

Chapter 3: Traffic Analysis

In keeping with the original goals for the Foothills Parkway, this traffic analysis had three primary components: (1) to determine the impact on the regional transportation network and Park roads, (2) to determine projected traffic flow on the Parkway and (3) to determine the effect of projected Parkway traffic volume on visitor experience. The following sections provide background information and further discuss the three primary components of the traffic analysis.

3.1 *Foothills Parkway* *Description*

If completed as envisioned, the approximately 72-mile Foothills Parkway would have the following seven interchanges (listed from east to west):

- I-40;
- U.S. 321 in Cosby;
- S.R. 416 in Pittman Center;
- U.S. 441 (Spur) near Gatlinburg;
- U.S. 321 in Wears Valley;
- U.S. 321 in Townsend; and
- U.S. 129 in Chilhowee.

No other external access to the Foothills Parkway is planned. Internally, frequent pull-offs are planned for viewing the Park and a limited number of “spur” roads leading to recreation areas are included as well. Its typical section

would include one 10-foot lane in each direction with 4 to 8 foot, stabilized shoulders. A 30-mph design speed is envisioned.

Given the physical location of the Parkway (spanning three counties: Blount, Sevier and Cocke) and the connectivity described above, it is apparent that the Parkway will to some extent serve a regional network function in addition to its primary role as a scenic parkway. The reasons are:

- The Parkway roughly parallels U.S. 321 from Walland to Cosby, and is a better road than U.S. 321 in the Walland–Wears Valley area.
- The Parkway provides a “bypass” of congested areas in Townsend, Pigeon Forge and Gatlinburg.
- The Parkway provides direct access from the Gatlinburg area to Walland and thence to the regional airport and traffic arteries leading to I-40/75 west of Knoxville.

It has been widely speculated, though not previously supported by analysis, that the section of the Parkway between Walland and Wears Valley (Sections E and F) would have the most regional traffic utility. Further, it appears that the extension of the Parkway to the Spur (Section D) might have substantial regional traffic utility as well.

3.2 *Existing Summer Daily Traffic*

Sections of the Foothills Parkway anticipated to be most frequently used lie in heavily tourist-oriented Sevier County. As such, substantial fluctuations in traffic from month to month can be expected. In the planning and design of new roads, wide traffic variations are usually addressed by attempting to meet the traffic needs on a relatively busy day, but not necessarily the busiest day of the year. Reliable monthly variation data are available for Sevier County, and factors based on those data were applied to roads affected by tourism. In Blount and Cocke Counties, tourist traffic is less predominant, so traffic fluctuation factors were not used on all roads.

All traffic projections on the Foothills Parkway and nearby roads represent the 30th most busy day of the year, which in Sevier County is about 43 percent above an average day and most closely relates to a summer weekday. Referencing the two completed sections of the Parkway, the section between Cosby and I-40 (Section A) carried 950 vehicles per day (vpd) in 2000 and Section G and H southwest of Walland carried 500 vpd. Figure 14 depicts Year 2000 30th highest day traffic volumes on roads in the immediate environs of the Foothills Parkway. It should be noted that traffic conditions in Sevier County can be extreme during the fall and summer months with excessive delays occurring on principal corridors and at major street junctions. The daily traffic volumes, as shown in Figure 14, do not

fully reflect the peak period congestion and delays experienced by motorists.

Roads in the Park are extremely congested during summer and fall. On a typical summer weekday, the volume of traffic on Newfound Gap Road between the Sugarlands Visitor Center and the North Carolina state line is 8,500 to 9,300 vpd. Approximately 4,100 to 5,100 vpd use Little River Road on a typical summer weekday. Laurel Creek Road sees 8,300 vpd and the Cades Cove Loop road carries about 4,000 vpd.

3.3 *Traffic Projection Methodology*

Traffic using the Foothills Parkway can be categorized as commuter trips, destination trips, or a combination of both. The purpose of a commuter trip is to get from one point to the next in the most convenient fashion; the purpose of a commuter trip on the Parkway is merely to use it as a means of conveyance from one off-Parkway location to another. On the other hand, destination trips on the Foothills Parkway are for a sight seeing and recreational experience along the road itself. Drivers making a trip with a dual commuter/destination purpose might be traveling from one off-Parkway location to another but choose the Parkway route because of its scenic attributes as well as convenience. Some destination trips will actually be diverted link trips that would otherwise be destined to the Park. In other words, the visitor might choose to enjoy the Foothills Parkway and its visitor recreational development instead of locations within the Park.

