The highway administrator is daily confronted with problems demanding immediate solution. He expects the traffic and planning division to aid him in their solution by recommendations founded on facts, tempered by experience and judgment. The suggested solution must not ignore the hard realities of the situation, such as applicable legislation, availability of funds, and the possible establishment of unworkable precedents. The final answer quite often must, of necessity, be somewhat short of the ideal solution.

The traffic and planning division must, therefore, secure the data which are needed to supply the answers to questions of immediacy. Some of these are requests for signals, sidewalks, new bridges, and the like. Others involve route selection, estimated traffic usage, and turning movements on new facilities. Data are also needed for longer range planning. This involves road inventory, priority ratings, estimates of revenue, and research.

So numerous and diversified are its activities that a mere recital of them would consume too much of your time and be too tedious. I will confine myself to those activities which I think will be most interesting to you.

**TRAFFIC VOLUMES**

Perhaps one of the items of most general interest and usefulness is the information on traffic volumes. We publish each year a mimeographed tabulation showing the annual average 24-hour traffic on each primary state highway throughout its length. Each route is shown by sections which are easily identified. Traffic volumes are shown by the following classes of vehicles: Virginia passenger cars, foreign passenger cars, light and medium trucks, trailer trucks and buses, and total vehicles. We also show the total vehicle volume as of 1941 so that a
quick comparison can be made with that pre-war peak year. We publish a traffic flow map based on the total vehicle volume.

Our engineers have been able to use this information in many ways. It is used as a guide to determine when to apply reflectorized pavement marking, for system classification, priority of improvement, and accident frequency studies, to mention just a few. The state police use it as a guide for the placement of their troopers. Private industry also finds it very useful in the selection of locations for filling stations, tourist courts and restaurants.

The basic data are secured by means of manual counts at more than 1,000 stations. These are so located that we get a complete coverage on the 9,000 miles of primary roads. Eighty of these are key stations. These are counted once every 26 days, giving us a total of 14 counts a year made up of two Sundays, two Mondays, etc., for all the days of the week at each station. The key stations are counted from 7 a.m. to 7 p.m., except for every third count, which is for a 24-hour period. These 80 stations are so scheduled that during one month, the stations will be counted on different days of the week. This has proved to be invaluable in calculating the vehicle miles of travel for each month, thus furnishing up-to-date information on traffic trends.

Unclassified recorder counts are taken on the 38,000 miles of secondary roads. Four 2-man parties using 50 accumulative counters and two non-accumulative counters each can cover the state in four years. Thus, we will have counts in each county every four years. The data from the non-accumulative counters will enable us to factor all counts so that comparative vehicle-mile factors can be determined. This is one of the factors used in the distribution of secondary funds, the others being population, area, and road mileage.

PAVEMENT MARKING

Pavement marking is applied by the maintenance forces in each of the eight districts. There was naturally a considerable difference in interpretation of policy. A pavement marking manual, prepared by the traffic and planning division, plus the assignment of an employee to work with the maintenance division has done wonders toward uniform marking. This year we will apply reflectorized paint on 4,900 miles of our most heavily traveled roads, using non-reflectorized paint on other roads.
In 1948 the sign section of our *Manual of Uniform Traffic Control Devices* was completed and distributed to the field engineers, who are responsible for sign erection and maintenance. This conforms in all important details with the national manual.

Another section dealing with obstruction marking, delineations, and pavement marking suitable for insertion in the manual has just been distributed.

The maintenance budgets provide funds for modernizing all signs on the Class I and II roads by July, 1951. We hope to completely modernize all our signs by the following year.

The highway commission has jurisdiction over traffic signals in towns under 3,500 population as well as in rural areas. Traffic signals have caused as much concern. Usually, requests for signals start when little more than 50 per cent of the minimum warrants are met. It is an understatement to say that it is difficult to convince the proponents that a signal in such a case is not justified. In spite of the fact that we have generally held to the warrants recommended by the AASHO, ITE and the National Conference on Street and Highway Safety, the number of signals has grown from 12 in 1945 to 103 on January 1, 1950.

Our most serious problems in highway deficiencies are in the Arlington-Fairfax areas included in the Washington Metropolitan area. The extent of these problems is indicated by the fact that there is a daily interchange between Washington and Arlington County of 166,000 vehicles crossing the Potomac River on four bridges each weekday. This exceeds the volume of traffic crossing the Hudson River from New Jersey to New York.

Because of the lack of sufficient funds it will be many years before all the highways of this area can be constructed to adequate standards. In the meantime we are doing what we can to relieve congestion.

