

**REPORT**

**OF A**

**SURVEY OF TRANSPORTATION**

**ON THE**

**STATE HIGHWAYS OF PENNSYLVANIA**

**BY**

**THE BUREAU OF PUBLIC ROADS  
U. S. DEPARTMENT OF AGRICULTURE**

**AND**

**THE DEPARTMENT OF HIGHWAYS  
OF THE  
COMMONWEALTH OF PENNSYLVANIA**

**1928**

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## FOREWORD



This report contains the results of highway traffic studies of the State primary, secondary and State-aid road systems of Pennsylvania conducted during 1924 under a cooperative research agreement between the Bureau of Public Roads, United States Department of Agriculture, and the Pennsylvania Department of Highways.

This investigation was undertaken in order to obtain essential facts concerning traffic on Pennsylvania highways as a basis for their future development.

The first part of the report contains a summary of the principal conclusions and the second part the evidence upon which the findings of the report are based.

The researches were conducted under the joint supervision of Thos. H. MacDonald, Chief of the Bureau of Public Roads, and W. H. Connell, who until May 1, 1927 was engineering Executive and Deputy Secretary of Highways of the Pennsylvania Department of Highways. Publication of the report has been completed under the administration of James L. Stuart, Secretary of Highways and Samuel Eckels, Chief Engineer.

J. Gordon McKay Chief of the Division of Highway Economics, Bureau of Public Roads, directed the work of the survey and preparation of the report, assisted by O. M. Elvehjem, Highway Economist, E. T. Stein, L. E. Peabody and B. P. Root, Associate Highway Economists, all of the Division of Highway Economics in cooperation with W. A. Van Duzer, Assistant Chief Engineer, J. W. Follin, Office Engineer and H. K. Craig, Cost Engineer, all of the Pennsylvania Department of Highways.

# THE PENNSYLVANIA HIGHWAY TRANSPORTATION SURVEY

## CHAPTER I

### PURPOSE OF THE SURVEY AND MAJOR CONCLUSIONS

There are in Pennsylvania approximately 93,000 miles of public roads, exclusive of city and borough streets, of which 10,719 miles were on the State highway and State-aid highway systems in 1924, and under direct supervision of the Department of Highways. Through additions to the highway systems, the mileage on January 1, 1927 was approximately 12,000. Of this mileage, about 4,000 miles have been designated as the primary highway systems which includes the connections between larger population centers, county seats and routes into adjacent states. This system is, with few exceptions, coextensive with the Federal-aid highway system. The remainder, or about 8,000 miles, consists of roads designated as secondary State highways and State-aid highways.

These highways serve more than 9,000,000 people scattered over 45,000 square miles of territory and included within 67 counties, 42 cities, 931 boroughs and 1,571 townships.

In 1924, 1,229,000 *Motor* vehicles were registered in Pennsylvania, representing one car to each  $7\frac{1}{2}$  persons. In 1914 the registration was only 113,000, or one car to each 72 persons, which means that in ten years the registration had increased ten fold. The registration for 1926 was 1,455,000, or one car to  $6\frac{1}{2}$  persons, and it is estimated that the motor vehicle registration in 1930 will be 2,086,000, which, on the basis of the estimated population of nearly 10,000,000, will represent one car to each 4.75 persons.

Prior to 1923, Pennsylvania was without fundamental traffic data and was facing a program of construction and maintenance, under the supervision of the Pennsylvania Department of

Highways, involving the expenditure of about \$260,000,000 in four years. Of this amount about \$200,000,000 was for work on the State highway system and the remaining \$60,000,000 on township and county highways. The need for traffic information which would serve as a guide to the proper expenditure of these funds in providing highway facilities for present and future traffic was self-evident. The Department undertook early in 1923 a series of traffic counts on the entire highway system and a few months later arrangements were made for a comprehensive highway transport survey to be conducted jointly by the Department and the United States Bureau of Public Roads.

#### *Present and Future Value of Traffic Data.—*

The data produced in these traffic studies are valuable as a guide in determining the required strength and width of the pavements to be constructed, and in establishing the ultimate widths of right of way; and they have been so used in planning the road improvement program since 1924. These data with minor modifications from time to time, will also serve as a guide in the further development of the highway improvement program in Pennsylvania in future years.

The establishment of plans for highway development, which will result in the maximum of highway transportation service, at a cost commensurate with the service rendered, requires a careful analysis of present highway traffic and the trend of its development. The plan of improvement may materially alter the economic and social development of the commonwealth as a whole or of any section. The improvement or lack of improvement of a given route is of importance not

only as a compliance with the traffic needs of the immediate locality, but also, as a partial answer to the traffic demands of a much wider area.

Therefore, the development of a system of highways should not be judged only as miles and types of highways constructed each year, but should be considered in terms of the movement of people and commodities, both present and future. The planning and construction of a connected system of highways deal, in fact, with the development of the Commonwealth and its localities, their agriculture, industries, the growth of suburban areas adjacent to centers of population and the social activities of the people.

*The Economic Highway.*—The plan of highway development, to be sound both from the standpoint of the most economical design and the earning capacity of the improvement, must be based upon not only the present but the estimated future traffic demands.

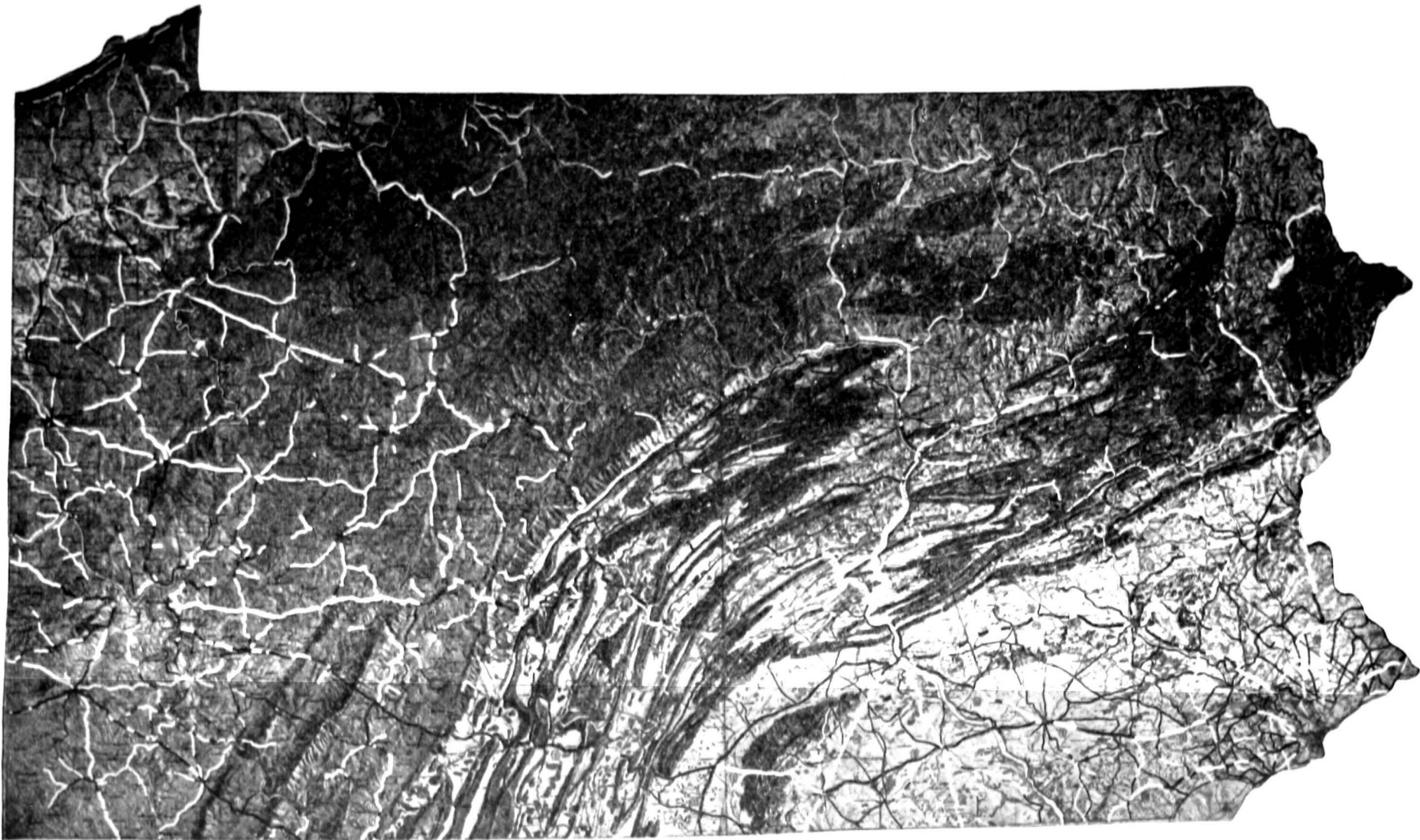
Highways, no less than other engineering structures, are designed for a specific purpose. The economic structure, whether it be a bridge, building, pavement, or, in fact, any structure is one that has been designed to accomplish at least annual cost, the purpose for which it is intended. In the case of the highway, the location must accord in direction with the natural direction of traffic flow; the pavement must be of sufficient width to accommodate, with a reasonable degree of comfort, the peak of traffic in terms of the number of vehicles, and it must be strong enough to accommodate the peak in terms of the weight of vehicles using the road in a given time. On the other hand, it must be remembered that there is waste in excessive provision which is to be avoided as carefully as the waste of inadequacy. It would be a waste of money to construct a pavement of insufficient strength or width, but it is likewise a waste of money to construct one that is more costly than the traffic requires. This means not only the present traffic, but the traffic that it is esti-

mated will use the highway during the life of the pavement.

There is an accepted principle that no highway should be improved in excess of its earning capacity. The demand for improved highways will continue until all important highways are improved, yet the extent to which the various highways may be improved and yield an economic return from such improvement varies greatly, and cannot be left to the hazard of uninformed judgment, but must be determined on the basis of the present and future traffic demands. In making this determination proper consideration should be given to possible savings in vehicle operating costs for present and estimated future traffic as well as location, construction and maintenance costs. So it may be said that the economic highway is one of which every section is improved to the degree required by the traffic and to no greater degree.

*Scope of the Transportation Survey.*—The transportation survey, herein reported, covered a period of one year and the field studies included a count of the number of vehicles passing various points on the highway system, as separated into passenger cars, motor busses and trucks, as well as detailed information regarding the capacity, weight, and use of motor trucks, and the use of passenger cars.

On the basis of the present traffic demand the various routes of the highway system were classified as terminal, industrial and semi-industrial, and on the basis of future estimated traffic demand the same routes were reclassified to show the probable classification in 1930 and 1935. An analysis was also made of the present condition of the various routes to determine their ability to meet the estimated traffic demands and a tentative program of improvement has been prepared which, if followed, will provide adequately improved highways for the probable traffic of each of the above future periods.



*Fig. 1—Relief map of Pennsylvania showing State Highway System*



## PRINCIPAL CHARACTERISTICS OF PENNSYLVANIA

A brief description of the physical characteristics of Pennsylvania and the extent and the probable development of its principle pursuits, such as manufacturing, farming, lumbering, mining, etc., is necessary before setting forth the findings and conclusions of the survey.

The terrain is generally mountainous, as shown in Figure 1, which is a photographic reproduction of a relief model map, showing the State highway system. The mountain ranges run in a generally southwesterly to northeasterly direction through the central part and separate the eastern and western sections which are referred to frequently in the report. The area, comprising the central

mountains and the northern territory, is described in the report as the northern and central section.

Because of the marked differences in traffic, physical characteristics, and development of these three geographical sections it has been deemed desirable to deal separately with each one of these sections, as well as with the Commonwealth as a whole.

*Eastern Section.*—The eastern section includes 18 counties, comprising all the counties around Philadelphia and those which surround the group of smaller cities of Lancaster, York, Harrisburg, Reading, Allentown and Bethlehem, as well as



*Delaware Water Gap*



*Bushkill Falls Near the Highway Between Stroudsburg and Milford*

the counties in which the anthracite coal mining is carried on, which include the cities of Scranton, Wilkes-Barre, Pottsville and Sunbury. Philadelphia, the largest city in this section, has a population of about 2,000,000 which gives it first rank among the cities of the Commonwealth and third place among all cities in the United States.

*Western Section.*—The western section of 20 counties includes all those counties along the western State boundary and others west of the Allegheny Mountains, including the cities of Pittsburgh, the commonwealth's second largest city, with a population of over 600,000, Uniontown, Washington, Butler, New Castle, Franklin, Erie, Clearfield, Johnstown and Altoona. The western section comprises the larger portions of the bituminous coal, oil and natural gas deposits.

*Northern and Central Section.*—This section contains the remaining 29 counties lying between the eastern and western sections. It includes all of the central counties from the southern State boundary to the northern boundary, as well as all counties lying along the northern and north-eastern boundaries. This section is generally mountainous, includes the Allegheny National Forest and most of the State forest reservations, and contains areas of great extent which are famous as hunting and fishing regions. It has comparatively few population centers, the most important of which is Williamsport, which has a population of about 40,000.

*The Population, of Pennsylvania, its Growth, Distribution and Density.*—From 1910 to 1920 according to the United States census the State population grew from 7,665,111 to 8,720,017, an increase of 1,054,906 persons, or 13.8 per cent; and it is estimated that the population at the time of the 1930 census will be (approximately) 10,000,000 people, which will be 14.7 per cent above the 1920 figure.

Of the total population, about 65 per cent is urban and about 35 per cent rural, as shown in Table 1.

Table 1—Urban and rural population

Class	Number of cities	1920 population	Per cent of 1920 State population
Urban			
Cities over 1,000,000	*1	1,823,779	21
Cities over 500,000 to 1,000,000	†1	588,343	7
Cities under 500,000	40	1,454,658	17
Boroughs over 10,000	39	566,798	6
Boroughs under 10,000 and other urban population ...		1,234,433	14
Total urban		5,668,011	65
Rural		3,052,006	35
Total State population		8,720,017	100

\*Philadelphia.

†Pittsburgh.

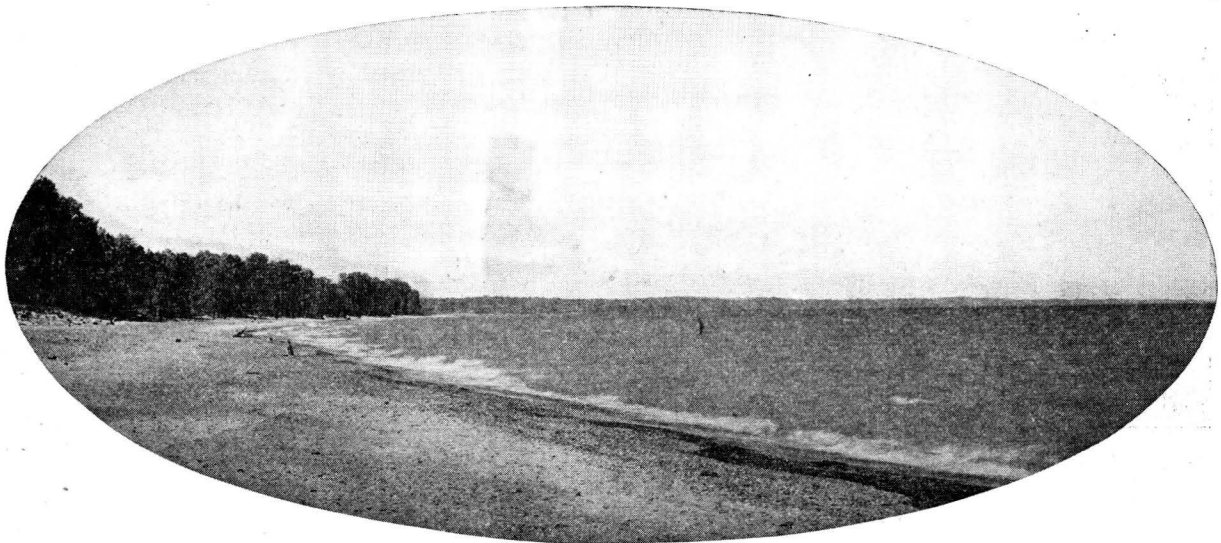
In density of population, Pennsylvania ranks sixth among the States with a population of about 200 persons per square mile. The population density by counties in 1920 varied from

12½ persons per square mile in Pike County to over 13,000 persons per square mile in Philadelphia County, which is coterminous with the city of Philadelphia. The variations in population density and in population trends within the counties are also great.

There is a marked difference between the distribution of population in the three previously defined geographical sections. The eastern section includes 18 counties, with an average population density in 1920 of 457 persons per square mile and in all of these counties population increased between 1910 and 1920. The 20 counties of the western section had an average population

areas. Other areas of dense and of rapidly increasing population are found at the larger cities or boroughs, but these regions are small and scattered.

Considering the Commonwealth as a whole, 13.4 per cent of the area had a population in 1920 of 200 or more persons per square mile and contained 77.9 per cent of the total population; 11.6 per cent of the area had from 100 to 199 persons per square mile and contained 8 per cent of the total population; while 75 per cent of the area had less than 100 persons per square mile, and contained only 14.1 per cent of the total population.



*Presque Isle on Lake Erie*

density of 219 persons per square mile in 1920, and in 17 of these counties the population increased between 1910 and 1920. The majority of the 29 counties in the northern and central section show a very low density of population, with an average of 44 persons per square mile, and in 18 the population decreased between 1910 and 1920. The total population within this section decreased about two per cent during the decade.

The 18 counties of the eastern section, together with 9 of the 20 counties of the western section, include nearly all of the important areas of dense population and all rapidly increasing population

In general, the areas of increasing population are also the areas of dense present population. All townships having a population in 1920 of 100 or more persons per square mile increased in population between 1910 and 1920, and with the exception of certain townships in the western section in the general vicinity of Pittsburgh, the areas which had in 1920 a population less than 100 persons per square mile decreased in population between 1910 and 1920.

