Location	AADT	Peak Mo.	AADT	Peak Mo.	AADT	Peak Mo.	AADT	Peak Mo.	Peak Hr.
45.17	South City Limit, Muir Mill	13,800	16,000	14,500	16,200	17,100	19,000	17,200	20,000	1,600
46.36	SR 20 junction	19,500	22,600	19,200	20,200	22,300	22,800	22,500	26,000	2,150
47.42	North City Limit	8,000	9,300	7,100	9,200	6,700	8,700	7,100	9,400	1,100

AADT: Average Annual Daily Traffic
Peak Mo.: Volume experienced during the peak month of the year (usually July)

1999 & 2004 Volumes from Caltrans website: http://traffic-counts.dot.ca.gov
1989 & 1994 Volumes from: Caltrans, Division of Traffic Operations, "*1999 (and 2004) Traffic Volumes on the California State Highway System*"

TABLE 8-10. MAXIMUM AADT'S VS. LEVEL OF SERVICE AND TYPE OF TERRAIN FOR TWO-LANE RURAL HIGHWAYS

K-FACTOR	LEVEL OF SERVICE				
	A	B	C	D	E
LEVEL TERRAIN					
0.10	2,400	4,800	7,900	13,500	22,900
0.11	2,200	4,400	7,200	12,200	20,800
0.12	2,000	4,000	6,600	11,200	19,000
0.13	1,900	3,700	6,100	10,400	17,600
0.14	1,700	3,400	5,700	9,600	16,300
0.15	1,600	3,200	5,300	9,000	15,200
ROLLING TERRAIN					
0.10	1,100	2,800	5,200	8,000	14,800
0.11	1,000	2,500	4,700	7,200	13,500
0.12	900	2,300	4,400	6,600	12,300
0.13	900	2,100	4,000	6,100	11,400
0.14	800	2,000	3,700	5,700	10,600
0.15	700	1,800	3,500	5,300	9,900
MOUNTAINOUS TERRAIN					
0.10	500	1,300	2,400	3,700	8,100
0.11	400	1,200	2,200	3,400	7.300
0.12	400	1,100	2,000	3,100	6,700
0.13	400	1,000	1,800	2,900	6,200
0.14	300	900	1,700	2,700	5,800
0.15	300	900	1,600	2,500	5,400

NOTE: All values rounded to the nearest 100 vpd. Assumed conditions include 60/40 directional split, 14 percent trucks, 4 percent RV's, no buses, and PHF values from Table 8-3. For level terrain, 20 percent no passing zones were assumed; for rolling terrain, 40 percent no passing zones; for mountainous terrain, 60 percent no passing zones.

III. PROCEDURES FOR APPLICATION

The methodology described in the previous section is generally applied in either the *operational analysis* or *planning* modes.

Design computations, as used in this manual, focus on the determination of the number of lanes required for a given facility. Such computations have little significance for two-lane highways, where the number of lanes is fixed. Such design features as horizontal and vertical alignment, however, have a significant impact on operations. Operational analyses can be performed for alternative designs to document this impact. Where computations indicate that a two-lane highway is not adequate for existing or projected demands, various multilane options may be considered and analyzed using other chapters of this manual.

A separate section of this chapter deals with operational and design measures for two-lane highways, short of reconstructing the entire highway as a multilane facility. This material should be consulted where a two-lane facility presently has or is expected to experience operational difficulties.

OPERATIONAL ANALYSIS OF GENERAL TERRAIN SEGMENTS

The objective in operational analysis is to determine the level of service for a given segment or segments of roadway for a known existing set of conditions, or for a future set of conditions which are hypothesized and/or forecast. The general approach will be to compute service flow rates for each level of service and compare these values with the existing flow rate on the facility. This is done using Eq. 8-1:

$$SF_i = 2{,}800 \times (v/c)_i \times f_d \times f_w \times f_{HV}$$

where all terms are as previously defined. A service flow rate for each LOS is computed because the heavy vehicle factor varies with LOS, and a direct solution of the equation for v/c ratio would be iterative. Users preferring to solve for v/c may do so, but must iterate until the assumed LOS used in computing the heavy vehicle factor is the same as that indicated by the v/c ratio found.

In general, the following computational steps are used. Computations may be conveniently performed on the worksheet illustrated in Figure 8-4.

1. Summarize all input data on traffic and roadway conditions, including:
   - Existing or forecast peak hour volume, in vph.
   - Peak hour factor, PHF, from local data or default value selected from Table 8-3.
   - Traffic composition (% trucks, % RV's, % buses).