In 1997, Wilbur Smith Associates (WSA) completed the *Sevier County Long Range Transportation Plan* that outlined roadway recommendations based on a TRANPLAN traffic model. The road network included all major roads in Sevier County and some of the roads in the Park. Land use and traffic data reflected 1994 conditions, and traffic projections were made for a 2004 design year.

Though there are some limitations to the Sevier County traffic model, it was apparent that it was the best tool available to estimate commuter traffic on the Foothills Parkway and the surrounding roads that would be affected by its completion. The limitations included 7-year-old traffic and land-use data and a road network confined to Sevier County. A lack of model network roads in Cocke County was not critical because no access to the Foothills Parkway will be provided between S.R. 416 in Sevier County and U.S. 321 in Cocke County. On the other hand, a lack of model network roads in Blount County and the northwest edge of the Park was somewhat problematic regarding traffic projections. Section E/F of the Foothills Parkway and the western portion of Little River Road were inserted into the model's street network as a link leading to an external station, therefore the traffic assignment might be less accurate than if they were internal links.

The Foothills Parkway was inserted into the traffic model's existing-plus-committed (E+C) road network with Year 2004 land use and traffic conditions. Its attributes included two

travel lanes, a 30-mph operating speed and interchanges located as described earlier in this chapter. Model runs were performed with every possible section combination of the Foothills Parkway being constructed (e.g., all sections; Sections B, C and D separately; Sections E and F as a unit, etc.).

Traffic projections from the model were limited to those resulting from Year 2004 land use projections. However, for the Foothills Parkway analysis, there was a need to project traffic for more distant horizons including Year 2010, 2020 and 2030. Consequently, the Year 2004 traffic assignments were used to determine the percent of traffic that would be assigned to the Foothills Parkway and its parallel routes. For example, in Year 2004, 24,523 vpd were assigned to the corridor that includes U.S. 321 and Little River Road. Without the Foothills Parkway, 18,464 vpd (75 percent) were assigned to U.S. 321, 4,807 vpd (20 percent) to Little River Road and 1,252 to other minor routes. With the Foothills Parkway, a total of 24,523 trips were assigned to the corridor with 15,173 vpd (62 percent) assigned to US 321, 6,150 vpd (26 percent) to the Foothills Parkway and 3,200 vpd (13 percent) to Little River Road. No trips were assigned to other minor routes.

Once the percentages were determined, the Year 2001 traffic volumes (actual counts as opposed to the model estimated Year 2004 trips) were inflated by 4 percent annually to estimate Year 2010, 2020 and 2030 conditions without the Foothills Parkway. Then traffic volumes in the corridors affected by the

Foothills Parkway were re-allocated, using percentages determined by the Year 2004 traffic model, to reflect the Foothills Parkway. The annual growth rate was determined from regression analyses conducted using data from several Tennessee Department of Transportation (TDOT) count stations with substantial historical data.

Accurately estimating destination trips to the Foothills Parkway was difficult because of its uniqueness. In essence, the Foothills Parkway has many of the same characteristics as a public park, including campgrounds, picnic areas, and other visitor recreational development areas. For the most part, it could be thought of as a 72-mile linear park with attractions scattered throughout its entirety. More accurately, it could be viewed as 8 separate parks correlating with the 8 sections.

The Institute of Transportation Engineers' publication *Trip Generation; Sixth Edition* contains trip generation information for various land uses including city, county and state parks as well as national monuments. The most widely used independent variable for each of these land use categories is acres of land. For example, two national monuments were studied, and the average daily trip generation rate was 5.37 trips per acre. Therefore, a 323-acre national monument (the average size of the two studied) would be expected to generate just over 1,700 trips per day. Since the Foothills Parkway is a "linear park" with over 8,800 acres of land, this methodology was judged inappropriate.