*Economic Characteristics.*—Pennsylvania's pre-eminence among the States of the Union is founded principally on the value of its industrial production, and of all the State's industries manu-

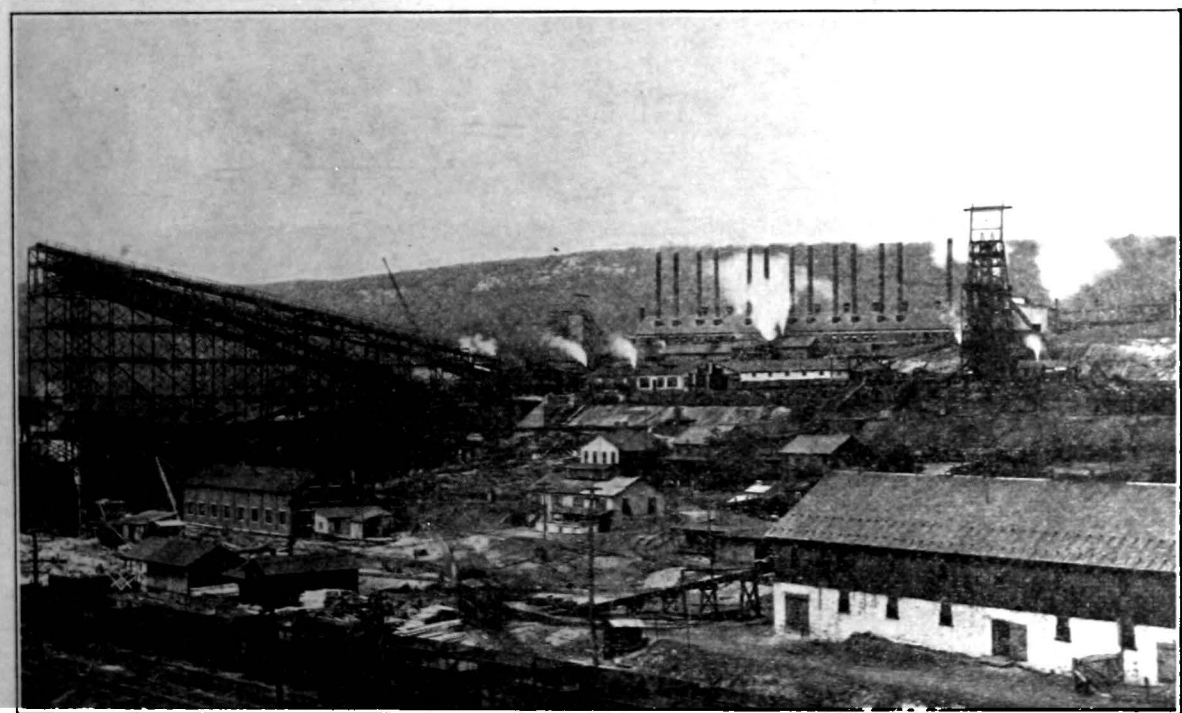
facturing easily takes first place and is therefore the controlling economic factor.

In the production of all industries, which exceeds \$11,000,000,000 a year, as well as in manufacturing, its principal industry, which according to the United States Census reports, accounted in 1920 for \$7,000,000,000 of the total. Pennsylvania is second only to New York. In the production of pig-iron it is the leading State, and in the value of its textile products it ranks third in the Union.

Mining, for many years the most important industry, has decreased in importance in recent

While practically all the anthracite coal in the United States is still produced in an area of about 480 square miles in eight counties of the east-central and northeastern sections of the Commonwealth and although the production amounted to 89,000,000 tons in 1920, the indications are that the maximum production has been reached or is about to be reached, and that during the next fifteen years the average will probably amount to only about 75 per cent of the peak production.

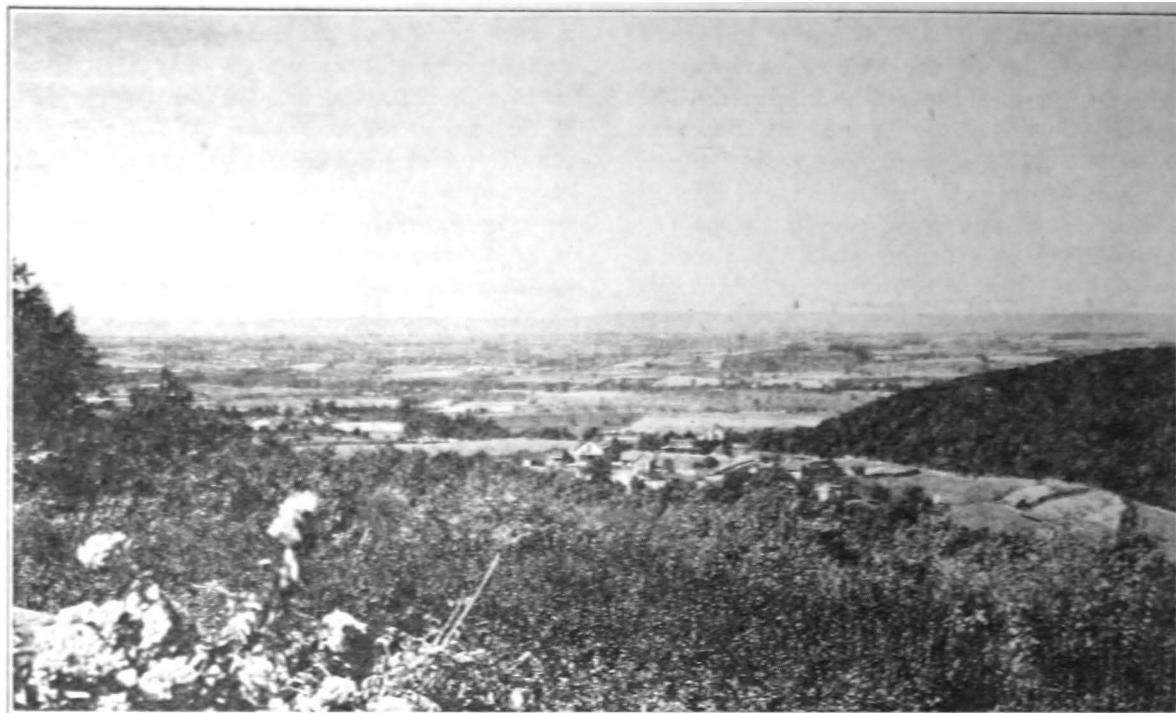
Bituminous coal mining is in much the same condition. This industry involves almost the en-



*An anthracite Mine East of Tamaqua in Carbon County*

years, both in respect to the number of persons engaged and the value of its products. Only about 10 per cent of the persons now engaged in productive industry in Pennsylvania are occupied in mining and quarrying operations. This is not to say, however, that mining is no longer a very important industry, but rather that its once supreme position among the industries of the State has been taken by the manufacturing industries.

tire western half of the Commonwealth, where some 20,000 square miles are underlaid by deposits. The producing fields cover approximately 14,000 square miles and their production in 1920 reached 170 million tons or 31 per cent of the total for the United States. While it can not be said that the maximum production has been reached, the relative importance of the Pennsylvania bituminous coal industry will probably not increase perceptibly.



*A View in Franklin County Typical of the Fertile Agricultural Lands of the Southeastern Section of the Commonwealth*



*The Town of Trout Run in Lycoming County in the Northern and Central Section of the Commonwealth. Most of the Forest Areas and a Major Portion of the Lumber Industry are Located in this Section*

The production of oil and gas is still an important industry of the western area, but the State production of seven million barrels in 1920 was only 2 per cent of the total for the United States and was a decided drop from the peak of 32 million barrels recorded in 1891. In the refining of oil Pennsylvania takes higher rank than in the product of its wells, the output of its refineries running to 6 per cent of the total for the United States. Natural gas production, in 1917 approximately 130 billion cubic feet, had decreased by 1921 to 75 billion cubic feet.

In respect to the number of persons engaged in Pennsylvania, agriculture ranks below mining, there being in agricultural and dairying pursuits

in 1920 fewer than 10 per cent of all persons engaged in gainful occupations. However, there are more than 200,000 farms, or about 3 per cent of the total in the United States; and the agricultural industry is secure in its future. Of the future of the allied forest industry there is not the same assurance. Lumbering at one time was of major importance in the Commonwealth and Pennsylvania stood first in production among all the States, but between 1900 and 1921, the annual production fell off from 2,250,000,000 to about 500,000,000 board feet, and the industry is now at a low ebb from which it will return only as the benefits of the present program of reforestation are realized.

## AMOUNT AND CHARACTER OF PRESENT HIGHWAY TRAFFIC

The tremendous increase in motor traffic during recent years has relegated the horse-drawn vehicle to a place of relative insignificance upon such principal roads as are included in the State highway system. Although the number of horse-drawn vehicles was recorded during the survey, they were found to be so few as to justify no further statistical analysis. The real problems relating to highway development at the present time are those resulting from motor vehicle traffic; and for this reason the following discussion is limited to motor vehicles only.

The average daily motor vehicle travel<sup>1</sup> on the State highway system during 1924 was found to be approximately 6,526,000 vehicle miles. Between 1924 and 1927 it is estimated that traffic has increased approximately 40 per cent and the daily use of the highways in 1927 is therefore approximately 9,135,000 vehicle-miles.

It is impossible to determine accurately the actual number of vehicles daily using the state highway system but it is estimated that the number of passenger car trips made daily in 1924 was approximately 350,000 and in 1927 approximately 490,000.

*Amount of Traffic on Primary and Secondary Parts of the State Highway System.*—About 64

<sup>1</sup> The traffic counts and information in the report, except as otherwise stated, are as of 1924.

per cent of the traffic on the State highway system was carried by the primary system in 1924. At that time the average daily density of traffic on the primary system was 1,051 and on the secondary system 375. In 1927 it is estimated that the average daily density of motor vehicle traffic on the primary system was nearly 1,500 and on the secondary system over 500.

*Traffic on Improved Versus Unimproved State Highways.*—At the time the traffic survey was made, in 1924, approximately 58 per cent of all the State highways were improved with hard-surface pavements. The average traffic density of the improved sections of the primary system was 1,210 vehicles per day, whereas the unimproved highways carried only 348 vehicles per day. On the secondary system the improved sections carried an average of 593 vehicles daily, and the unimproved an average of 210.

*Traffic on State Highway System in Relation to Total Highway Traffic.*—The total motor vehicle utilization of the rural highways in 1924 was approximately 3,487,210,000 vehicle-miles.

The traffic on the State highway system, which comprised about 11 per cent of the rural highway mileage, amounted to 6,526,000 vehicle-miles daily, or 2,381,990,000 vehicle-miles annually, which was 68.3 per cent of the total vehicle-mileage on the entire rural highway system comprising 93,194

miles. The remaining 1,105,220,000 vehicle-miles or 31.7 per cent of the total on the rural highways were on the State-aid, county, and township roads which constituted 89 per cent of the total rural highway mileage.

Of the 3,487,210,000 vehicle-miles on the rural highways, 1,516,575,000 or 43.5 per cent of the total was on the 3,953 miles of primary or main highways of the State highway system, which constitute only 4.2 per cent of the mileage of rural highways. On the 6,321 miles which constituted the secondary highways of the State highway system in 1924, and which was 6.8 per cent of the total rural highway mileage, the traffic amounted to 865,415,000 vehicle-miles, or 24.8 per cent of the total on all rural highways.

The amount of vehicular traffic on the rural highways probably increased about 40 per cent between 1924 and 1927, or from 3,487,210,000 to about 4,900,000,000 vehicle-miles annually.

*Variations in Traffic Density on the State Highway System.*—There is a wide variation in the amount of traffic on different parts of the State highway system and a very marked variation between routes and even different sections of the same route. In general, traffic density varies with population density and practically all of the routes carrying heavy traffic are adjacent to or connect the large cities.

The eastern section, which is the area of densest population and greatest industrial development is also the region of greatest traffic concentration; the western section is next in importance and the northern and central section is of least traffic importance. The region of maximum traffic concentration is around the City of Philadelphia.

*Relative Traffic in the Three Geographical Sections.*—The average density of traffic on the State highway system in the eastern section in 1924 was 1,039 vehicles per day, approximately the same as the average density of traffic on all roads in the primary system. The average of 658 vehicles for the State highway routes in the western section was approximately equal to the average traffic on the entire State highway system; and the average of 348 vehicles per day in the northern and central section was approximately the

same as the average recorded traffic on the secondary routes of the State highway system.

In 1924, 890 miles or 8.7 per cent of the 10,274 miles of State highways were carrying over 1,500 vehicles per day and 2,202 miles, 21.4 per cent, were carrying from 600 to 1,500 vehicles daily, while 7,182 miles or 69.9 per cent were carrying less than 600 vehicles per day.

The eastern section contained only 27.1 per cent of the State highway system, but 72.8 per cent of all the mileage of State highways carrying over 2,000 vehicles per day in 1924 were in this area, as were 72.4 per cent of those carrying over 1,500 vehicles per day.

The western section had 32.2 per cent of the State highway mileage in 1924 and 25.0 per cent of the mileage carrying over 2,000 vehicles and 25.1 per cent of the mileage carrying over 1,500 vehicles per day.

Traffic in the northern and central section was found to be smaller than in either of the other sections. Although this section contained 4,181 miles of State highways, 40.7 per cent of the total, only 9 miles in 1924 carried a daily average of more than 2,000 vehicles (only 23 miles carried over 1,500 vehicles, and there were only 690 miles which carried over 600 vehicles daily).

*Concentration of Traffic Near Centers of Population.*—Practically all routes carrying heavy traffic are adjacent to or connect the large cities.

Of the 644 miles of highway in the eastern section carrying an average of over 1,500 vehicles daily in 1924, 169 are in the Philadelphia district, 142 connect and radiate from the cities of Reading, Allentown and Easton, 79 radiate from Harrisburg, 88 are in the Scranton-Wilkes-Barre district, and 89 in the Sunbury, Shamokin, and Pottsville district.

In the western section 66 miles, carrying an average of over 1,500 vehicles daily in 1924, radiate from Pittsburgh and 37 miles form the interstate route from New York to Ohio through Erie.

*Maximum Traffic in Philadelphia Region.*—In Bucks, Chester, Delaware and Montgomery counties, forming an approximate semi-circle of 36 miles radius drawn about the City of Philadel-

phia and including less than one-twentieth of the area of the Commonwealth, the traffic on the State highway system in 1924 was approximately one-sixth of the traffic on the entire State system. A large part of this traffic, particularly in Bucks and Chester counties which have a relatively low density of population compared with Delaware and Montgomery counties, originates in the City of Philadelphia. Traffic on the State highway system in these four counties was approximately equal to the traffic in 22 northern counties which comprise 36.6 per cent of the State area. In explanation, it may be remarked that the population of these four counties and of the City of Philadelphia in 1920 was about 28 per cent of the State total, whereas the 22 northern counties had only about 9 per cent of the total.

*Traffic Variation Between Individual Routes.*—There is a very marked variation of traffic on various routes. At the Philadelphia city line on the route to Media the average motor traffic per day was 9,114 vehicles, while on Route 289 of the secondary system in Lycoming county, the daily average was but 22 vehicles. The maximum daily traffic at these two stations was 25,060 and 80 vehicles, respectively.

Comparison of important through routes indicates large variations in traffic volume. On the Lincoln Highway from the New Jersey line through Philadelphia to Pittsburgh, including approximately 290 miles of State highway, the average density of traffic in 1924 was approximately 1,800 vehicles per day. *The population*

*of an area ten miles wide on each side of this highway is about 4,000,000.* In sharp contrast with this the average traffic on 371 miles of the Roosevelt Highway in the northern part of the Commonwealth was only about 500 vehicles daily, and it is pertinent to remark that the population of a similar belt 10 miles wide on each side of this highway is only about 600,000.

*Variation on Sections of Main Routes.*—There is also a wide variation in the amount of traffic on different sections of the main routes and the rapid decrease in traffic with distance from the centers of population indicates that even on the "through routes" the major part of the traffic is local in character. On the 88 miles of the Lincoln Highway from Chambersburg to Jennerstown the average density of traffic was 800 per day, whereas it was 3,940 per day on the 35 miles from Philadelphia to Coatesville, and 2,699 per day on the 23 miles from Greensburg to Pittsburgh. On the northern section of the Lackawanna Trail, from Great Bend to Kingsley, the traffic was 692 vehicles per day as compared with 4,626 per day on the 6 miles from Willow Grove to Philadelphia, and 3,002 vehicles per day on the 11 miles from Factoryville to Scranton.

*Seasonal, Monthly and Daily Variations in Traffic.*—The traffic densities discussed above are those of an average 24-hour day throughout the year. On individual days in different seasons of the year, the traffic will, of course, vary widely from these averages, as shown on typical routes listed below.

Route	Location	Total daily traffic in numbers of vehicles			
		Average day-year period	Average day-winter (Nov.-Apr.)	Average day-summer (May-Oct.)	Average day-maximum month
Lincoln Highway .....	Philadelphia— Coatesville .....	3,940	2,760	5,120	6,460
Susquehanna Trail ....	Lawrenceville—Trout Run .....	729	440	1,060	1,390
Lackawanna Trail .....	Clarks Ferry— Harrisburg .....	2,483	1,550	3,420	4,070
	Great Bend—Kingsley Willow Grove— Philadelphia .....	692	310	1,070	1,310
Roosevelt Highway ....	Philadelphia .....	4,626	3,350	5,900	7,590
	Wellsboro— Coudersport .....	341	220	460	650



The seasonal maximum of passenger car traffic in Pennsylvania is reached in August, when the traffic is 70 per cent greater than the monthly average.

The month of maximum truck traffic is October, but the seasonal variation is not as wide as that of passenger car traffic, by reason of the offsetting effects of climate and business peak. In the southern counties the seasonal maximum is only about 25 per cent above the monthly average but in the north the excess is about 50 per cent.

Sunday passenger car traffic for the Commonwealth as a whole is 85 per cent greater than the average for the seven days of the week; but Sunday truck traffic is only 17 per cent of the seven-day average.

The hour of maximum traffic occurs during the afternoon hours, but varies on different routes, and at different seasons of the year. During the summer months the maximum hour is generally between 4 p. m. and 8 p. m., during the winter months between 4 p. m. and 6 p. m. The traffic density during the maximum hour approximates twice the density of the average hour of the day.

Combining the seasonal and daily averages in traffic, it appears that maximum passenger car traffic, that is, traffic on a Sunday in August, is about 270 per cent more than the average daily traffic for the year in the northern counties and approximately 170 per cent more in the south.

*Amount and Character of Truck Traffic.*—Truck traffic on the State highway system amounts to about 9 per cent of the total traffic, but this percentage varies from 4 to 18 per cent on different sections of highways, the higher percentages occurring on routes located in important industrial or mining areas. Of the total number of trucks observed, 62.7 per cent were loaded and 37.3 per cent were empty, the loaded trucks varying from 45 to 90 per cent at different stations.