Those of you who were present at the last ITE Annual Meeting in Washington will recall the paper by M. M. Todd. This was a very able explanation of a system of signals which had just been put into operation on Route 211 near Washington. This section of Route 211 is 28 feet wide, used as a 3-lane road, is 1½ miles in length and carries from 18,000 to 23,000 vehicles per day. You can imagine how difficult it would be to enter the major road from any one of the many side streets during the peak periods. It was first suggested that about four signals, strategically located to permit progression, be installed to break traffic for the benefit of entering vehicles. Since
too much capacity would be lost on this already overloaded road, some means was sought of offsetting this. It was found that the traffic during peak periods was unusually one directional. Eighty per cent was inbound in the morning and 72 per cent outbound in the evening.

Burton Marye, Jr., then Traffic and Planning Engineer, suggested that lane control signals permitting lane shifts be combined with standard intersection coordinated controls. The traffic density variable cycle type of control was decided on as being the most efficient and flexible. Shifting of lane allocation to permit the use of two lanes by the major movement of traffic is done electrically through the interconnection circuits by means of relays in the secondary dispatchers controlled by a time-clock in the master. The type of progression phase is shifted at the same time by the same clock to fit the lane allocation. I am glad to report that this system is working very well indeed—much better than we had dared hope.

Route 241, near Alexandria, Virginia, is a two-lane road carrying about 8,500 vehicles a day at its intersection with Route 236. Route 236 is a four-lane road carrying about 13,000 vehicles a day. Since Route 241 does not cross Route 236, all traffic entering the intersection from Route 241 must either right turn or left turn. Although the traffic signal has been timed to allocate 55 per cent of the green signal time to Route 241, there is a considerable stack-up during peak periods. Since there are not sufficient funds to provide a four-lane highway on Route 241, I recommended the construction of a right turn lane at a cost of about $5,000. This is now under construction and should provide considerable relief.

There are some bright spots in the picture. When the Pentagon Building was built in Arlington County just across the Potomac River from Washington just prior to our entry into the war, the Pentagon Network of roads was constructed. This connects with the two heaviest traveled bridges across the Potomac, and serves as an excellent distributor to the Virginia area.

Connecting with the Pentagon Network is the Shirley Memorial Highway. This is a freeway by-passing Alexandria and connecting with Route 1 south of Alexandria. It is 17.3 miles long, and saves Route 1 through traffic 3.4 miles in travel distance, and through passenger vehicles 20 minutes in time. It has not yet been opened to through commercial vehicles because a five-mile section on the south end has not yet been completed as a four-lane divided highway. This five-mile section has only one 24-foot pavement carrying two-way traffic.
Opened to traffic on September 6, 1949, this highway is presently carrying 4,500 vehicles a day on the southern section, and 30,000 vehicles a day on the northern end. When completed an estimated 1,700 commercial vehicles a day are expected to use this highway. The estimated annual saving to through traffic would then be:

- 617,000 gallons of gasoline
- 1,365,000 man hours
- 1,500 tires
- 7,000,000 miles of travel

ACCIDENT PRONE LOCATIONS

Accident prone locations require prompt investigation and correction. We have placed an employee at state police headquarters to maintain accident spot maps, and to advise us of any place where as many as three accidents occur at any one place. The difficulty here is the lack of accurate location information in the accident reports. Fortunately, although operating as two separate departments, the state police and the highway department work in close cooperation at all levels. This cooperation on the local level enables our field engineers to report to the traffic and planning division any hazardous condition which they cannot correct on their own. We also receive complaints from citizens. During the last six months we investigated and recommended corrections at 61 such locations.

Wherever possible, the recommended corrections involve appropriate signs, delineators, or pavement markings. There simply is not enough money available to correct all the deficiencies. Sometimes, more drastic measures are required.

One such place was an intersection on Route 1, our major north-south route. About five years ago it was found that there had been 23 accidents at this point, killing nine and injuring 21 persons during the preceding four years. Route 1 at this point was a four-lane undivided road carrying about 12,000 vehicles a day. A heavy left-turning movement into the minor highway created a hazardous condition. Plans were made to divide Route 1 at this point with a 20-foot median, provide a left turn lane, and to install a traffic signal. The left-turn lane worked so well that no signal was needed, and accidents have been practically eliminated. A similar intersection just north of Richmond has since been treated in like manner, with the same happy results after a short period of adjustment.

Unfortunately, having once learned the conditions along a highway, many operators drive from memory. If conditions are changed they...
sometimes fail to adjust their action to the new conditions. Hence we can usually expect some accidents to follow any changed conditions, no matter how much better than the old.

TRAFFIC CONGESTION AND PARKING PROBLEMS

Like other American cities, traffic congestion and parking shortages are among the foremost problems facing Virginia communities.

The urban problem was recognized by the federal government when Virginia received an allocation of $1,500,000 for each of five
years for the improvement of urban federal-aid routes, these funds to be matched by state and city funds.

Virginia recognized the urban problem when the general assembly made it possible for the state to finance one-half the cost of urban extensions of the highway systems.