A more reliable approach for estimating destination trips is to examine traffic on existing sections of the Foothills Parkway in comparison to the Blue Ridge Parkway, another linear park. On the northeast end, Foothills Parkway Section A, a summer daily traffic volume of 950 vpd has been estimated, probably split between commuter trips and destination trips. On the west end of the Foothills Parkway, the summer daily traffic volume is 500 vpd, most of which is probably destination trips. It should be noted that both the east and west ends of the Foothills Parkway are relatively isolated from major activity centers although access is provided to a small subdivision on the west end.

Comprehensive monthly traffic count data are maintained at 43 locations along the Blue Ridge Parkway in North Carolina. In 2000, the overall average daily traffic volume at the 43 stations was 590 vpd. October is the busiest month with traffic being reported at 54 percent above average. Considering all 43 stations, the average daily traffic volume in October 2000 was 891 vpd.

Given the traffic volumes on existing sections of the Foothills Parkway and the Blue Ridge Parkway, it is estimated that Sections C and D would generate approximately 1,500 daily destination trips today. Included in these destination trips are trips to the various visitor recreational development areas. Sections C and D are near tourist centers, so they are expected to attract more trips than Sections A, G and H and more trips than the average of all Blue Ridge Parkway stations. Additionally,

the remaining sections (B, E and F) should generate approximately 1,000 destination trips per day (driving to enjoy a vista with minimal stops, stopping to enjoy the various visitor recreational developments, or both), or roughly the average of 43 Blue Ridge Parkway stations and Section A's 30th highest day volume. These values are expected to grow yearly at about 4 percent to Year 2030.

On many Sevier County roads, historical traffic growth has exceeded 4 percent annually over the past 10 years. US 321, Wears Valley Road, should experience a 3.50 percent annual traffic growth through Year 2030 according to the regression analysis. Likewise, historical data on US 441 between the Sugarlands Visitor Center and the North Carolina state line suggest future annual traffic growth will occur at 4.22 percent. The projected Foothills Parkway growth rate of 4 percent was based on overall historical traffic growth in Sevier County and projected future traffic growth on US 321 and US 441.

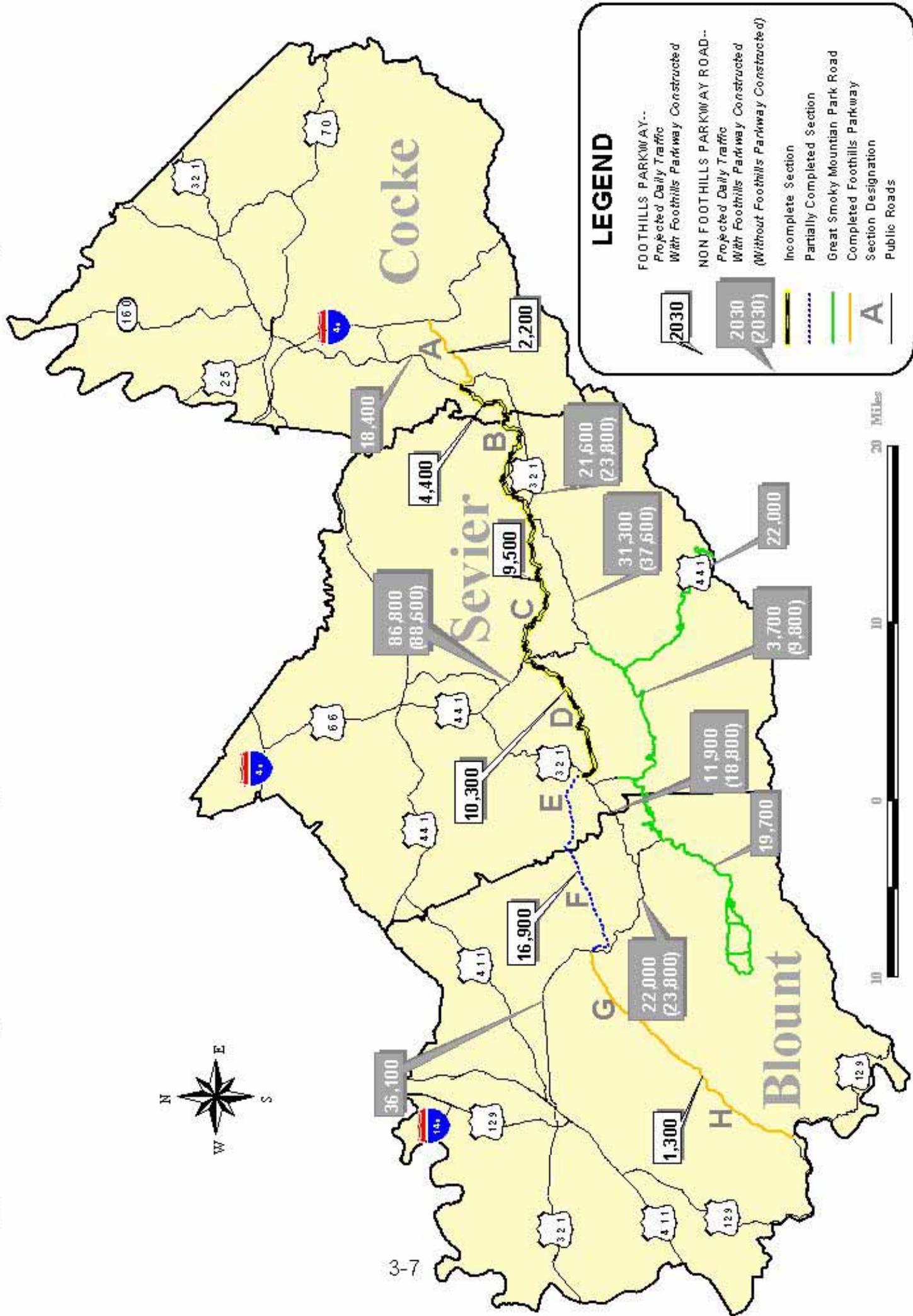
Traffic counts for the last 10 years were used to perform regression analysis on both completed sections of the Foothills Parkway. According to the regression analysis, traffic on the east end should increase by 3.1 percent annually to Year 2030 and traffic on the west end at 1.8 percent annually to Year 2030. These projections assume that other sections of the Foothills Parkway will not be completed. In the final analysis, the 4 percent growth rate was used on the completed sections of the Foothills Parkway instead of the 3.1 and 1.8 percent.