Truck traffic over the State highway system as a whole is made up predominately of small-capacity trucks carrying light gross loads. Appreciable numbers of heavy trucks or loaded 5 to 7½-ton capacity trucks having gross weights exceeding 21,000 pounds are confined to relatively few localities. The distribution of total truck

traffic and of large-capacity truck traffic on the primary State highways is shown in Figure 8.

The total commodities transported over the 10,274 miles of State highways in 1924 was between 5,000,000 and 6,000,000 net tons. In the same year there were transported on the 13,428 miles of railroads in the Commonwealth more than 350,000,000 net tons of freight, of which nearly 9,000,000 net tons were L.C.L. (less than carload lots) shipments.<sup>2</sup> The freight haulage on the State highway system in 1924 was 148,000,000 net ton-miles, while the L.C.L. railroad shipments amounted to about 400,000,000 ton-miles.

Products of manufacture comprised 60 per cent of the total net tonnage on the highways. The remaining 40 per cent was made up of products of mines, 13 per cent; products of animals, 11 per cent; products of agriculture, 9 per cent; and of forests, 7 per cent.

The total truck traffic on the State highway system in 1924 amounted to 214,255,000 truck-miles, representing an average daily traffic of 587,000 truck-miles, of which 369,000 were on the primary system and 218,000 on the secondary system. By 1927 it is estimated that the truck traffic on the State highway system has increased about 40 per cent over that recorded in 1924, or to about 300,000,000 truck-miles annually, representing a daily truck travel of about 800,000 truck-miles.

The average daily density of truck traffic on the entire State highway system in 1924 was 57, on the primary system 93, and on the secondary system 35.

A wide variation was found in 1924 between the number of trucks operating on the different State routes. The average daily density of truck traffic was 233 on 661 miles of the most heavily traveled roads of the primary system around the principal centers of population, and only 38 on 1,436 miles of primary roads, in the light traffic areas. The remaining 1,856 miles of medium traveled primary roads carried a density of 86 trucks per day.

On the individual routes around the principal

<sup>2</sup> Estimated by the Pennsylvania Department of Highways from the reports to the Pennsylvania Department of Internal Affairs.

centers of population truck traffic exceeded 600 vehicles per day, and in 1927 it is estimated that the average truck traffic on certain of the main routes close to the City of Philadelphia amounts to as high as 900 trucks per day.

The City of Philadelphia was found to be the most important trucking center, particularly from the standpoint of heavy loads, with Pittsburgh next in importance.

*Weight of Trucks.*—The average gross weight of all loaded trucks weighed in 1924 was 7,600 pounds. Of the total number, 56.6 per cent weighed less than 6,000 pounds, only 8.7 per cent weighed 18,000 pounds or over; and only 2.4 per cent had gross weights of 24,000 pounds or over.

The average net and gross weight of loaded trucks, and the average weight of empty trucks by capacity groups is shown in Table 2.

Trucks of small capacity (rated capacity of  $\frac{1}{2}$  to  $2\frac{1}{2}$  tons) are found on all sections of the State highway system although in varying numbers. Large-capacity trucks do not operate to any great extent on all State highways or sections of highways because of the absence of need for the service for which they are economically fitted. There must be a sufficient total volume of tonnage or some group of commodities ready for movement over the highways in a given area before any noticeable number of large-capacity trucks operate. The larger the movement of all trucks in any given area the greater is the probability of a considerable number of large-capacity trucks and heavy loads. The use of all trucks in respect to number and size depends upon the amount and type of commodities to be hauled and

consequently upon the population and industries of the area served.

*Trucks Operated for Hire.*—Of the total truck traffic on the State highway system, 13.8 is made up of trucks operating for hire either on a contract or tariff basis. As between contract and tariff haulage, the former is of considerably greater importance in terms of tonnage transported.

An examination of the records of the Public Service Commission shows that in 1926 there were about 309 concerns holding certificates of public convenience for freight hauling on a tariff basis. About 162 of these concerns operated over the State highway system, about 50 on routes radiating from Philadelphia. These routes average 17.5 miles between termini and cover about 2,000 miles of State highways.

One railroad company has contracts with several trucking companies for the distribution of package freight between way stations.

*Heavy Loads Confined to Few Localities.*—The primary and secondary State highway systems, with few exceptions, include all the highways which carry any considerable number of large-capacity trucks. But even upon the State system the movement of large-capacity trucks is important on only a relatively small part of the system. Reference to Figure 8 shows that there is a marked concentration in the volume of total truck traffic and of loaded 5 to  $7\frac{1}{2}$ -ton trucks around the important centers of population and industry, particularly in the eastern section, whereas the truck traffic is very light in the northern and

Table 2—Average weights of motor trucks by capacity classes

Motor truck capacity	Classified as	Net Pounds	Average weight	
			Gross Pounds	Empty Pounds
Tons				
$\frac{1}{2}$ — $1\frac{1}{2}$ }	Small capacity	1,050	4,160	3,110
2— $2\frac{1}{2}$ }		3,410	10,270	6,860
3—4	Medium capacity	5,790	15,450	9,660
5— $7\frac{1}{2}$	Large capacity	8,420	20,620	12,200

central section, because of the small population and the mountainous terrain.

*Heaviest Truck Traffic in Philadelphia Region.*—The most important motor trucking area is the territory around the City of Philadelphia. Two routes radiating from Philadelphia were found to carry approximately 600 trucks per day, on one of which 190, or over 30 per cent, were 3 to 7½-ton capacity trucks, and 81, or nearly 15 per cent, were loaded 5 to 7½-ton trucks. These large-capacity trucks constitute the most important consideration in truck traffic.

On the assumption that the truck traffic increased 40 per cent between 1924 and 1927, the average number of trucks in 1927 is approximately 850 per day on the highways between Philadelphia and Paoli and between Philadelphia and Chester.

*Interstate Truck Traffic.*—Truck travel on certain of these highways, particularly on the Lincoln Highway from Philadelphia to Trenton and New York, is partially an interstate movement. Of the total trucks moving into or out of Philadelphia on this route, 66 per cent originated at or were destined to New Jersey and New York points, and the external influence is particularly pronounced in the case of the trucks of the larger capacities. The truck traffic on no other route is influenced to as great an extent by outside cities, although a considerable part of the traffic on the Philadelphia-Chester-Wilmington route was also found to be interstate. The only other routes where truck traffic was affected to any

appreciable extent by foreign State influences were the routes into Erie from Buffalo on the east and Ashtabula and Cleveland on the west; the route into Beaver Falls from Youngstown, Ohio, and the route into Uniontown from Morgantown, West Virginia.

*Pittsburgh Second Important Truck Center.*—The City of Pittsburgh is the center of the second most important trucking area. There are three main trucking routes on the State highway system: the first from Pittsburgh northeast to Tarentum; the second, the Lincoln Highway southeast to Greensburg; and the third, the route from Pittsburgh southwest to Bridgeville. Several county roads radiating out of Pittsburgh also carry considerable truck traffic, that on the east side of the Ohio River toward Beaver carrying 274 total trucks per day in 1924 of which 20 were loaded 5 to 7½-ton trucks. The highway to Tarentum had the heaviest truck traffic in 1924—457 trucks per day with 26 loaded 5 to 7½-ton trucks.

Based on the assumption that the traffic has increased 40 per cent between 1924 and 1927 the average truck traffic in 1927 on the highway between Pittsburgh and Tarentum is about 640 trucks per day, and on the other two important trucking routes mentioned is between 500 and 600 trucks per day.

The City of Pittsburgh is, of course, the dominating influence upon motor truck traffic in this section, as evidenced by the fact that 87 per cent of the trucks on the route to Tarentum were either coming from or going to Pittsburgh.

**Table 3—Average daily density of total truck traffic by capacity classes, and traffic of loaded 5 to 7½-ton trucks on the principal primary State highways out of Philadelphia in 1924**

Route from Philadelphia		Daily total truck traffic			Daily traffic of loaded 5 to 7½ ton trucks
No.	To	All trucks	½ to 2½ ton trucks	3 to 7½ ton trucks	
142	Paoli .....	605	452	153	55
180	Chester .....	600	410	190	81
281	Trenton .....	336	195	141	66
151	Willow Grove .....	329	262	67	23
130	Media .....	301	224	77	17

There are three minor areas in the western section which warrant mention from the standpoint of motor truck traffic. These are in the vicinity of Beaver, Uniontown and Altoona, but the zone of heavy motor traffic in each area is comparatively short.

*Scranton-Wilkes-Barre—The Third Area.*—The third important area of motor truck traffic in 1924 was found to be adjacent to the cities of Scranton and Wilkes-Barre in the anthracite producing region. There are two important trucking routes in this area, one from Wilkes-Barre to Scranton on the east side of the Susquehanna River and thence to Carbondale. Motor truck density on this route was greatest just west of Scranton where the average daily number of all trucks was 626 per day, of which 73, or about 12 per cent, were 3 to 7½-ton trucks, and 13, or 2 per cent, were loaded 5 to 7½-ton trucks. Between Scranton and Carbondale there was a total truck movement of about 364 per day of which about 10 per cent were of 3 to 7½-ton capacity. The second route—on the west bank of the Susquehanna River from Pittston to Wilkes-Barre and beyond—averaged 378 trucks, between Pittston and Wilkes-Barre and 390 south of Wilkes-Barre. The motor truck movement in this area is almost entirely a local short-haul movement, averaging between 13 and 18 miles.

*Reading, Harrisburg, and Other Cities.*—Reading and Harrisburg are the centers of the next most important areas of motor truck concentration. Reading is the hub of motor highways leading to Allentown, Pottsville, Harrisburg and Philadelphia. Traffic on important routes out of Harrisburg, with the exception of the route to Lancaster, is predominantly a local movement, and at least half of the trucks travel less than ten miles per trip.

The cities of Pottsville and Shamokin are the centers of population and industry in another important area of motor truck concentration, while the cities of Allentown and Bethlehem also form the center of such an area. The remaining

areas surround York and Lancaster. The least important of these areas surrounds Lancaster which is the center of an agricultural rather than an industrial region.

East of Erie there was an average truck density in 1924 of 180, 10 of which were 3 to 7½-ton trucks, while west of Erie the density was 129, of which 10 per cent were large-capacity trucks.

*Northern and Central Section.*—Motor truck traffic on the highways in the northern and central section is very small and in practically all cases in 1924 consisted of less than forty vehicles per day, and these trucks were generally small in capacity and for the most part equipped with pneumatic tires. Highway improvement designed to serve heavy motor truck traffic will be generally unnecessary in this section for a considerable number of years.

*Amount and Character of Motor Bus Traffic.*—The total registration of motor vehicles engaged in carrying passengers for hire in 1924 was 6,773. In 1926 the total registration of these vehicles was 8,034<sup>a</sup> of which approximately 70 per cent had a seating capacity of 8 persons or less. These smaller vehicles are similar to the passenger automobile in size, weight and equipment and do not constitute a separate highway problem. An analysis of the seating capacity of 2,252 motor busses having a seating capacity of more than 8 persons is shown in Table 4.

Table 4—Motor busses with seating capacity in excess of 8 persons, 1926

Seating capacity	Number	Per cent	Estimated maximum gross weight
			Pounds
9—26	1,696	75.3	13,000
26—40	364	16.2	18,000
41—63	12	0.5	26,000
64	6	0.3	26,000
67	174	7.7	26,000
Total	2,252	100.0	

Of the total of 2,252 busses, about 25 per cent were operated exclusively in cities, there being nearly 500 in Philadelphia, 50 in Pittsburgh and

<sup>a</sup> Of this total, 474 were operated by school districts or were engaged in interstate traffic, and no certificate was required from the (Pa.) Public Service Commission.

a smaller number in Scranton and several other municipalities. The 180 busses of 64 or 67 seating capacity are double-deck busses operated in Philadelphia. There are also about 100 busses operated out of the larger cities, especially Philadelphia, to adjoining States.

About 1,500 busses are operating on the rural highways. It has been estimated that nearly 400 are engaged in carrying school children in consolidated school districts. It has also been estimated that about 900 busses are being operated on the State highway system. The total seating capacity of the busses operating on the State highway system is approximately 17,000, or an average of 19 seats per bus. The routes as described in the applications for certificates of public convenience cover about 2,800 miles of the State highway system, or less than 25 per cent of the total mileage of the system. The average length of the routes on State highways, for which certificates have been issued is 12.4 miles between termini. In Figure 2 are shown the bus routes on the State highway system. There are only two of the 67 counties which do not include bus routes. Those which have the highest mileage and accordingly the most pronounced development of bus traffic on the State highway system are all western counties, Butler, Mercer, Washington, Westmoreland, Indiana, Somerset and Fayette. The mileage is also pronounced in the case of Bradford and Tioga Counties, in the northern tier, and Chester County, adjacent to Philadelphia.

*Foreign and State traffic.*—Of the total passenger car traffic on the principal routes of the primary State highway system in 1924, 86 per cent was made up of cars registered in Pennsylvania, and 14 per cent of cars which carried license tags from other States.

The utilization of the principal traffic routes of the primary States highways by motor trucks of foreign registration was less than by passenger cars of foreign registration, amounting to only 4.4 per cent of the daily truck-miles. Traffic by trucks of foreign registration is of little significance except in border counties, and within these is important only on the principal interstate highways.

*Touring and Non-Touring Traffic.*—Touring trips are defined as trips of more than one day's duration, taken principally for recreation. Of the total passenger car traffic on the principal routes of the primary system 5.6 per cent is made up of cars on touring trips, largely limited to important through routes. The highest proportion of touring to total traffic was found on the light-traffic sections of important through routes, such as the section of the Lincoln Highway between McConnellsburg and Bedford, and the National Pike between Summit and the Maryland line. The volume of touring traffic is equally large on other sections of important through routes but it forms a smaller part of the total because of the greater volume of local traffic.

*Business and Non-Business Use.*—Of the total passenger care traffic on the principal routes of the primary system, 52.8 per cent was made up of cars on business trips, and 47.2 per cent of cars on non-business or pleasure trips. Business and non-business traffic is quite equally distributed over the primary system. Business traffic is of greater importance on the routes adjacent to the larger cities and in the industrial areas. Non-business traffic is of greater importance on the important through routes, scenic routes and in areas adjacent to pleasure resorts and to places of historic interest.

*City-owned and Farm-owned Cars.*—Passenger car traffic on the primary system, in 1924 was predominantly a traffic of city-owned cars, making up 92.9 per cent of the total daily passenger-car-miles. The term *city owned* includes all cars not actually owned on farms. Farm-owned cars made up 7.1 per cent of the total daily passenger-car-miles. This low percentage indicates that the movement of farm-owned cars is primarily a local movement. It applies, however, only to the principal routes of the primary system, and on other highways it is probably that the proportion of farm-owned cars exceeds the proportion found on the primary system.

*Number of Passengers per Car.*—The average number of passengers per car under all types of car usage was found to be 2.6 persons. Cars registered in Pennsylvania averaged slightly less

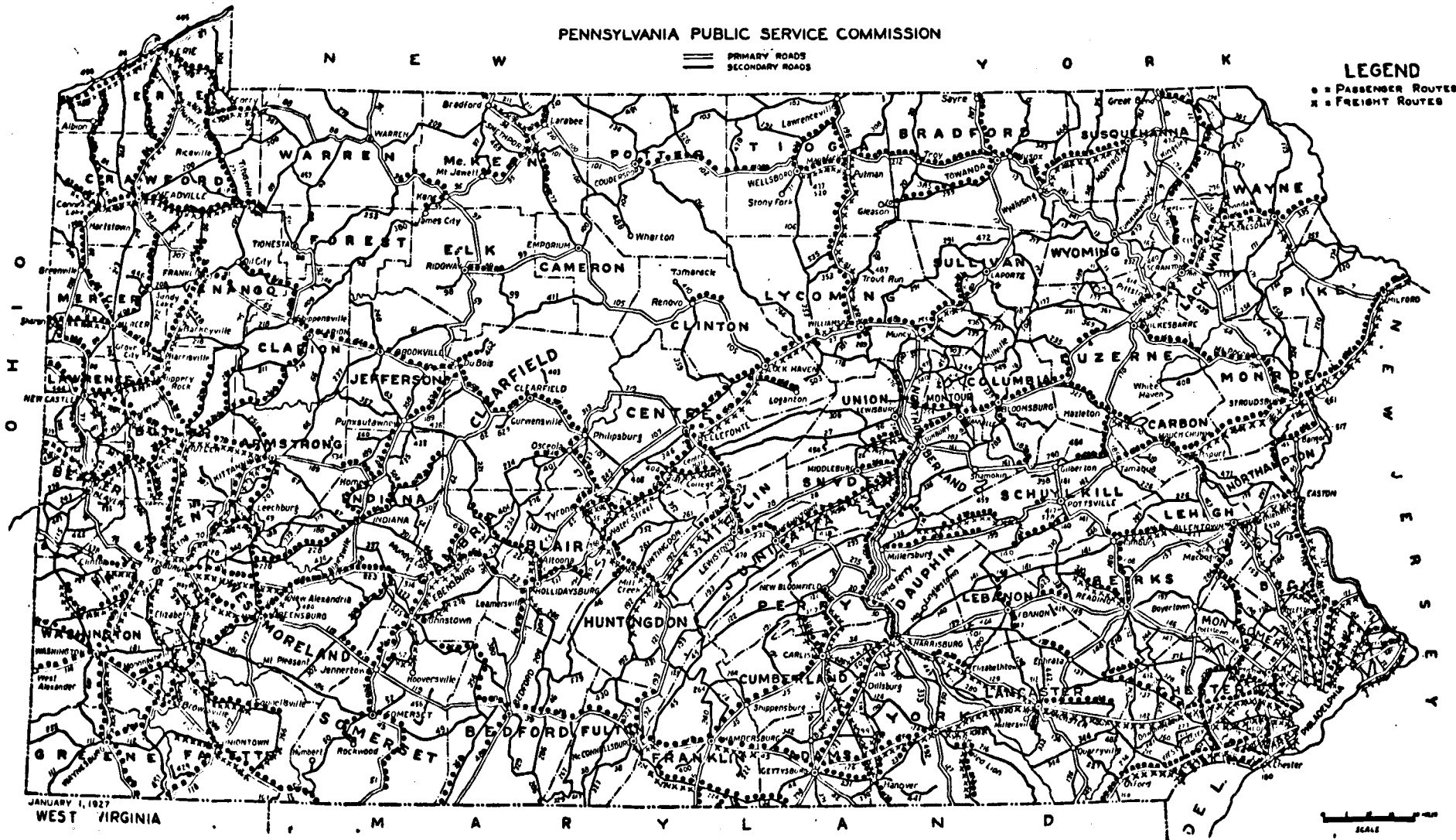


Fig. 2—Pennsylvania State highways included in the authorized routing for common carriers of freight and passengers operated under certificates of public convenience issued by the Pennsylvania Public Service Commission

than this figure, and cars registered in other States averaged 2.8 passengers per car. Cars on touring trips averaged 3.2 persons per car; cars on business trips two persons; and on non-business or pleasure trips 3.3 persons per car.