Planning and development of the urban highway extensions are not enough. The cities needed immediate relief from the traffic congestion and parking problems accompanying the upward surge in motor vehicle use following the close of the war.

Again recognizing that rural and urban traffic problems could not be separated by a corporate limit the department established an urban section in its traffic and planning division to aid the cities in their solution of traffic and parking problems. The traffic service available to the municipalities is not confined to the urban extensions of the highway system, but extend to all streets and to all forms of motor vehicle transportation. Studies have ranged from traffic control at one intersection to a city-wide survey which included all phases of the traffic and parking problem.

The basic street patterns of Virginia’s cities have remained practically unchanged since the original street lines were established. Some streets have been widened but this has provided only temporary relief from traffic congestion. The cities’ streets, particularly those in the central business districts were not designed to accommodate the tremendous volumes of traffic they are required to serve daily. Providing street widths adequate to handle today’s traffic cannot be economically justified in the compact business districts. To relieve the intolerable traffic conditions the cities must resort to an extension of regulatory control.

Complete parking and traffic studies have been made in six cities ranging in population from 10,000 to 50,000. In addition to these complete studies, an origin-destination survey and a parking survey have been made in the city of Richmond, which has a population of approximately 225,000.

TOLL BRIDGES AND FERRIES

In the eastern part of Virginia there were in 1940 numerous toll bridges and ferries under private ownership. Realizing that there was little chance that they would ever become free facilities under the existing conditions, the legislature passed the Revenue Bond Act in that year.

This Act named the state highway commission as a bridge authority with power to acquire by purchase or condemnation certain bridges
and ferries, and to construct certain other bridges. These are to be made toll free or nearly so when paid for.

The traffic and planning division in 1940 conducted origin-destination surveys at 27 locations which formed a cordon around the proposed facilities. These data were secured during late spring, midsummer, and fall, and included weekdays, Saturdays, and Sundays. The data were analyzed and presented in report form, which showed not only the traffic using the present facilities, but also the traffic which could be expected to use the proposed facilities.

The consultant firm of Parsons, Brinckerhoff, Hall and Macdonald was employed in April, 1949, to make an estimate of cost and a study of traffic and earnings.

Acting on the recommendations of the consultants, the Bridge Authority issued $19 million in revenue bonds, purchased the James River Bridge System and the Chesapeake Ferries, and now have under construction a bridge across the York River at Yorktown.

These facilities should pay off the bonds in 20 years, after which they will be made toll free, or nearly so.

FOREIGN PASSENGER CAR SURVEYS

You may be interested in a foreign passenger car survey which we made in Virginia last year. Twenty-five interview stations were located near the state's borders. Interviews were conducted at each station during each of the four seasons. Twenty thousand interviews were obtained as the vehicles were leaving Virginia.

Some of the more important facts learned from this survey are:

1. A total of 24,100 cars bearing out-of-state license plates enter Virginia daily. Eleven per cent of the owners live in Virginia, but are still using license plates from other states.

2. Of the 24,100 out-of-state cars entering Virginia daily, 49 per cent are on pleasure trips, 44 per cent on business trips, 5 per cent are on combined business and pleasure, and 2 per cent are listed as commuting.

3. Of those out-of-state vehicles registered in states bordering Virginia, 62 per cent were on business, and 32 per cent on pleasure, whereas of those vehicles from more distant states, 69 per cent were being used for pleasure, and 23 per cent for business purposes.

4. The average number of days spent in Virginia was found to be 2.55 days when the trip was pleasure, and 1.88 days when on business.
5. The average spent per person per day was $5.63. Thus the total amount spent by visitors to Virginia, traveling by car alone, amounts to over $220 million.

In the line of research we are planning two projects in cooperation with the Bureau of Public Roads. These are in connection with the Shirley Memorial Highway. One of these projects has for its purpose a determination of actual usage of an expressway versus the predicted usage on the basis of methods now used. The other project is a study of the effect of an expressway on land values.

Underway at the present time is a research project in Charlotte County, known as the Charlotte County Research Project. The purpose of this study is:

1. To determine the impact of a new industry on the population of a rural, agricultural area.
2. To investigate the relation of road service to the social and economic needs of the area, and to determine the systems of roads which will best provide for those needs.
3. To determine the kinds of roads the people want, and are willing to pay for.
4. To determine the most economical method of providing all weather year round surfaces on roads carrying low traffic volumes.

This is a joint study undertaken by the Bureau of Public Roads, the University of Virginia, Virginia Military Institute, the Virginia Department of Highways, and the Virginia Council for Highway Investigation and Research.

A "before" study was made prior to the beginning of operations at a new industry then under construction. These data are now being analyzed by the University of Virginia.

Following a few years of operation, an "after" study will be made.

The Virginia Council for Highway Investigation and Research and Virginia Military Institute are working on the low cost road phase. It is hoped that this project will provide the answers to many perplexing problems of the highway Administrator.