3.4 Regional and Park Impact in Year 2030

Constructing the Foothills Parkway in its entirety would have a significant impact on the regional transportation network as evidenced by Figure 15. The Appendix includes illustrations depicting Years 2001, 2010, 2020 and 2030 traffic estimates with and without the Foothills Parkway. By Year 2030, Section E/F is expected to accommodate approximately 16,900 vpd with about 2,200 of those being destination trips. The traffic volume on Section D is projected to be approximately 10,300 vpd with 3,200 of those being destination trips. About 6,300 commuter and 3,200 destination trips on Section C result in a total Year 2030 daily traffic estimate of 9,500 vpd. Section B is anticipated to have a balance of commuter and destination trips with 2,200 of each traversing this section of the Foothills Parkway on a peak summer weekday.

Surrounding parallel roads, including Little River Road in the Park, should benefit the most from the Foothills Parkway. Without the Foothills Parkway in Year 2030, daily traffic on Little River Road is projected to be about 9,800 vpd, but with the Foothills Parkway the volume is expected to drop to about 3,700 vpd. Similarly, traffic on U.S. 321 from Townsend to Wears Valley is projected to drop from 18,800 vpd without the Foothills Parkway to 11,900 vpd with the Foothills Parkway. U.S. 321 between Gatlinburg and Cosby would also realize a reduction in traffic as a result of the Foothills Parkway. Near Gatlinburg, the reduction is expected to

Figure 15. Projected 2030 Daily Summer Traffic on Foothills Parkway and Environs



be approximately 6,300 vpd, and further to the east, the reduction should be about 2,200 vpd. With the exception of a modest decrease in traffic on the Spur (U.S.441 between Gatlinburg and Pigeon Forge), other roads in the Foothills Parkway environs should not be significantly affected by its construction.

The Park Service has indicated that they are committed to completing construction of Section E/F. Therefore, the traffic analysis discussed herein is limited to the feasibility of constructing Sections B, C and D. Options include full-build as well as constructing one or more individual sections or combination of sections. The various combinations of construction alternatives are as follows:

- All sections;
- Section E/F;
- Sections E/F and B;
- Sections E/F and C;
- Sections E/F and D;
- Sections E/F, B and C;
- Sections E/F, B and D; and,
- Sections E/F, C and D.