*Total Passenger Mileage.*—Total passenger-car mileage on the State highway system in 1924 was

approximately 2,167,000,000 and the passenger-mileage was about 5,500,000,000. The railroads in the same year carried about 135,000,000 passengers in the Commonwealth for a total of 4,300,000,000 passenger-miles.<sup>4</sup>

<sup>4</sup> Estimated by Pennsylvania Department of Highways from the reports to the Pennsylvania Department of Internal Affairs.

## FORECAST OF FUTURE HIGHWAY TRAFFIC

*Motor Vehicle Registration and Traffic Increase Equally.*—Highway traffic and motor vehicle registration have increased at nearly equal rates over a relatively long period in all other States for which traffic information is available despite differences in industrial development, wealth and population. It may, therefore, be assumed that what is true of these States will also be true in Pennsylvania; namely, that registration and traffic will increase at approximately equal rates and that the percentage of increase predicted for motor vehicle registration for the next few years can be used for forecasting future traffic.

This prediction, however, is based on the assumption that the average mileage per vehicle per year will show no important change for a period of five or six years in the future.

*Estimated Increase in Future Traffic.*—The prediction of motor vehicle registration for 1925 agreed very closely with actual registration for that year. For 1930 the number of registered motor vehicles is estimated at 2,086,000, an increase of about 70 per cent over the 1924 registration. Applying the principle that the rate of traffic increase is equivalent to the rate of increase in motor vehicle registration, it was accordingly estimated that the traffic for the Commonwealth as a whole would increase about 70 per cent between 1924 and 1930.

*Applying forecasting to County Units and Individual Routes.*—The same basis of forecasting was applied to county units so as to eliminate differences in the ratio of the persons per registered vehicle in the different counties. The forecasts of county increases in traffic were then applied to the traffic on sections of highway adjacent to each traffic station.

There is a wide variation in the estimated increase in traffic in the several counties, ranging from an 11 per cent increase between 1924 and 1930 for one of the northern counties, which has a rapidly decreasing population, to 85 per cent in Delaware County, which during the past decade had the highest population increase among the several counties.

*Effect of Estimated Future Traffic on the Highway Program.*—The analysis of future traffic density is important, both from the standpoint of location of routes on the highway system and the determination of the extent of the improvement necessary. To serve its purpose completely, a highway must be able to accommodate those vehicles which will normally be operated upon it.

With respect to passenger car traffic, the number of cars is the only information needed. The average daily traffic is of less significance than the maximum hourly traffic on routes of extremely large density. The type of car is of no great significance from the standpoint of designing the pavement to carry the load, since passenger cars average only about 2,800 pounds (including the weight of passengers) and the minimum and maximum weights range from approximately 1,800 to 6,500 pounds. Weights over 5,000 pounds are infrequent. Moreover, practically all passenger cars are equipped with pneumatic tires and various kinds of shock absorbers.

With respect to the motor trucks, on the other hand, the range in capacity and weight is a very important consideration in the planning of highway improvements. The smallest trucks ( $\frac{1}{2}$ -ton capacity) observed on the State highway system had an average gross weight of 2,490 pounds,

while the largest (those of 7½-ton capacity) averaged practically 24,000 pounds gross weight. It can readily be seen that different types of highways must be planned for light and heavy truck loads, as well as for the volume of total traffic. The highway built to carry only passenger car traffic and small, light trucks will not stand up under heavy traffic of large-capacity trucks. However, it is not an economically sound policy to build highway improvements capable of carrying heavy truck loads where there are not enough heavy trucks using the highway nor any occasion for, or likelihood of heavy trucking during the life of the pavement.

The analysis of bus traffic presented in previous pages indicates that only 9 per cent of the busses with seating capacity of 9 persons or more operating on September 1, 1926, had a total loaded gross weight above 18,000 pounds, which would be comparable with the heavy truck classification or large-capacity trucks carrying 5 to 7½ tons load. Practically all of the busses in this 9 per cent group were equipped with solid tires and nearly all of them were operated in the cities. Of particular importance with regard to these large-capacity busses is the fact that many of them are designed for the full 8-foot width permitted by law. This fact is of considerable importance when there is any appreciable amount of bus traffic, and under such conditions has a determining effect upon the width of the road surface. Bus traffic also raises an additional consideration, in that frequent stops on the ordinary two-lane road slows up traffic. A considerable amount of bus traffic on an important route would therefore require turn-outs upon which to make bus stops, and eventually it would probably require widening of the roadway.

*Proposed Classification of Highways.*—The relationship between traffic demand and extent of improvement required on the various State highways can perhaps best be visualized by classifying the various highways into groups according to the amount and character of the traffic. To each such class can then be assigned the strength and width of pavement most economical in relation to the passenger car and motor truck traffic of the class.

These classes have been designated in order of traffic importance as terminal, industrial and semi-industrial.

The classification of individual routes is made on the basis of the volume of total traffic, the total number of trucks, the number of 3 to 4-ton trucks and the number of trucks of larger capacity (5 to 7½-ton).

*Terminal Highways.*—The terminal highway is rated as one carrying a considerable number of heavy (5 to 7½-ton) trucks. A considerable number of the loaded, large-capacity trucks on the terminal highway indicates the need for a pavement designed to carry extra heavy loads.

*Industrial Highways.*—The industrial highway is rated as one which carries a large amount of truck traffic but relatively fewer of the 5 to 7½-ton loaded trucks than the terminal highway. In this class, pavements should be designed to carry heavy loads and extra heavy loads in limited numbers.

*Semi-Industrial Highways.*—The semi-industrial highways are primarily passenger car routes on which very little trucking of over 2½-ton trucks is expected. On these highways, pavements need not be designed to carry frequent heavy loads.

*Classification of Highways on the Primary or Main Highway Routes.*—Main highways should be designed to carry traffic desiring to use them and the strength of construction necessary depends on the load limit and the frequency of heavy loads which the pavement is required to carry. In constructing pavements on the through routes of the State highway system, provision should be made for the accommodation of vehicles loaded to the full legal limit and for such frequency of heavy loads as is proved to be probable on each section of the through route. It is realized that there are many sections of such through highways upon which pavements suitable for heavy truck traffic will not be needed for some time. However, a study has been made of all sections of the main highways classified as terminal and industrial with the purpose of indicating when, on the basis of the estimated future traffic, these sections will have to be provided with pave-



ments adequate for terminal and industrial truck traffic, as outlined above. This information will be of value to the Department in estimating the future highway replacement program.

The Lincoln Highway from Trenton, New Jersey, through Philadelphia, Lancaster, York, Bedford, Greensburg, Pittsburgh and thence on to the West Virginia line near East Liverpool, Ohio, is the heaviest traffic through route and there always will be some heavy truck loads (of 21,000 pounds or over, gross weight) crossing the Commonwealth on this highway. Because of its importance as a main highway, it is classed as semi-industrial or industrial throughout its length, except short sections near Philadelphia and Pittsburgh which are classed as terminal. However, there are sections of this highway, such as the section from Chambersburg to Jennerstown, that are carrying today very few truck loads of 21,000 pounds or over. By reason of its location and distance from large centers of population, it is estimated that on this particular section of the percentage of heavy truck loads will not materially increase for a great many years. It would not, however, be practicable to exclude industrial traffic from this section of through highway, and there are similar instances on all of the through highways.

On the basis of the observed traffic, the following classification has been established for terminal, industrial, and semi-industrial highways on the primary system:

*Location of Terminal Highways in 1924.*—The 122 miles of terminal highways in 1924 are located, except for one mile west of Harrisburg, in three small areas; the Philadelphia, Pittsburgh, and Scranton-Wilkes-Barre areas. Seventy-one miles of primary highways terminating in Phila-

delphia are classified as terminal in 1924. These highways connect Philadelphia with Trenton, Chester and the Delaware line, Media, Coatesville and Willow Grove.

Second in importance to the Philadelphia area is that surrounding Pittsburgh, where 26 miles of highway on the primary system, connecting Pittsburgh with Bridgeville, Springdale and East Pittsburgh are classified as terminal in 1924; and finally, there are 24 miles classified as terminal in the Scranton-Wilkes-Barre region.

*Future Changes in Classification.*—For the Commonwealth as a whole, the terminal highway mileage more than doubles between 1924 and 1930 and is nearly three times as great in 1935 as in 1924. Highways classified as industrial in 1930 will slightly more than double the mileage of 1924, and by 1935 the industrial class is more than 2½ times as great as in 1924. Semi-industrial highways in 1930 have only two-thirds of the 1924 mileage, and in 1935 there is a further reduction to only about half of the 1924 mileage.

*Location of Terminal Highways in 1935.*—In the Philadelphia area, which has about 60 per cent of the terminal highway mileage in 1924, the increase by 1935 is small in the latter year, 79 of the 336 miles of predicted terminal highways are in this area. Terminal highways in the Reading, Allentown, Bethlehem, Easton and Pottsville area will comprise 104 miles in 1935, but Philadelphia will continue to be the most important single city on the basis of heavy truck traffic, which is the important factor in classifying a road as a terminal highway. The mileage of State highways of Pennsylvania radiating from Philadelphia also constitutes only a part of the highways leading out of Philadelphia as a metropolitan center, since no account has been taken of the traffic which

Year	Terminal		Industrial		Semi-Industrial		Total	
	Miles	Per cent	Miles	Per cent	Miles	Per cent	Miles	Per cent
1924	122	3.09	812	20.54	3,019	76.37	3,953	100.0
1930	279	7.06	1,641	41.51	2,033	51.43	3,953	100.0
1935	336	8.50	2,084	52.72	1,533	38.78	3,953	100.0

goes across the river and thence through Camden, New Jersey.

At present there is freer traffic intercourse between Philadelphia and Camden as a result of the building of the Philadelphia-Camden bridge, which was opened to traffic on July 1, 1926. The exact effect of this bridge upon the traffic in the Philadelphia region is somewhat problematical. It will probably tend to draw passenger car traffic into Philadelphia and thence over the bridge to New Jersey that formerly may have by-passed the Philadelphia region to cross the river at points outside of the city, but it will probably not have much effect upon truck traffic now using State highways since the latter is a short-haul movement.

In 1935 the Scranton-Wilkes-Barre area will have 67 miles of terminal highway, and adjacent to Harrisburg there will be 30 miles. The mileage of terminal classification on the State routes leading into Pittsburgh will not increase by 1935, although the Pittsburgh region will continue to be of great importance from the standpoint of truck traffic. The Pittsburgh region is more self-contained than some of the other populous centers, and because of the generally mountainous terrain it is not probable that truck traffic sufficient to justify classification as terminal routes will develop within the next few years on those routes or sections of routes which are not already terminal in character.

*Distribution by the Three Geographical Sections.*—In 1924 the eastern section contains more than three-fourths of the terminal mileage and nearly three-fourths of the industrial mileage. The terminal mileage in this section increases in importance both in 1930 and 1935. The industrial class mileage also increases, but less rapidly than in the western and northern and central sections. The proportion of industrial mileage in the eastern section decreases from 73 per cent in 1924 to 45 per cent in 1930 and to 35 per cent in 1935. In the western section, 83 per cent of the mileage is semi-industrial in 1924, and but 24 per cent of the mileage is in this class in 1935, indicating the rapid change from semi-industrial to industrial in this section during the next 10 years.

The 1924 classification of highways in the northern and central section shows that nearly 98 per cent of the total mileage is in the semi-industrial class. No mileage is classified as terminal in 1924 and but 6 miles, located adjacent to Lewistown, are in this class in 1930 and 1935. The greatest change in classification in this section will, therefore, be from the semi-industrial into the industrial class, the mileage of the latter increasing from 33 miles in 1924 to 444 in 1935.

*Tentative Program of Highway Improvements.*—Analysis of the 3,953 miles of the primary system, with consideration of the present condition of the surface, present traffic, and estimated future traffic, indicates the mileage of replacement and resurfacing that will probably be required provided the conditions and estimates of traffic upon which the proposed schedule is based do not materially change.

#### Replacement

	Miles
*Replacement less than 2 years .....	265
Replacement 2 to 5 years ..	406
Replacement 5 to 10 years ..	228
<b>Total replacement within 10 years ....</b>	<b>899</b>

\* Replacement indicates rebuilding worn-out stone roads with a durable type of pavement.

#### Resurfacing

*Resurfacing less than 2 years .....	122
Resurfacing 2 to 5 years ..	135
<b>Total resurfacing within 5 years .....</b>	<b>257</b>

\* Resurfacing indicates laying new surfaces of a flexible type and adding additional stone to bring the base to the proper thickness.

The whole program as thus outlined, involves about 30 per cent of the primary system mileage. During the 5-year period it includes 928 miles, or about 25 per cent of the primary system; and of these 928 miles, replacement will be required on over 70 per cent.

*Distribution of Program by Geographical Sections.*—The eastern section, as already shown, is the most important traffic area from the standpoint of both total traffic and motor trucking and contains a larger percentage of terminal and industrial highway mileage, than either of the two other sections, and it is logical that a considerable part of the highway replacement program should be planned for the primary system of this section. A considerable mileage of the eastern section has been improved in the past with flexible types of surface which, while sufficient for the traffic of the period, must now be replaced with more durable types of pavement.

For the western section a relatively small mileage of replacement is proposed for three reasons: First, because there is in this section at present a very small mileage of stone pavements compared with the eastern section; second, because an extensive program of construction of durable surfaces has been under way for some time in this section and these surfaces, which have been substantially completed, will be adequate for a number of years; and third, traffic is considerably lighter in the western than in the eastern section.

In the northern and central section a very small mileage is planned for replacement and resurfacing during the next five-year period. This section is third in traffic importance and the main traffic routes, as such, are at the present time largely new and durable pavements.

*Parallel or Alternate Routes.*—Additional traffic lanes increase the traffic-carrying capacity of a highway although probably not in direct proportion to the increase in width. Beyond a certain width it is inadvisable to attempt to carry additional traffic on the same route, and parallel routes must be provided. Additional routes will be necessary for purposes of entry into some of the cities in order to relieve congestion. This is true of Philadelphia, although Philadelphia is peculiarly fortunate in that few of the highways entering the city converge and combine in a single route. At Pittsburgh the situation is less satisfactory than at Philadelphia. Studies of parallel routes have been made by the Department in both of these regions.

*Separate Trucking Routes.*—The large volume of motor truck traffic in the Philadelphia region indicates that the development of separate highways for motor truck traffic may be necessary. The separation of truck traffic from passenger car traffic on State routes between Philadelphia and Trenton has already been considered with the probable removal of truck traffic from the Lincoln Highway, or northern route through Langhorne, and the segregation of truck traffic on the southern route through Bristol.

The development of a new terminal highway to take care of the large volume of truck traffic and the large number of heavy truck loads between Philadelphia and Chester along the Delaware River was made the subject of a special act of the General Assembly in 1923 and its location and design has been given some study. If built, it will mark the first state highway built primarily for heavy truck traffic.

The Department is now making studies to determine if a similar type of development will be required in the Pittsburgh area in the immediate future. It is doubtful whether a like necessity will exist elsewhere for a considerable period of years.

*By-Pass Routes.*—Traffic congestion in the centers of population can be relieved partly by routing through traffic over by-pass routes around the cities or boroughs; and at least, the situation can be considerably improved by routing traffic through these urban centers on the outlying streets rather than carrying it through the central business districts. Sentiment favorable to such planning is continually growing. Philadelphia needs a capacious "belt-line" upon which motor vehicles from Baltimore and other southern points on the way to Trenton and New York can avoid the congested streets of the city. The Department has recently made studies, in cooperation with the local authorities, of feasible by-pass routes, in both the Philadelphia and Pittsburgh areas.

*Directness of Route.*—It is important that the routes connecting the larger centers of population be not only of sufficient width and adequate type to carry a large volume of traffic, but also that

they be as direct as possible; accordingly all obstructions to the free and rapid movement of traffic, such as railroad grade crossings, sharp curves and heavy grades should be removed. Directness of route will require relocations which can be made as the highways are reconstructed for a greater volume of traffic. These relocations will require the acquisition of new right of way, which should be acquired in the immediate future, and rights of way for alternative and parallel routes should be acquired at the same time.

A classification of the 500 primary-system grade crossings on the basis of the number of train movements, amount of highway traffic, physical features of the location, etc., indicates that about 30 per cent are very dangerous, 30 per cent less dangerous and 40 per cent least dangerous. The percentage of very dangerous crossings is less on the secondary system.

Nearly 500 crossings have been eliminated by under-passes or overhead crossings on the State highway system. Many of these separations,



*A Line Revision on Route 107 Near Julian in Centre County*

*Elimination of Dangerous Railroad Grade Crossings.*—More than 1,200 grade crossings still exist on the State highway system. Their elimination is proceeding slowly and will require some years for accomplishment. During the years 1923-1926, the Department's program included the elimination of 251 grade crossings, 177 by relocation and 74 by under-pass or overhead construction.

Of the 1,200 grade crossings, about 500 are on the primary system and 700 on the secondary.

however, are considered dangerous to the highway traffic because of inadequate width, bad curves, etc., which require a reduction in speed for safety.

On some of the principal routes, there are relatively few dangerous crossings at grade. For example, on the Lincoln Highway from Philadelphia to Lancaster there are no dangerous, unseparated grade crossings, and this is also true of a few other routes.

*Widening Beyond Two Traffic Lanes.*—All primary-system roads provide at least two lanes

for traffic, and are surfaced at least 18 feet wide, while through the boroughs extra width has frequently been provided by the local residents. On a few sections of highway in the townships, the Department has already provided additional traffic lanes. On the Lincoln Highway west of Philadelphia the pavement has been widened to provide four traffic lanes, from Philadelphia through Ardmore, Bryn Mawr to Devon; and to accommodate three lanes of traffic from just west of Malvern to Downingtown. The route from Philadelphia to Chester is constructed to carry four lanes of highway traffic outside of the double-track central width now used by the interurban street railway company. A short section, 45 feet wide, is constructed adjacent to Pittsburgh on the route northeast to Freeport.

The two-lane highway can handle safely the maximum traffic on all except the extremely heavy traffic roads, but above a certain density, which varies with several factors such as types of vehicles, treatments of intersections, etc., the two-lane highway becomes unequal to its task with the result that traffic is retarded and congestion is increased.

Two traffic lanes will be adequate to carry the predicted volume of traffic on approximately 95 per cent of the mileage of the primary system for the next 5 to 10 years without congestion of traffic.

Around the cities of Philadelphia, Pittsburgh, Scranton and other important cities, there is need of greater capacity on many existing highways or the relief of congestion by the construction of parallel routes. The tentative plan of improvement includes the widening of 51 miles to greater than two-lane width in the next two years, about 64 additional miles in from two to five years, and approximately 35 miles immediately thereafter.

*Value of the Service Produced by the State Highway System.*—The large value of the service produced by the State highway system which, in 1924, carried over 2,000,000,000 passenger-car-miles and over 200,000,000 truck-miles of travel, is self-evident. Hard surfaced highways, replacing earth roads, have resulted in saving annually

large amounts in reduced motor vehicle operating costs.

An improved highway which is serviceable throughout the year has a value greatly in excess of an unimproved highway which is impassable during certain months of the year. The improved highway also saves time by permitting more rapid movement of traffic, and promotes the safety of the traveling public.

The foregoing items, comprising the service value of improved highways, relate primarily to the economic value. From the social and recreational standpoints, improved highways have additional values, which are universally recognized. Social contacts have been greatly facilitated. Educational facilities in the rural communities have been vastly improved, by the consolidation of schools made possible by surer means of transportation, and the improved highways have also greatly expanded facilities for recreation. Modern means of living are closely associated with motor transportation, the full development of which depends upon improved roads, and the many advantages of which are reflected in almost innumerable ways.

*Saving in Motor Vehicle Operating costs by improved Highways.*—The service value of the Pennsylvania State highway system, which carried in 1924 an annual traffic of 2,381,900,000 vehicle-miles, is very large, and is reflected in many ways. While it can not be exactly measured, it can be estimated with a reasonable degree of accuracy. The costs of operating the vehicles that compose the traffic are probably not less than 10 cents per vehicle-mile for passenger cars and 25 cents per vehicle-mile for trucks, and it is estimated by the Pennsylvania Department of Highways that the reduction in these costs made possible by the improvement of the highways is approximately 2.5 cents per passenger-car-mile and 5 cents per truck-mile.<sup>7</sup>

Applying these assumed savings of 2.5 cents per passenger-car-mile and 5 cents per truck-mile to the traffic on the 5,951 miles of improved highways in the State system, the annual service value

<sup>7</sup> See Bulletin 69, Iowa State College of Agriculture and Mechanic Arts, Highway Transportation Costs, by T. R. Agg and H. S. Carter, page 20.

of these improved highways is found to be approximately \$9,100,000 for truck traffic and \$45,800,000 for passenger car traffic, a total of \$54,900,000, or an annual value of \$9,220 per mile of improved State highway.

The foregoing estimate is based on the observed traffic density of 1924. Converting to the basis of 1927 traffic density by the addition of 40 per cent, the estimated increase from 1924 to 1927, the saving to motor vehicle operators using the same 5,951 miles of improved highways of the State system is now approximately \$76,800,000 or an annual saving of \$12,900 per mile.

The Department of Highways considers this a conservative estimate of the value of the improvement that has been effected in the roads of the State highway system, as measured by savings in vehicular operating costs. If the more important highways of the system are singled out—those that carry the densest traffic—it can be shown in the same manner, that their service value greatly exceeds the average. Thus, the annual service value of the Lincoln Highway, U. S. 30, from Philadelphia to Pittsburgh was approximately \$4,701,000 in 1924, or approximately \$17,150 for each of its 274 miles. Similarly, it can be shown that in the same year the 35-mile section of the same highway from Philadelphia to Coatesville, where traffic was extremely heavy, made possible a reduction in the operating expense of motor vehicles amounting to \$1,300,000 or approximately \$37,000 per mile.

*Relation of Service Value to Annual Costs for Hard-Surfaced Roads.*—It can readily be shown that the service value of the improved roads of the State highway system as thus estimated, exceeds the average annual cost of the improvement. This is true even if we consider only the most expensive and durable types of improvement.

The average cost of durable construction in Pennsylvania for two-lane roads is about \$50,000 a mile. The annual cost for each mile of such construction, including interest and sinking fund on the capital outlay, plus the annual maintenance charge, estimated by the Pennsylvania Department of Highways, is about \$4,800 a mile, from which must be deducted the annual maintenance charge of about \$500 a mile for the dirt road which is replaced, or a net annual cost of \$4,300 a mile; whereas the average annual service value of hard-surfaced pavements on the State highway system in 1924 was about \$6,150 a mile.

*Annual Service Value Exceeds Motor Vehicle Taxation.*—The estimated annual service value of the hard-surfaced roads of the State highway system, in 1927, is \$76,800,000, as compared with the approximate sum of \$43,000,000 paid by motorists in motor vehicle license fees and gasoline taxes, in 1927. This means that there is a net saving of approximately \$33,800,000 to the motorists, in 1927, over and above the amount collected from them to support the State highway system.

## CHAPTER II

### THE HISTORY OF HIGHWAYS IN PENNSYLVANIA

Pennsylvania, known as the "Keystone State" from its position at the crown of the arch formed by the original thirteen colonies, has within its nearly rectangular borders an area of approximately 45,000 square miles. East and west its greatest length is approximately 300 miles. Between the Maryland and the New York lines the



*Old and New Markers on the Mason and Dixon Line  
Between Pennsylvania and Maryland*

distance is a little over 160 miles. A modification of the general rectangular outline in the northwest corner furnishes a shore line on Lake Erie, and at the eastern border the Delaware River provides a navigable outlet to the sea.

The relief map reproduced in this report as Figure 1, shows that the most important physical features are the mountains which curve in a gigantic quarter circle from its southern border to its northeast corner. In its every aspect—climatic, economic, social, political—the character of the Commonwealth is modified by these almost unbroken highlands which separate its eastern and western portions.

Their influence in shaping the political subdivisions is clearly evident. Within the mountainous area the boundaries of the counties follow the curvilinear courses of the ridges and valleys. These ridges and valleys have exercised a controlling influence upon the location of the highways; and the transport survey indicates that they also have a marked influence on the use of these highways.

*Southeast Area.*—The mountains have a profound industrial influence. Like a wall they enclose to the southeast a quarter circle, embracing 14 counties, which is at once Pennsylvania's most fruitful garden and most productive workshop. Two-thirds of the area of this section is in cultivated farms. In comparison with the Commonwealth as a whole this section has only a sixth of the total area but includes more than a quarter of the improved agricultural acreage; and the value of its farm and dairy products is more than three-eighths of the total. Yet it is not solely an agricultural section; it is preeminent also as an industrial region. In it is Philadelphia, the State's largest city, and seven other cities that take high rank as industrial centers. Although its area is only 17 per cent of the total it is the home of about 40 per cent of the population, and the value of its industries is nearly 44 per cent of the total value of the production of all industries and mines. The importance of this industrial section is not due entirely to Philadelphia. Excluding the industrial output of the metropolis, it still produces more than a quarter of the total value of

all industries, and if Allegheny County, in which is situated the city of Pittsburgh, be also excluded, it produces half as much as all the remainder of the Commonwealth.

This highly productive agricultural and industrial area which is the home and workshop of approximately 3,500,000 people must necessarily require a large activity in transportation, and is shown by the transport survey to be of first importance as a producer of highway traffic.

*Northern Area.*—Beyond the mountain wall to the north lies another section which contrasts sharply in every respect with the southeastern area. This section, including 15 counties, forming a segment of a circle with the northern border as its chord, is heavily forested. Two-thirds of its area is classed as forest land, and less than a quarter as farm land; it embraces 28 per cent of the total area, but its farms include only 16 per cent of the improved agricultural land, and its farm and dairy products account for only 14 per cent of the total value of such products. In industries other than agriculture it ranks even lower, the value of its industrial production being only 4 per cent of the total. More sparsely populated than any other section, and the population of nine of its 15 counties decreasing, this section is not likely to make strong demands for transportation facilities. The fact, as developed by the survey, that this section forms a part of the area of lowest density of highway traffic receives, therefore, abundant confirmation in the general character of the section. Even its forests—once highly productive—no longer support an important industry. In 1860, Pennsylvania held leading rank in this industry, today it is forced to draw on outside territory for 84 per cent of the lumber and 74 per cent of the pulp wood to meet its own requirements. It is estimated that it will take some 50 years of careful conservation before the Commonwealth will be able to produce a sufficient amount of lumber to supply its own demands, so that it is reasonable to anticipate that for the next 15 years at least the revival of the lumber industry will have no considerable effect upon the population, production or traffic of this and other heavily forested areas.

*Western Area.*—West of the mountains and forming roughly the segment of another circle with the western boundary as its chord is an area which is second only to the southeastern section in the production of its farms. The 13 counties included in this section make up a fifth of the total area and include more than a quarter of the improved farm land. Fifty-five per cent of this area is in cultivated farms and the value of their agricultural production is 21 per cent of the total. Pittsburgh, the second city in population and the center of the steel industry, is in this section, and its industrial production is exceeded only by that of Philadelphia. Excluding Allegheny County this western area does not rank high as an industrial section.

In population and industry it is second to the southeastern area and it may therefore be expected to rank correspondingly in highway traffic, which fact is demonstrated by the survey. It is the principal seat of the oil industry, but as oil is transported largely in pipe lines this industry contributes to its importance as a highway traffic area, only through the transportation of materials for the drilling of wells and the maintenance of wells and pumping stations.

*Central Area.*—There remains a large section—more than a third of the total area—which is included in the vast curve of the mountains. Twenty-five counties are in this area. The slopes of the mountains are heavily forested and these forests constitute 50 per cent of the total area. In the valleys are fertile farm lands which make up a third of the farm area and which produce commodities valued at more than a quarter of the State's total agricultural production. But this section owes its greatest importance to its mines and quarries.

At the eastern extremity of the mountain arch, in the counties of Carbon, Columbia, Dauphin, Lackawanna, Luzerne, Northumberland, Schuylkill and Wayne are the fields in which practically all of the anthracite coal of the United States is produced. At the western extremity are the bituminous coal fields. Along the Susquehanna River, where it pierces the mountains, there is a

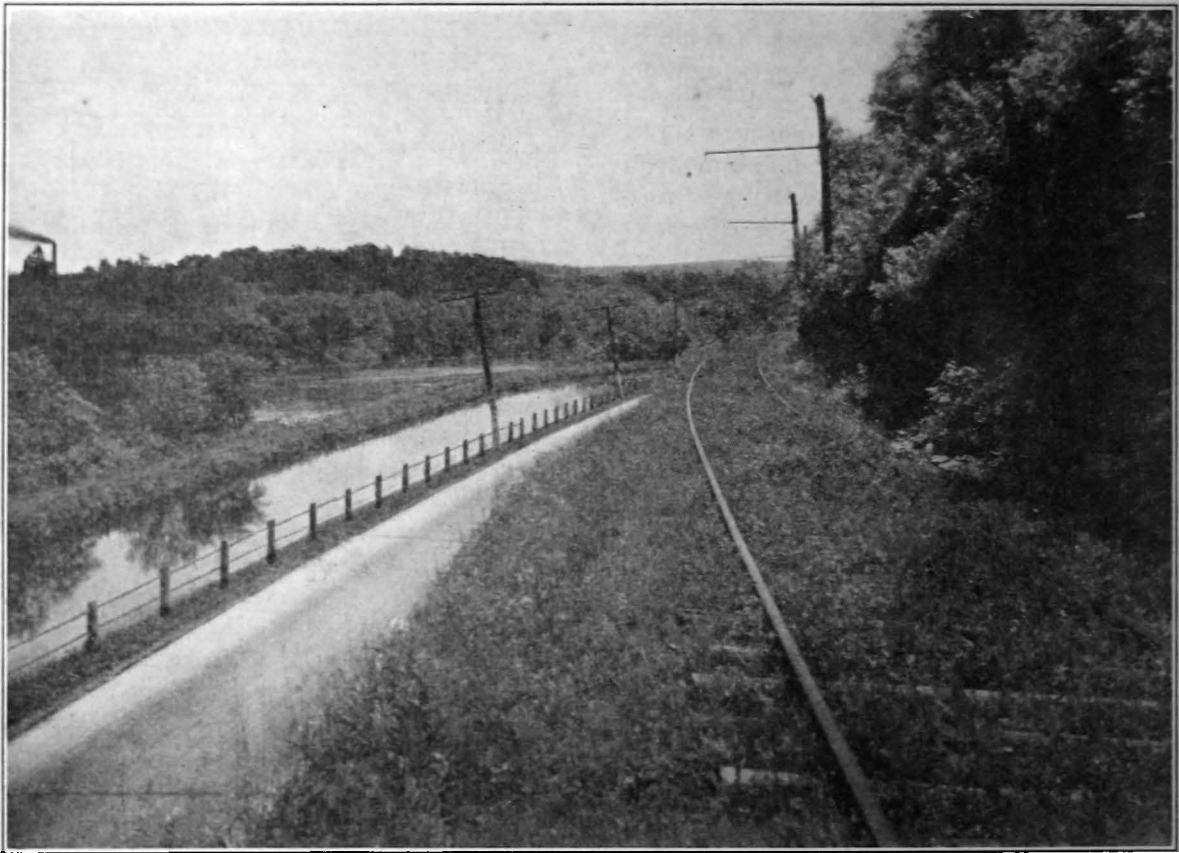


"river coal"<sup>\*</sup> industry which contributes heavily to the highway traffic of the immediate vicinity although it is of minor importance among the industries of the Commonwealth. It is to the anthracite coal fields that the cities of Scranton, Wilkes-Barre, Pottsville and Sunbury owe their industrial importance and their high rank as centers of highway traffic.

*Transportation Facilities.*—For the transportation of its people and the products of its indus-

transportation are the Monongahela, Allegheny, Ohio and Delaware Rivers and the Lehigh Coal and Navigation Company Canals. The Susquehanna River is too shallow for navigation. In the northwest corner the city of Erie owes its importance to its position on Lake Erie.

According to the reports made by railroads operating within the Commonwealth, they carried a total of 363,000,000 passengers and 827,000,000 net tons of freight in the year 1924, including



*Electric Railway, State Highway, Canal and River South of Easton*

tries Pennsylvania has approximately 13,500 miles of steam railroad lines, 4,000 miles of electric railway track largely in the cities, and a total of more than 100,000 miles of highways and streets of which the State systems, primary and secondary, include about 12,000 miles.

The principal arteries of internal water-borne

23,000,000 net tons of L. C. L. (less than carload lot) freight. These figures are for the entire mileage of these railroads, both within and without the Commonwealth. Figures are not available for

<sup>\*</sup> River coal is fine coal that is washed down from the collieries and is reclaimed by boats which pump the sand and coal from the river pockets and separate the coal by screening.

the haulage within Pennsylvania alone, but multiplying these totals by the percentage of the total mileage of the lines that lies within Pennsylvania an estimate of 134,000,000 passengers and 353,000,000 net tons of freight, including nearly 9,000,000 tons of L. C. L. freight is obtained.

Of the total tonnage of freight carried by the railroads, products of mines represented 63 per cent, manufactured goods 26 per cent, products of agriculture  $5\frac{1}{2}$  per cent, products of animals  $1\frac{1}{2}$  per cent and products of forests 4 per cent.

The electric lines, mainly within the cities, carry approximately 1,700,000,000 passengers annually. The amount of freight carried is negligible in comparison with that carried by the railroads.

From the observations made during the highway transport survey it is estimated that there

were transported in 1924 over the State highway system between 5,000,000 and 6,000,000 tons of freight, 60 per cent of which was classified as products of manufacture, 13 per cent as products of mines, 11 per cent as products of animals, 9 per cent as products of agriculture and 7 per cent as products of forests.

Of water-borne freight there were at Pittsburgh in 1922 approximately fourteen and one-half million tons carried on the Monongahela River, and about 4,000,000 tons on the Allegheny River. In the same year, traffic on Lake Erie through the port of Erie was a little over 2,000,000 tons, and the Delaware River at Philadelphia carried 19,000,000 tons. Canals carry an estimated tonnage of 1,000,000 annually.

## THE DEVELOPMENT OF THE STATE HIGHWAY SYSTEM

As in other States the effective work of highway improvement has been done in very recent years, the great bulk of it under the administration and direction of the State Highway Department which was established in 1903, but did not have the supervision of a State highway system until 1912.

The early history of the roads, their administration and early highway legislation is much the same as in the other Colonial States.