Each of these combinations was inserted into the transportation model's road network using Year 2004 land use and committed roadway projects. In short, section traffic projections on all construction combinations appear to be equal to the full-build (Sections B, C, D and E/F) projection except when the alternative involves Section C.

If Section C were constructed alone instead of with all other sections, the Year 2030 traffic projection is expected

to decrease from 9,500 vpd (with Sections B, C and D constructed) to 7,600 vpd. With Sections B and C constructed but not Section D, the traffic assigned to Section C is also expected to be 7,600 vpd. Conversely, if Sections C and D are constructed without Section B, the traffic assigned to Section C is projected to approximate 8,400 vpd. It is concluded that Section D will have more influence on Section C than would Section B.

3.5 Impact of Traffic on Level of Visitor Experience

Normally a road is constructed with the anticipation that it will be well utilized when it opens. If it were not well utilized, most transportation planners would deem it a failure or at least not cost effective. By contrast, the goal of the Foothills Parkway is not necessarily to accommodate a significant amount of traffic upon opening or in the future. Rather the goal is to provide a scenic view of the Park and a positive visitor experience. If traffic is excessive, it will detract from the visitor experience (the ability to enjoy the views) as motorists concern themselves with vehicles ahead of or behind them or in the opposing traffic lane. Ideally the Foothills Parkway will attract destination trips (to enjoy the views and the visitor recreational development) and destination/commuter trips but not at levels that will detract from the visitor experience. It should be noted that it is impractical to differentiate between commuter and destination trips, as the Park Service would have no mechanism to restrict commuter trips on the Foothills Parkway.

Figure 16. Foothills Parkway Anticipated Year 2030 Traffic Flow:

Traffic Density for a Summer Weekday Half-Mile Representative Section

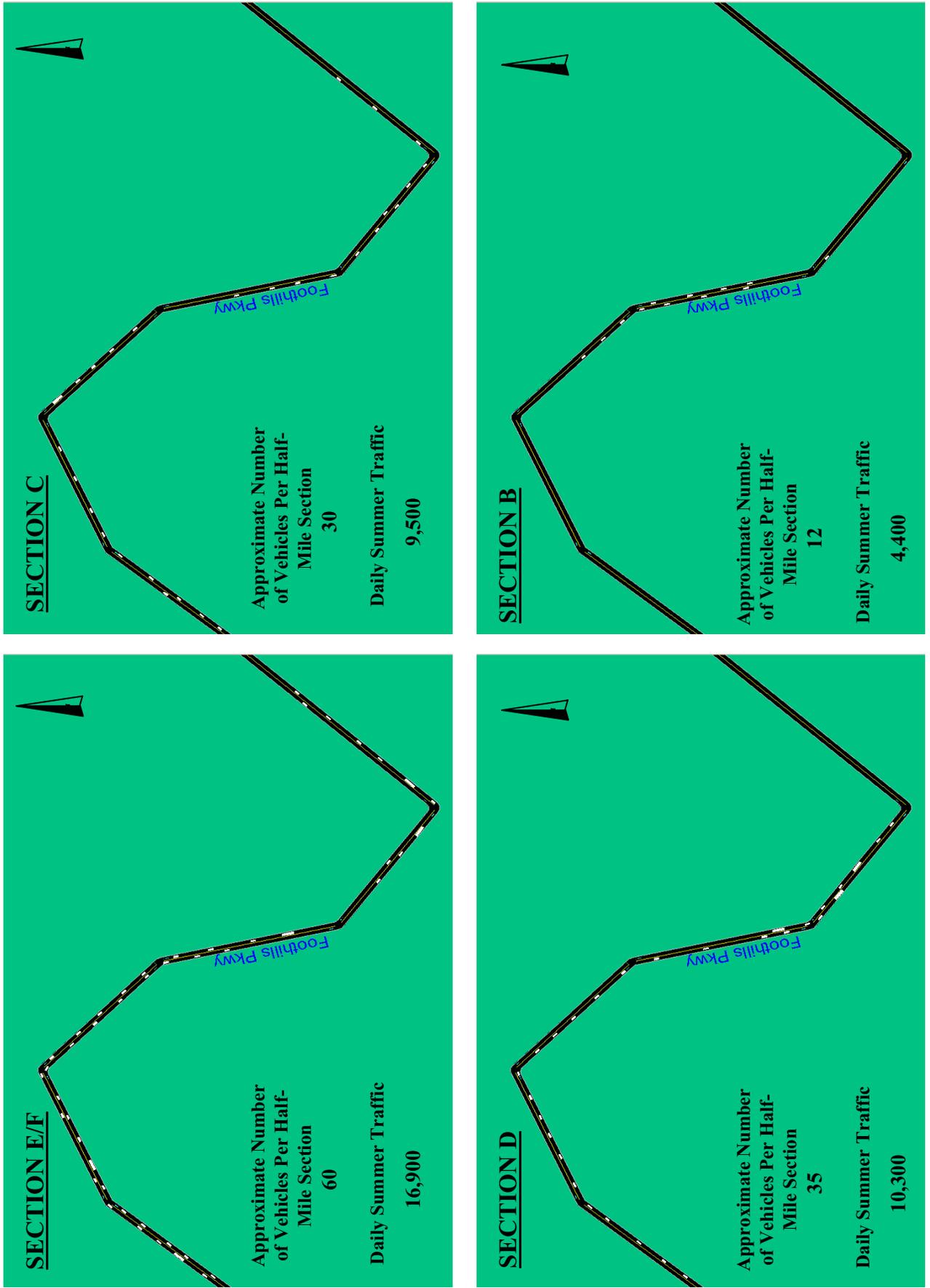


Figure 16 depicts Year 2030 traffic flow information on the four incomplete sections of the Foothills Parkway. The traffic simulation model SimTraffic was used to produce an instantaneous snapshot of traffic density on a typical half-mile segment. It was assumed that a peak hour would produce about 12 percent of the daily traffic, and that at any given time, half of the traffic would be traveling in each direction. The traffic density is what might be expected during a peak hour of a typical summer weekday.

Section E/F is projected to have a density of approximately 60 vehicles per half-mile segment, or about 29 percent of the road occupied by vehicles. Section D is projected to experience a density of about 35 vehicles per half-mile or about 18 percent of the road occupied. Section C should have a density of 30 vehicles per half-mile segment, which would result in about 15 percent of the road occupied. Section B should experience the lowest density of traffic with only 6 percent of the road occupied from the projected 12 vehicles per half-mile segment.

Traffic engineers typically quantify two-lane roadway operating conditions using a quality of service (Level of Service) concept that is published in the *Highway Capacity Manual (HCM)*. Two-lane highway Level of Service is defined with two criteria: average travel speed and percent of time spent following other vehicles. For the Foothills Parkway, however, this evaluation process is not valid. First, the HCM's evaluation

procedure is applicable for high design speed roads. Second, and more importantly, the criteria used in the HCM evaluates motorists' mobility, and travel time is a major consideration.

Travel time and being restrained by other vehicles should not be a major evaluation criterion for the Foothills Parkway, except to the extent that each of these detracts from the visitor experience. Instead, the criteria should be based on roadway density, or the percent of the road occupied by vehicles at a given moment. More than likely, the densities that result in a poor Level of Service using the HCM criteria will far exceed the density at which a significant detraction from the visitor experience occurs.

At what density does traffic volume begin to detract from the visitor experience? Additional studies are required to determine this, but instinctively, an order of magnitude of 10 to 15 vehicles in a half-mile roadway segment seems reasonable. These densities relate to approximately 4,500 vpd assuming a 12 percent peak hour traffic and a 50/50 directional distribution factor. Little River Road, with daily summer traffic volumes ranging from 4,100 to 5,100 vpd, experiences peak period traffic densities of approximately 10 to 15 vehicles per half mile section. On the other hand, Newfound Gap Road between the Sugarlands Visitor Center and the North Carolina state line carries roughly 8,500 vpd on summer weekdays and probably experiences traffic densities of over 25 vehicles in a half-

mile section. This density level is very noticeable to motorists and hinders their visitor experience.

On Section B, the Year 2030 daily traffic projection is 4,400 vpd so the traffic should not detract from the visitor experience. Sections C and D, conversely, will attract 9,500 vpd and 10,300 vpd, respectively, so traffic is expected to detract from the visitor experience.