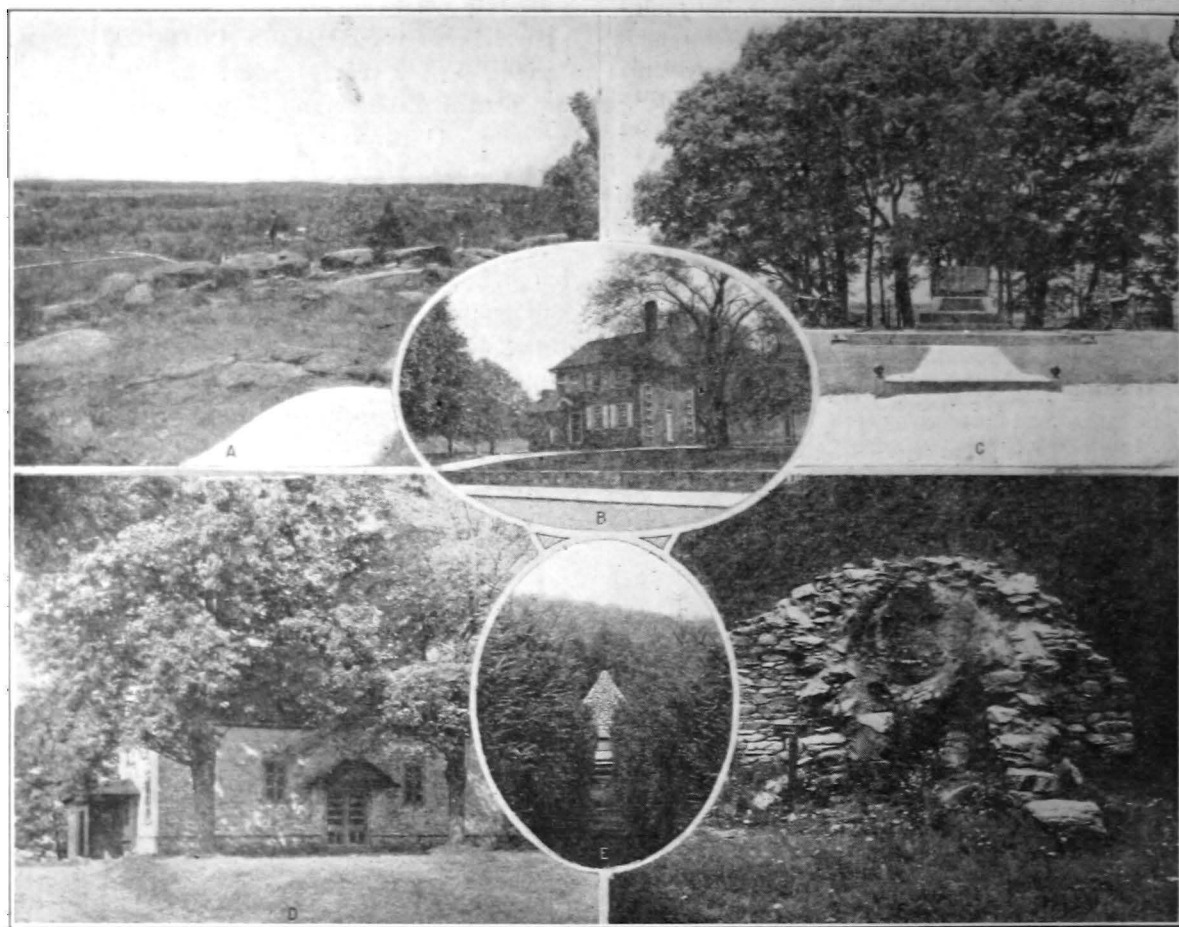
Among the early records (1711) are to be found descriptions of a road leading from a point on the Delaware River opposite the landing of John Reading to Fourth and Vine Streets in Philadelphia, long known as the "York Road," also of the Strasburg Road, the Lancaster-Philadelphia Road, and many others.

Of historic importance are the Forbes Road (now the Lincoln Highway) opened as a military highway to the West by General Forbes in 1758; the Lancaster Turnpike, the first "artificial" road constructed in Pennsylvania and one of the first in the United States; the "Necamolin Trail," used by Major Washington when, as an envoy of Governor Dinwiddie of Virginia, he carried a message to the French commander at Fort Le Boeuf in

1750; and the National Pike which crosses the southwestern corner of the Commonwealth on its way from Cumberland to the Ohio River, and which was opened as a military road by General Braddock on his trip to the relief of Fort Duquesne on the present site of Pittsburgh.

The Lancaster Turnpike,  $62\frac{1}{4}$  miles in length, was completed at a cost of approximately \$444,000 in 1794. It was constructed by a turnpike company incorporated in 1792, the first of a long line of similar companies which sprang into existence during the following eighty years. During the early years of the nineteenth century many miles of such roads were constructed. The records show that upwards of 2,500 miles were in operation in 1831, and a large mileage was added during the forties and during the period immediately following the Civil War and up to 1874 when the present State constitution was adopted.

The Commonwealth contributed approximately \$2,000,000 toward the construction of these turnpikes; but almost without exception they proved to be unprofitable ventures. Many of them were poorly constructed, and but few yielded sufficient revenue to pay for their maintenance. The lack of maintenance caused many of them to be aban-



*Points of Historic Interest on the State Highway System in Pennsylvania*

*A. Gettysburg Battlefield from Little Round Top. B. General Washington's headquarters at Valley Forge. C. High Water Mark of the Confederacy at Gettysburg. D. Kennett Square Meeting House. E. Site of birthplace of President Buchanan at Mercersburg. F. Ruins of Thaddeus Stevens' Iron Furnace at Caledonia Park on the Lincoln Highway.*

done and failure to maintain others caused their condemnation. The maintenance of the abandoned and condemned roads devolved upon the counties or townships, boroughs and cities through which they passed, but the change in authority did not result in greatly improving the road conditions. In many instances, in fact, conditions became worse, so that it came to be remarked that a common dirt road was a bad road because it was generally impassable six months in the year, but an abandoned turnpike was worse because it was bad all the time.

At the time of the establishment of the State Highway Department in 1903 it was reported that there were still in use over 1,100 miles of toll roads. With but few exceptions this mileage is now free of toll, there being but 20 to 30 miles remaining. All turnpike roads traversed by State highways are now free except those designated as State highways by the Act of 1925.

Interest in the improvement of the roads revived with the vogue of the bicycle and, in order that the public might be informed as to the value of "good roads" and the best methods of building

them, William H. Rhawn and other public-spirited citizens of Philadelphia and vicinity, acting through the University of Pennsylvania, offered in 1889 a prize for the best paper on the construction and maintenance of common roads. As a result of the interest thus aroused a number of

Rates of Toll on the Cumberland Road in Pennsylvania.	
Every score of sheep	6'
" " Hogs	6'
" " Cattle	12'
" Horse and rider	4'
Every led or drove horse, Mule or Ass	3'
" Sled or sleigh drawn by one horse or pair of oxen	3'
" Horse or pair of oxen in addition	3'
" Bearbarn, Sulky, Chair or Chaise with one horse	6'
" Horse in addition	3'
Every Chariot, Coach, Coupee, Stage, Phaeton or Chaise with two horses and four wheels	12'
" Horse in addition	3'
Every other carriage of pleasure by whatever name it may be called, the same according to the number of wheels and horses drawing the same	
Every cart or wagon, whose wheels do not exceed three inches in breadth, drawn by one horse or pair of oxen	4'
" Horse in addition	3'
Every cart or wagon whose wheels exceed three inches and does not exceed four inches in breadth, for every horse or pair of oxen drawing the same	4'
Every cart or wagon whose wheels exceed four inches, and do not exceed six inches in breadth, for every horse or pair of oxen drawing the same	3'
Every cart or wagon whose wheels exceed six inches and do not exceed eight inches in breadth, for every horse drawing the same	3'
All carts or wagons whose wheels exceed eight inches in breadth	FREE
Any person refusing or neglecting to pay toll, a fine of	

Toll Rates Posted on Old Toll House on the National Pike

townships in the vicinity of Philadelphia constructed several miles of telford-macadam road.

Of curious interest as an indication of the state of the public mind at the time is the first of the acts to be passed by the General Assembly to

remedy the situation. This act, passed June 12, 1893, enabled the taxpayers of townships and road districts to contract for the making of roads at their own expense, including the payment of the salaries of the township or road district officers, in consideration of which the levy and collection of road taxes was to be waived. Of greater interest is the fact that 25 townships still work under this act.

Under the act of June 26, 1895, a county road system was organized in Allegheny county and afterward in other counties. At present a number of counties are working under this act by reason of their maintenance of abandoned or condemned turnpike roads.

With the coming of the automobile the voice of the motorist was added to that of the cyclist, and their combined influence, together with the inability of the local authorities to provide funds for the maintenance and repair of the roads, led finally to the passage of the act of 1903 providing for the establishment of a State Highway Department.

Under the provisions of this act, by which the Commonwealth agreed to pay two-thirds of the cost of reconstructing township roads, several hundred miles of road were constructed, principally of telford-macadam but including also smaller mileages of brick, concrete and bituminous penetration macadam.

Finding that the counties and townships were slow to realize the benefits to be obtained through the assistance tendered by the Commonwealth, the proportion of State aid was increased to three-fourths of the cost by the Act of 1905; the balance being made payable by the county and township according to the terms of agreement in each particular case.

It was not until the passage of the Act of May 31, 1911, that a system of State roads to be constructed and maintained at the sole expense of the Commonwealth was established. This act retained the system of State aid but reduced the percentage payable by the Commonwealth to 50 per cent.

The State highway system established in 1911 included about 8,000 miles. With subsequent additions it included about 10,274 miles in 1924.

Of this mileage 3,953 miles constituted the primary system, designated as such by the Department of Highways in 1919. The remaining 6,321 miles constituted the secondary system. About 1,200 miles of State highways were added to the system by the 1925 General Assembly, and came

under State maintenance on June 1, 1926. Together with State-aid roads not included in the State highway system, but maintained by the Department, the total mileage of State and State aid highways June 1, 1926, was approximately 12,000.

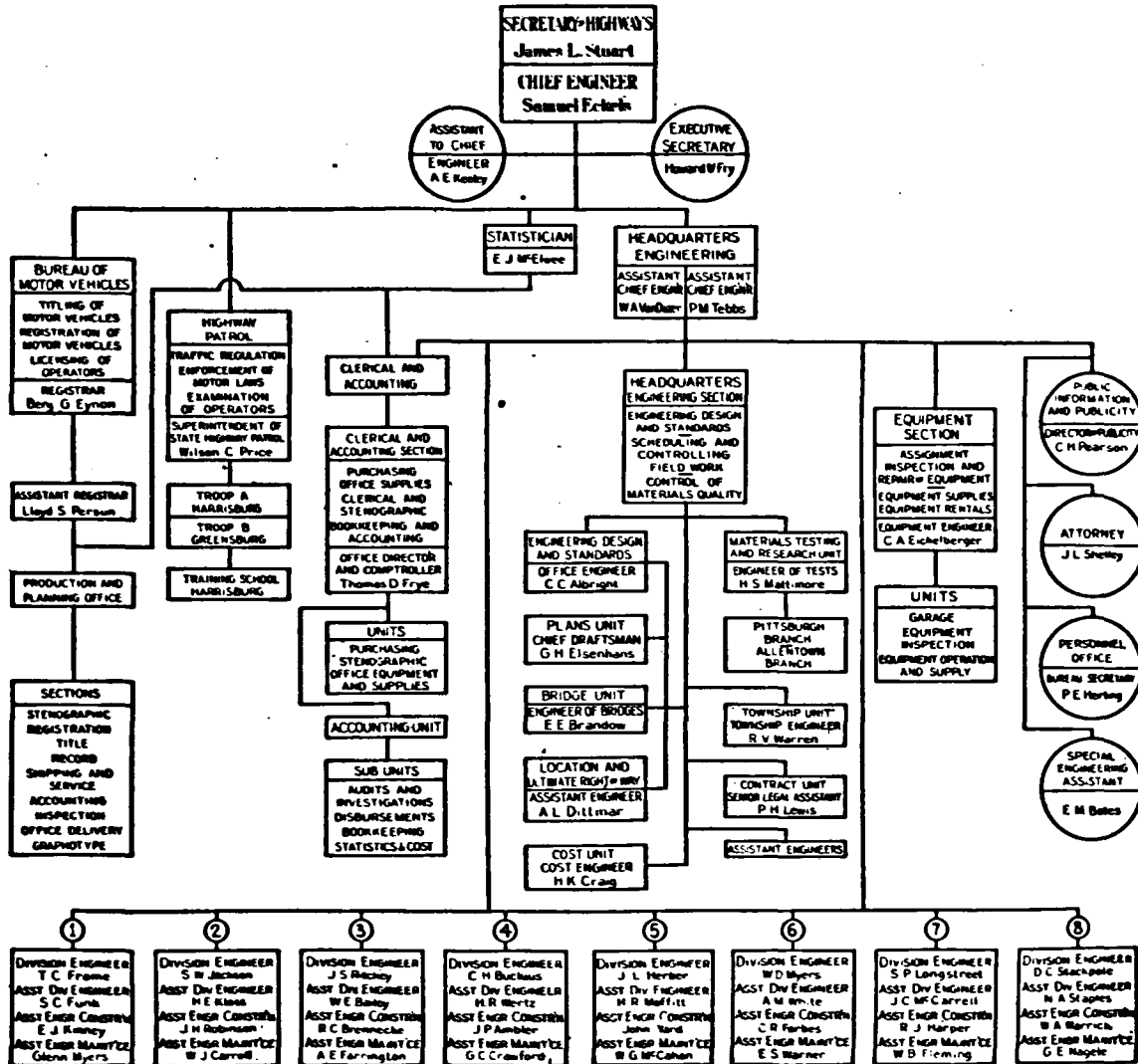


Fig. 3—Organization and functional chart of the Department of Highways, Commonwealth of Pennsylvania

## ORGANIZATION OF THE DEPARTMENT OF HIGHWAYS

The organization of the Department of Highways, as shown in Figure 3, is headed by the Secretary of Highways, who is appointed by the Governor. In him is vested authority to appoint all other employes of the Department with the approval of the Governor.

The chief engineer is next in authority and has been delegated all powers of the secretary. Reporting to the chief engineer is a group of staff engineers, who supervise the varied activities of the central offices; eight division engineers, who

and as each project is authorized for performance it is checked against the budget and the budget amounts for each purpose are not exceeded. During the performance of each project there is close control over the disbursements and costs.

The Commonwealth is divided into eight engineering divisions, each in charge of a division engineer. These division engineers have supreme authority in their division in all matters except questions of policy. Each division engineer has an engineering force capable of supervising all



*The State Capitol at Harrisburg*

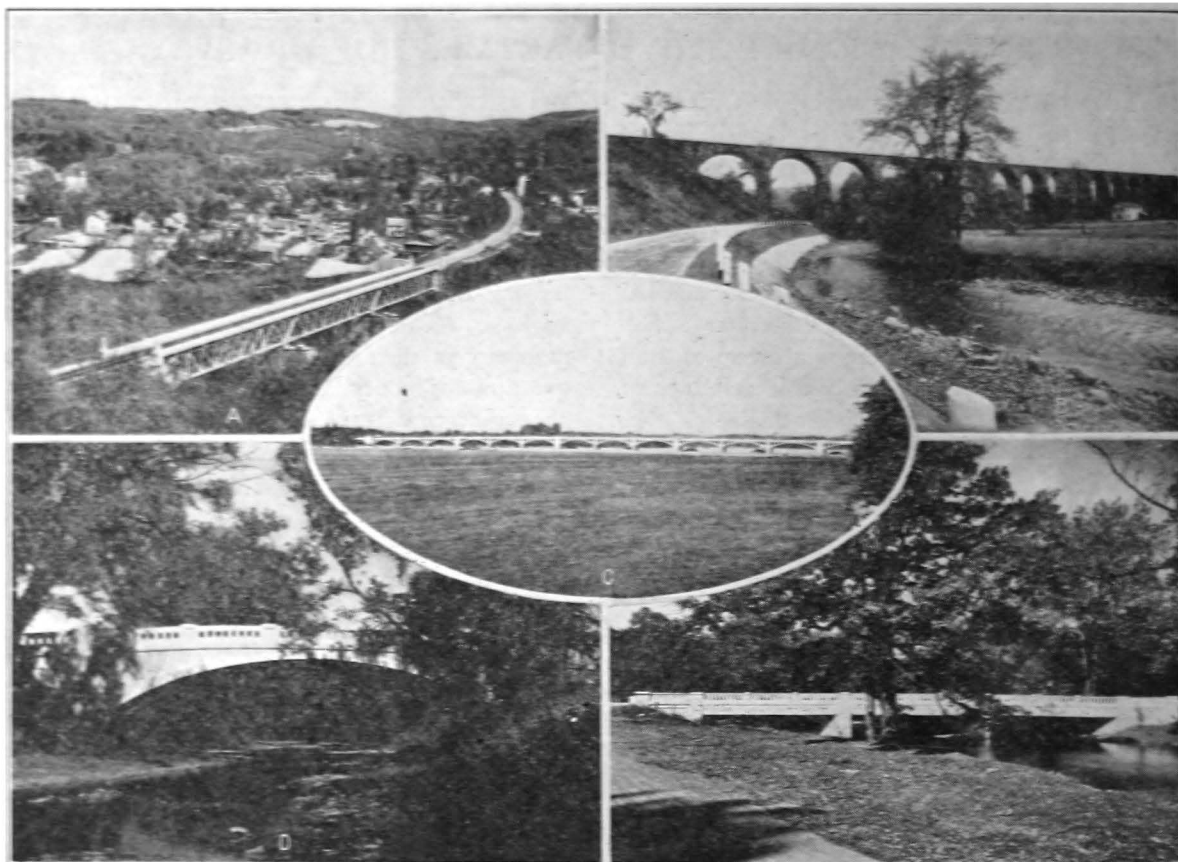
are responsible for all field work; and the registrar of motor vehicles.

All questions of policy, planning and scheduling, contracting and control of all highway work, purchasing, inspection and control of all materials and equipment, as well as the preparation of all engineering standards and design, are under the supervision and control of the headquarters executive staff.

All expenditures of the Department are controlled through a budget system. The annual budget deals with the sources and amounts of revenue available and distributes the proposed expenditures to certain definite purposes. The items of the budget comprise the program of projects

construction and maintenance work in his territory, including that performed for counties, townships and boroughs. The division engineering forces make surveys, prepare all plans according to departmental standard designs, and after the work is advertised and awarded by the central office, or authorized to be done by departmental forces, supervise its performance. The performance of all maintenance work done by department forces is under the direct supervision of 52 maintenance superintendents who report to their respective division engineers.

The yearly collection of about \$25,000,000 for the titling and registration of motor vehicles and the licensing of motor vehicle operators, involv-



*Group of Bridges on the Pennsylvania State Highway System*

*A. Route 9, Wyoming County, Bridge Over Tunkhannock Creek at Nicholson. B. Route 296, Susquehanna County, Erie Railroad Bridge Over Highways and Conocochea Creek. C. Bridge Over Susquehanna River Between Dauphin and Cumberland Counties at Clark's Ferry. D. Route 23, Lycoming County, Bridge Over Lurrys Creek. E. Route 123, Bridge Over Yellow Breaches Creek Between York and Cumberland Counties.*

ing over 5,000,000 transactions annually, is handled through the central office by the Bureau of Motor Vehicles. This branch of the Department also deals with the revocation of licenses of those who violate the motor vehicle laws.

The highway motor patrol has an authorized strength of about 350 men. Its major activity is the enforcement of the motor vehicle laws on the State highways and rendering assistance to the motoring public. A separate part of the patrol organization is responsible for the examination of prospective motor vehicle operators. Separate details weigh truck loads on the highways, while others are concerned with the headlight law enforcement.

During the peak of the working season about 25,000 people are engaged in work under the

supervision of the Department, of which from 12,000 to 14,000 are on the State highway payroll and the remainder are employed by highway contractors. The foremen, caretakers and laborers employed by the Department on maintenance work at times total 9,000 to 11,000, while as many as 2,500 to 3,000 persons are on the salary payroll. The latter group comprises the engineering and clerical forces of the central office, including the Bureau of Motor Vehicles and the Motor Patrol, and the corresponding forces of the 60 field offices.

During the working season equipment valued at about \$9,000,000 is used in State highway work, including Department equipment valued at about \$3,500,000, rented equipment about \$500,000, and equipment used by highway contractors valued at



*Motor Patrol Squad Ready for Practice Cruise*

about \$5,000,000. Among the major equipment operated at the peak of the working season are:

2,170 motor trucks	1,200 concrete mixers
540 road rollers	1,400 units of road equipment, such as sprinklers, sweepers, stone spreaders, road machines
340 tractors	
230 steam shovels	
130 cranes	

During the winter the Department operates approximately 600 trucks and 100 tractors with snow plows to keep the main traveled highways open.

*Accomplishments of the Department of Highways Since 1919.*—When, in 1919, it became possible, as a result of the first \$50,000,000 highway bond issue, to undertake an extensive program of road construction, the Department designated 3,953 miles of principal highways as the primary system, and undertook to complete the paving of this primary mileage as rapidly as possible. To that purpose it devoted practically the entire proceeds of the first bond issue. At that time approximately 1,800 miles of this system had already

been improved. During the years 1919-1922 about one thousand miles of new construction were completed.

Continuing the same policy, the last administration (1923-1926) applied approximately \$40,000,000 of the second bond issue of \$50,000,000 to the completion of the primary system, and at the end of 1926 the remaining 1,100 miles were practically completed, with contracts in force to complete the paving of the small remainder or to complete the grading and drainage of sections upon which pavements will be laid in the near future. Thus in eight years the Commonwealth has realized its dream of a paved system of main arterial highways providing uninterrupted facilities for travel at all times to all parts of the Commonwealth.

While this extensive program has been under way on the primary system, considerable progress has also been made in the paving of the secondary system, consisting of the remainder of the State highway system. Approximately 1,300 miles of the secondary roads had been improved up to 1919. During the administration of 1919-1922



approximately 1,100 miles were paved. During the administration 1923-1926 about 1,000 miles of new hard-surfaced roads were added to the secondary system which, with the mileage previously improved, gives a total of about 2,100 miles of new hard-surfaced roads constructed on the secondary system since 1919, and a total of 3,400 miles of improved roads in that system at the end of the year 1926.

In addition to the improved mileage on the primary and secondary system, nearly 600 miles of State-aid roads had been constructed in 1926. With this mileage the combined State and State-aid systems now have an aggregate length of about 12,000 miles, of which, at the close of the year 1926, approximately 8,000 miles had been improved by hard-surfacing, the balance of 4,000 consisting chiefly of earth roads and a small mileage of shale and gravel roads or roads to which some stone has been added to help carry the traffic.

Thus at the end of 1926 there were in the combined State and State-aid system two miles of improved roads for each mile unimproved. Without considering the 1,200 miles of unimproved roads added to the system in 1926, the ratio is nearly three miles of improved to one unimproved. An idea of the progress that has been made during the eight-year period can be formed by comparison of this condition with that of 1919 when there was but one mile improved to each two miles unimproved.

The administration of the Department of Highways during the four years 1923-1926 involved

the general supervision of expenditures amounting to more than \$250,000,000. Of this amount about \$190,000,000 was spent on the State and State-aid highway systems and the balance on roads not included in either of those systems. The program of expenditures on State and State-aid highways is about 50 per cent in excess of that of the preceding four-year administration, while previous to 1919 the amount of money expended was very small compared with the present program.

The \$190,000,000 State and State-aid road expenditure was financed by funds derived from the following sources:

Motor registration receipts and gasoline tax .....	\$91,000,000
Bond issue proceeds .....	48,100,000
General State revenues .....	10,500,000
Federal aid .....	14,300,000
Local share of work jointly financed	26,100,000
	<hr/>
Total .....	\$190,000,000

The \$10,500,000 from general State revenues was made available by old appropriations. The policy was adopted in 1925, of financing the entire State highway program from the proceeds of the motor vehicle registration fees and gasoline taxes, including the entire cost of maintaining the 12,000 miles of State and State-aid highways and the general operations of the Department; and, in addition ( the interest and sinking fund demands of the State highway construction bonds.

## ROAD MAINTENANCE

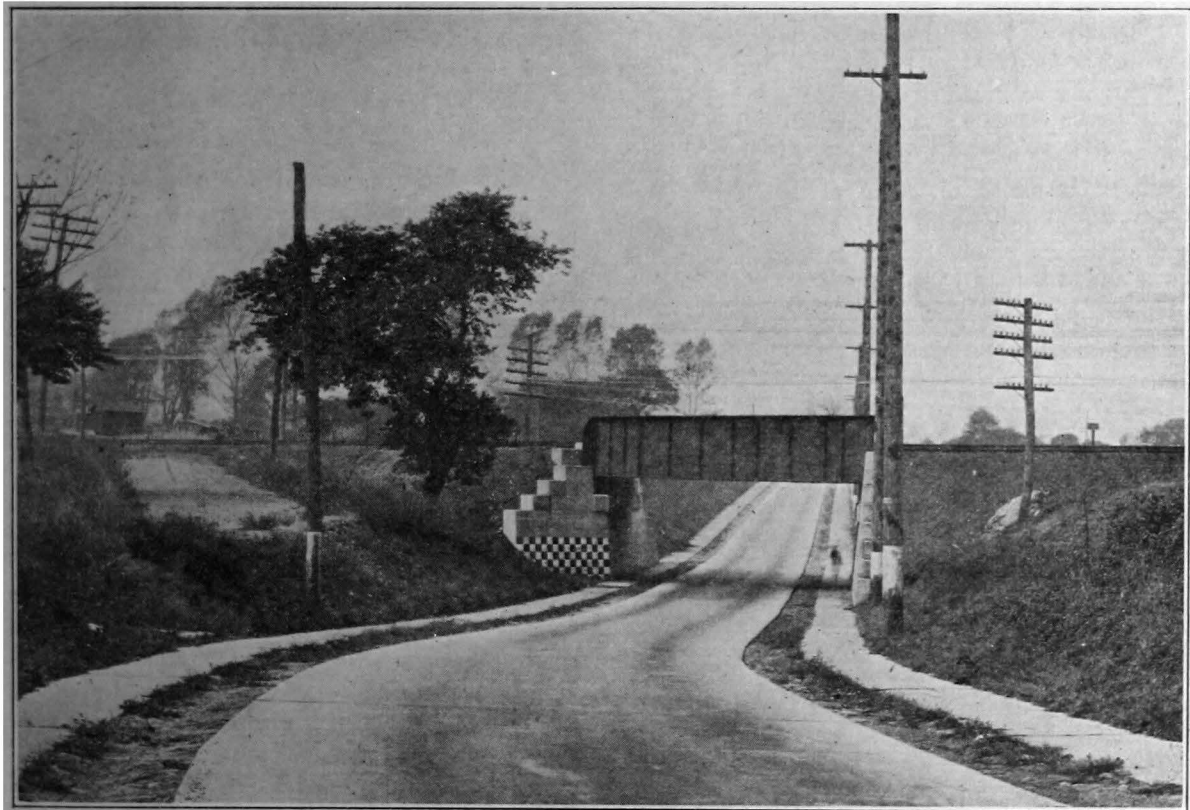
On December 31, 1926, there were 12,033 miles in the State and State-aid highway systems, of which 4,150 miles were improved with pavements of reinforced cement concrete, or with brick, block, bituminous concrete and sheet asphalt pavements on cement concrete base; 3,777 miles were improved with bituminous surface-treated or penetration macadam, or with bituminous concrete or sheet asphalt on stone base, or brick or stone block on gravel or stone base; and 4,106 miles

consisted principally of earth roads, including, however, a small mileage temporarily surfaced with shale or gravel or to which had been added in some cases a small quantity of broken stone.

With the exception of a small mileage of State-aid roads not included in the State highway system, these roads are maintained solely at the expense of the Commonwealth. State-aid roads are maintained at the joint expense of the Commonwealth and the local communities.

The maintenance expenditures of the Department reach a total of approximately \$20,000,000 a year, including expenditures for replacement, as well as resurfacing, and the various items of general maintenance, and including also expenditures for grade crossing elimination, snow removal, widening of dangerous curves, guard rail construction, etc.

this danger an effort is being made to minimize the number and severity of accidents by placing flashing signals, by painting checkerboards on the pavements, etc., as a warning to the traveler that he is approaching a grade crossing. The program during the years 1923-1926 resulted in the elimination of 254 crossings, 177 by relocation of the roads to avoid the crossings.



*Grade Crossing Elimination on Route 180 in Delaware County*

The latter items the Department recognizes as essential to the provision of adequate, safe and convenient highway transportation service, and it is, therefore, devoting no small part of its available revenues to the maintenance and gradual extension of the service and safety of the highways by these means.

For several years the Department has engaged in a very extensive program of grade crossing elimination, and pending the final elimination of

There are still about 1,200 grade crossings left on the State highway system, about 500 of which are on the primary system and somewhat over 700 on the secondary system. Of this total number 217 have been classified as very dangerous, 381 as less dangerous and somewhat over 600 as least dangerous; and it is the policy of the Department to consider the respective crossings for elimination in the order of their danger, regardless of whether the particular section of road on

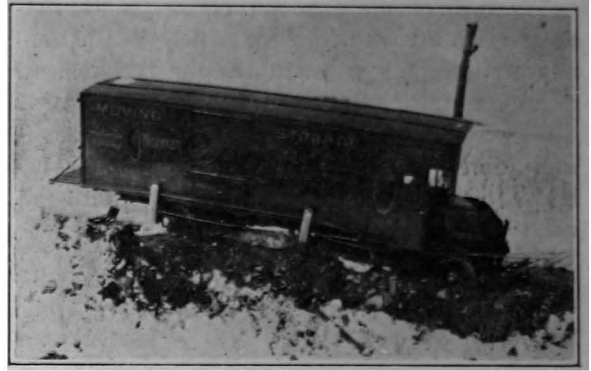
which they are located is involved in the construction program.

With a similar object—that of promoting the safety of the highways the Department has carried on extensively the work of erecting guard rails on embankments, of painting traffic lines on the surface of the highways, of whitewashing telephone poles as an aid to night travelers, of erecting warning signs and recently of installing reflecting signals.

The snow removal program has been extended each year as the paving of highways between the various centers of population has been completed. The organization for snow removal maintains a snow alarm system which enables the snow removal forces to get under way as soon as the snow has reached the depth of two inches. The Department has also made extensive installations of snow fence, realizing that the prevention of drifts is cheaper than their removal.



*Surface Marking on the Highway Indicating the Approach to a Railroad Grade Crossing Near Hummelstown.*



*Cable Guard Fence prevents Many a Serious Accident*

Snow removal is one of the many activities in the line of service to the traveling public which is greatly emphasized. The main roads must be kept open every day in the year, otherwise there is economic loss. Snow removal, however, is not solely of service to the traveling public; it also materially reduces the road maintenance costs.

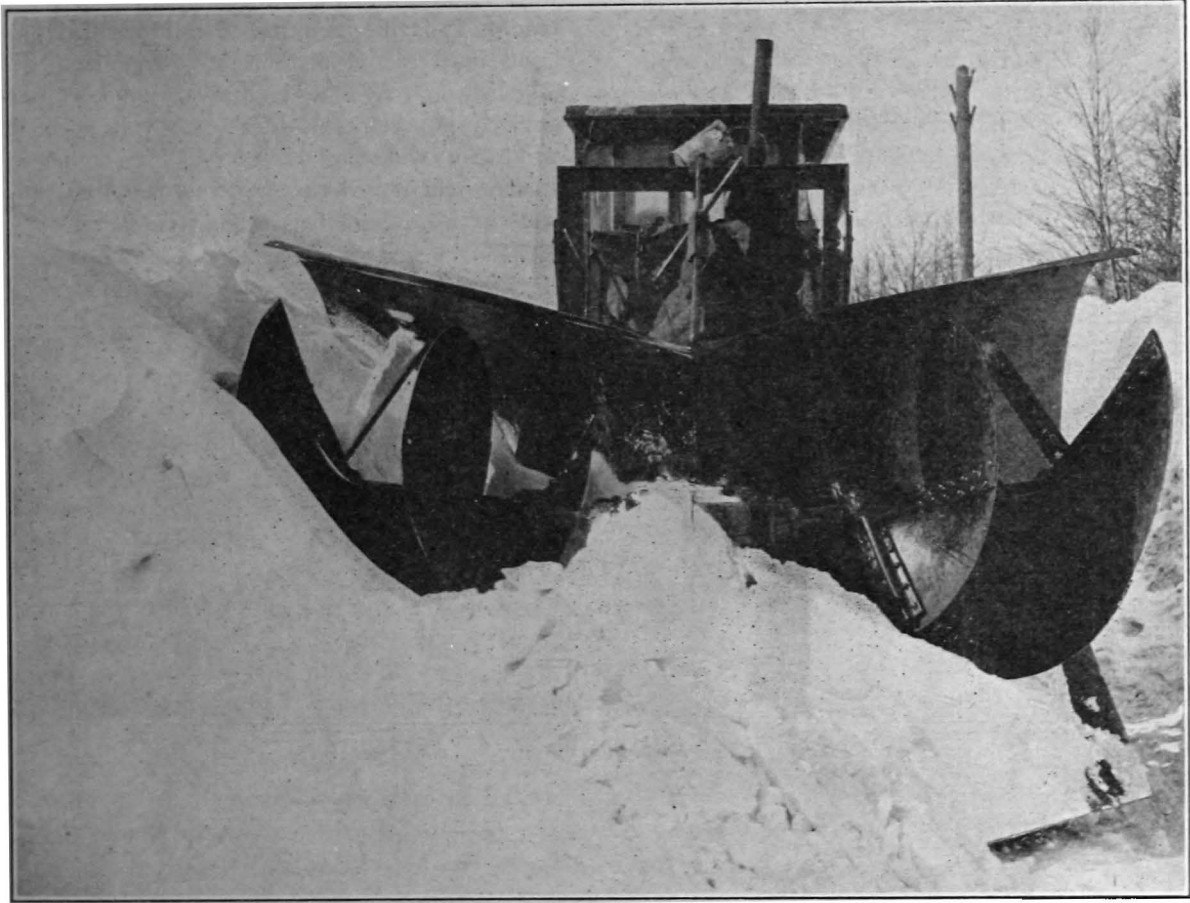
The care and attention given to these features of its work are in harmony with the Department's conception of its function as that of providing adequate facilities for highway transportation, not merely that of building and maintaining the highway structure.

It is its belief that the work of repairing, replacing and improving the existing surfaces and structures must be continued without cessation, in order that the highways shall continue to render the service for which they are built, and that it should constantly endeavor to maintain a standard of service on each separate link of the highway system consistent with the needs and importance of the traffic.

## ROAD CONSTRUCTION POLICIES

It has been the aim of the Department in every instance to determine the design of the pavement on the principle of providing adequately for the present and estimated future traffic needs at the least annual cost. Its policy has been never to

such surfaces have not been constructed even though they may have been adequate to meet the immediate traffic needs. In some cases where the traffic has been very light and it has appeared that it would not materially increase for 15 or



*Rotary Snow Plow in Action Near Ridgway*

build an expensive pavement where one of the less costly surfaces of the flexible type would serve the traffic for a reasonable period at a lower annual cost. If, however, it has seemed probable that a development of truck traffic would occur which would destroy a surface of the flexible type before the expiration of its economic life,

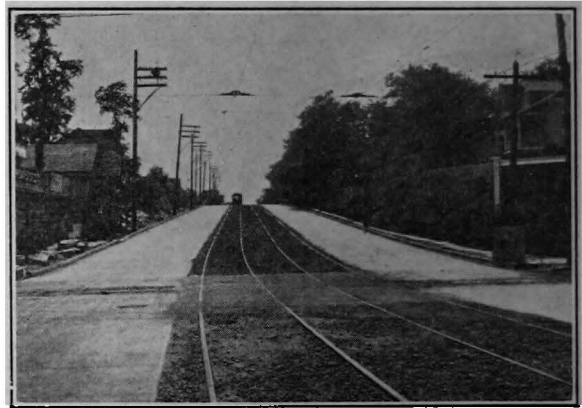
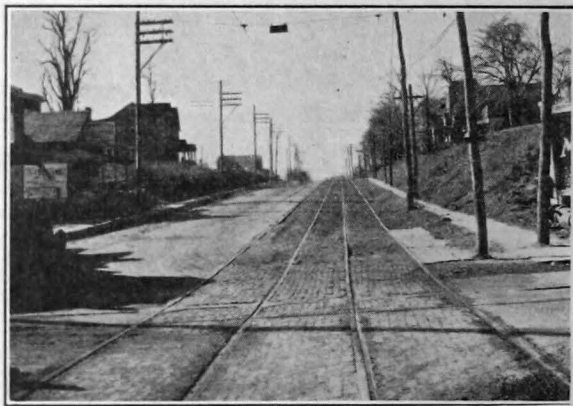
20 years, the highways have been improved by progressive construction. In such cases a surface of bituminous surface-treated macadam has been built at about half the cost of a more durable pavement. Such surfaces are expected to be adequate for the traffic for a great many years; and when the traffic warrants the further improve-

ment, it is the intention to build the more durable pavement over the existing surface, thus salvaging the initial investment and utilizing its strength as added support for the pavement.

The maximum right-of-way width established by the Governor and Council of the Colony at 50 feet in 1700 remained by reenactment the law of the Commonwealth until June 7, 1907, when it was increased to 80 feet and again on April 6, 1921, to 120 feet.

The General Assembly in 1925 also conferred upon the Secretary of Highways the power, with the approval of the Governor, to fix the ultimate right-of-way width on any State highways up to the maximum width of 120 feet, and by filing a

plan with the register of deeds in the respective county involved to preclude the payment by the public of damages for any improvements made within the reserved ultimate right-of-way lines after the filing is made. The Department has laid out an extensive program of surveys from which plans are being prepared and filings will be made in the near future on the more important highways leading into the principal centers of population. It is the intention to continue this program until the ultimate right-of-way has been established on all State highways. This is a particularly important measure to provide adequate width for widening of highways as traffic increases, and it will save future generations millions in property damages.



*Chester Pike at Ridley Park Borough Before and After Widening*

## CHAPTER III

### THE HIGHWAY TRANSPORTATION SURVEY

The general purpose of the highway transportation survey was to obtain detailed data regarding the volume and type of traffic on the State highway system and to estimate the future traffic importance of the various routes and sections of routes. The information so obtained is necessary for the establishment of a definite plan of highway improvement based on traffic needs and for the establishment of a highway budget for a period of one year.

The survey, cooperatively conducted by the Pennsylvania Department of Highways and the United States Bureau of Public Roads was begun in November, 1923, and continued for a period of one year.

Prior to the beginning of the survey the Pennsylvania Department of Highways had conducted a series of traffic counts at approximately 1,000 points on the State highway system. These counts were made during the months of May, July and October, 1923, and February, 1924. Each operation consisted of a record of the number of passenger cars and trucks for from two to six days in each of the above months. The hours of operation at each station varied from 12 at minor stations to complete 24-hour counts at the more important stations. The data obtained were valuable in the selection of the most advantageous points at which to record traffic during the period of the transport survey and the density data for all stations were combined in the traffic analysis of the Pennsylvania highways.

During this survey, traffic data were recorded at 352 points on the Pennsylvania highways. At 82 of these points complete motor truck information including weights was obtained, as well as

the density of traffic of all types of vehicles. These stations were located at key points on the principal highways in different sections in order that motor truck utilization in various parts of the Commonwealth could be determined.

At the remaining 270 stations all truck data except weights, and the density of all types of traffic were recorded.

Each operation consisted of a ten-hour observation period alternating between 6 a. m. to 4 p. m., and 10 a. m. to 8 p. m. In addition to the regular day operations a sufficient number of night operations, from 8 p. m. to 6 a. m., were made to enable a reasonably accurate adjustment of all traffic records to a 24-hour period. Detailed passenger car data were obtained by a special party operating throughout the year at selected stations. The operating schedule provided for an accurate distribution of operations so that each hour of the day, day of the week, and season of the year for each station was correctly represented in the summary of traffic information. The field operating schedule was constructed so as to avoid duplicate recording of traffic, which would result if two or more stations, located near each other on the same route, or on connecting routes, were operated on the same day.

From information regarding hourly, daily and seasonal variations in traffic obtained during the survey, the earlier counts conducted by the Pennsylvania Department of Highways were adjusted to an average daily traffic for the year period. The inclusion of these counts provides definite information as to traffic at 1,351 points. The location of each of these traffic stations is shown in Figure 4 and 4a.

HIGHWAY TRANSPORTATION SURVEY

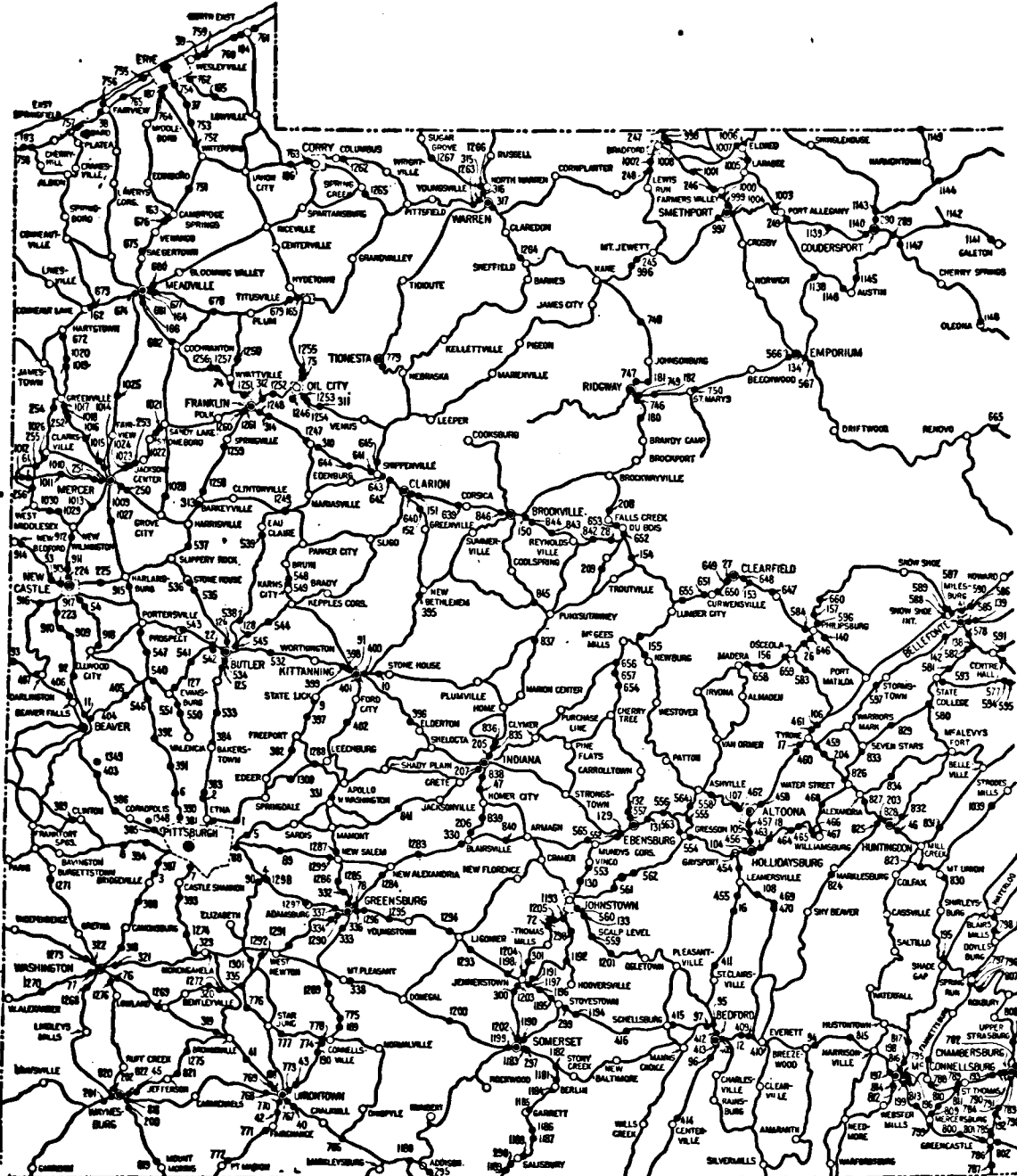


Fig. 4—Map of Pennsylvania showing the location of traffic survey stations (west section)

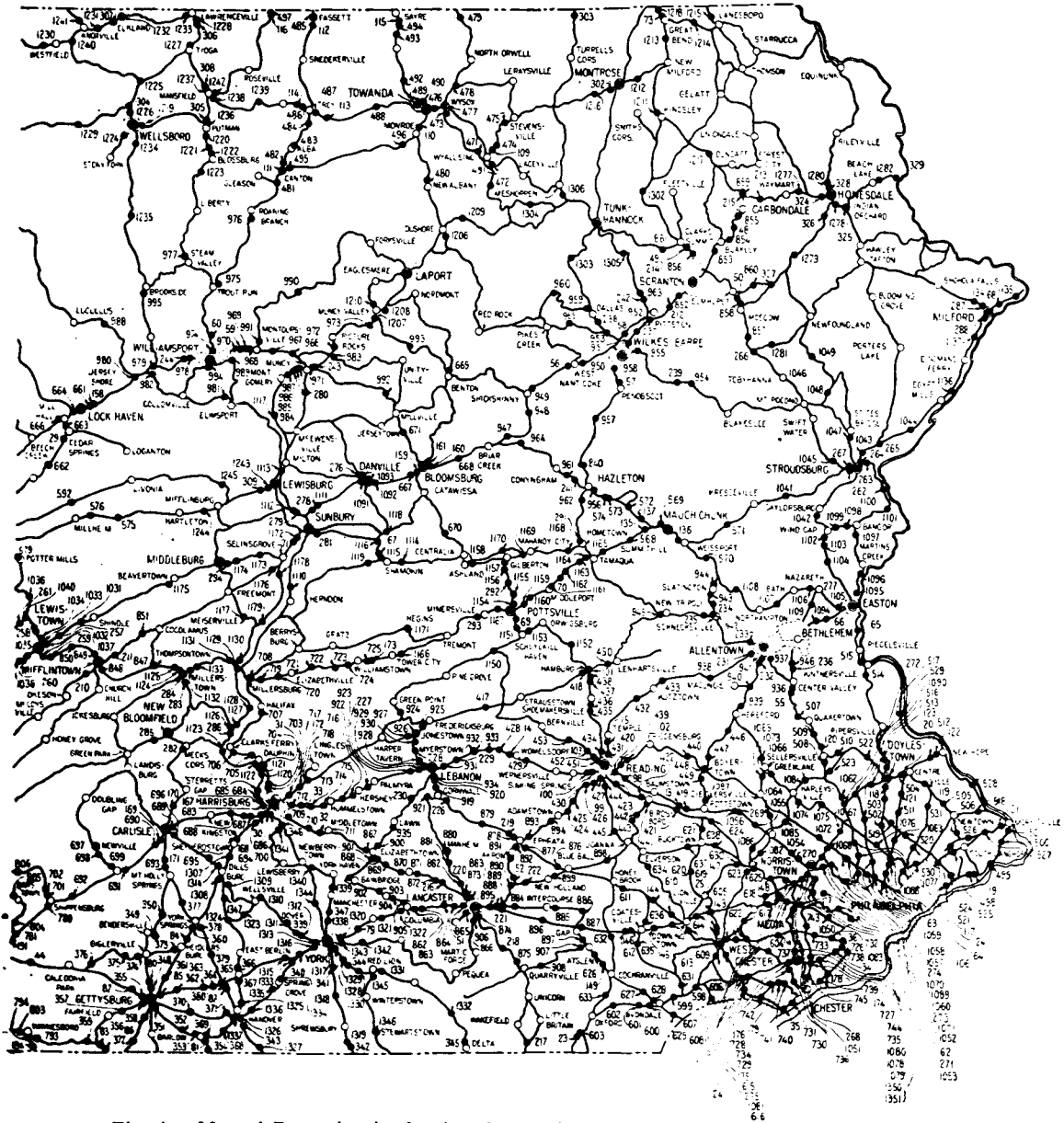


Fig. 4a—Map of Pennsylvania showing the location of traffic survey stations (east section)



## ✓ THE DENSITY OF MOTOR VEHICLE TRAFFIC IN 1924

As previously stated there were in 1924 more than 93,000 miles of rural highways in Pennsylvania, of which 10,274 miles had been officially designated as the State highway system. The highways of the State system, in turn, were classified according to their importance as the primary and secondary systems, the former coinciding, but for a few minor exceptions, with the Federal-aid system. In the following discussion the term *State highways* refers to the combined primary and secondary systems.

Annual motor vehicle traffic<sup>9</sup> on the 3,953 miles of the primary system during 1924 was 1,516,575,000 vehicle-miles. On the 6,321 miles of the secondary system the annual traffic during the same period was 865,415,000 vehicle-miles. The preponderating importance of the State highway system is to be seen in the fact that annual traffic on the remaining 83,000 miles of rural highways, namely, the State-aid, county and township roads, which constitute 89 per cent of the total mileage (was estimated as 1,105,220,000 vehicle-miles. The State highway system, therefore, with but 11 per cent of all the rural road mileage in Pennsylvania, carried 68.3 per cent of the total annual motor-vehicle-mileage on the rural highways.

The daily volume of traffic on the different parts of the State highway system varied widely. At the Philadelphia city line, on primary route 130 to Media, the average motor traffic per day was 9,114 vehicles, while on route 289 of the secondary system in Lycoming County, the average was but 22 motor vehicles. The maximum traffic at these stations was 25,060 vehicles and 80 vehicles, respectively.

The detailed tabulation of motor vehicle density at the 1,351 traffic survey stations is shown in Appendix II, in which are listed all stations at which data were secured, the numbers of the corresponding routes, the average density of all motor vehicle traffic for a 24-hour day, the average daily density of motor truck traffic, the nor-

mal maximum traffic, and the estimated traffic for 1930.

The average and maximum daily traffic on all primary routes of the State highway system are shown on the map, Figure 5. Either the United States Bureau of Public Roads or the Pennsylvania Department of Highways upon request will furnish a map which shows the average daily total motor vehicle traffic, motor truck traffic, and estimated total traffic in 1930 on each State highway for which traffic data were obtained, together

<sup>9</sup>In this report certain terms, frequently used, have invariably the same meaning. These terms and their definitions are as follows:

*Vehicles* refers only to motor vehicles (passenger cars and trucks) exclusive of horse-drawn conveyances.

*Traffic* is defined as the movement to and fro of vehicles over a highway.

*Density of traffic* is defined as the number of motor vehicles passing any given point on a highway in a unit of time. Unless a different unit of time is specifically stated density of traffic refers to the number of vehicles passing any given point on a highway during a day of 24 hours.

The accuracy of the determination of density of traffic is influenced by the distance between the survey stations. Exactness of method would require a density record for each point on the highway system where traffic varies. The cost involved in proportion to the relatively small gain in accuracy does not justify location of traffic observation points at close intervals. The density computed for each station on the Pennsylvania highway system is applied to the short sections of highway reasonably adjacent to each station on which there is but little variation in traffic.

In discussions of the utilization of the highway system, where it is desired to discriminate between the use of the highway by vehicles and the volume of traffic, the term *vehicle-miles per mile* is used in the former connection. Numerically, *vehicle-miles per mile* are equivalent to density of traffic.

*Vehicle-mile* is defined as the movement of a motor vehicle one mile.

Average daily vehicle-miles on the highway system are calculated by multiplying the average daily density of traffic on each section of highway, by the length of each section, and adding the products.

*Daily* refers to a day of 24 hours.

*Average daily* refers to an average day during the period of the survey.

*Ton-mile* is defined as the movement of a ton one mile.

*Net tonnage* refers to the net weight of the motor truck cargo.

*Gross tonnage or gross load* refers to the weight of the motor truck cargo and vehicle. The gross weight of an empty truck is equal to the weight of the truck.

*Foreign* traffic represents vehicles having other than Pennsylvania State license tags. Foreign vehicle-miles are calculated by applying the percentage of foreign vehicles at each station to the total vehicle-miles on the sections of highway adjacent to each station and adding to obtain the total foreign vehicle-miles. Similar procedure is used in calculation of farm and city, business and non-business and touring traffic, and trucking for hire.



with the distribution of population. The relative traffic importance of the various routes is clearly indicated by this map; and for purposes of quantitative judgment, the mileage involved is classified in Figure 6 according to several traffic-density classes.

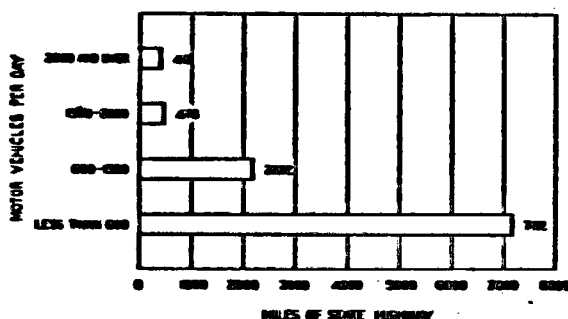


Fig. 6—Mileage of State highways by traffic classes

During the period of the survey there were certain sections of highway under construction, with resulting interference with normal traffic movement. In certain cases, where there was reasonable basis for a corrected estimate, allowance has been made for this fact. Obviously, there is no way of knowing exactly how much traffic there would have been on any given highway had there not been such interference with free vehicle movement.

Upon the basis of traffic there are three separate sections (fig. 7) somewhat comparable with the distribution of population and industry. The most important of these sections lies in the eastern part of the Commonwealth, and includes, in order of traffic density, the counties of Philadelphia,<sup>10</sup> Delaware, Lackawanna, Northampton, Montgomery, Dauphin, Lehigh, Schuylkill, Luzerne, Berks, Bucks, Chester, York, Cumberland, Lancaster, Northumberland, Carbon and Lebanon. This is the area of densest population and of greatest industrial and mining development. It will be

readily seen from the traffic map that it is also the region of heaviest traffic concentration. It included 2,780 miles of State highway, or 27.1 per cent of the entire State system. Of its highways, 300 miles carried a daily traffic of over 2,000 motor vehicles. It is also the most important motor trucking section, where the greatest number of trucks and the greatest percentage of large-capacity trucks operate.

Next in traffic importance is the western section, including the counties of Allegheny, Blair, Erie, Fayette, Lawrence, Washington, Westmoreland, Beaver, Mercer, Butler, Venango, Clearfield, Cambria, Somerset, Crawford, Armstrong, Jefferson, Greene, Indiana and Clarion. Within this area there were 3,313 miles of State highway, 32.2 per cent of the entire State system, of which 103 miles carried a daily average of over 2,000 motor vehicles. A considerable volume of trucking is also to be noted, largely in the vicinity of Pittsburgh.

The wedge-shaped area lying between and north of the two sections just described, and including all the remaining counties is of least traffic importance. Of the 4,181 miles of State highway in this section, 40.7 per cent of the State system, but 9 miles carried a daily average of more than 2,000 vehicles; and only 690 miles carried over 600 vehicles daily.

Table 5 lists, according to these three divisions, the various sections of State highway which carried a daily average traffics of 1,500 motor vehicles or more in 1924. These sections are further classified as to whether they constituted a part of the primary system or the secondary system. The number of trucks of all capacities is shown, together with the number of heavy (3 to 7½-ton) trucks.

<sup>10</sup> There are no State highways in Philadelphia County. The city of Philadelphia and the county are coterminous.

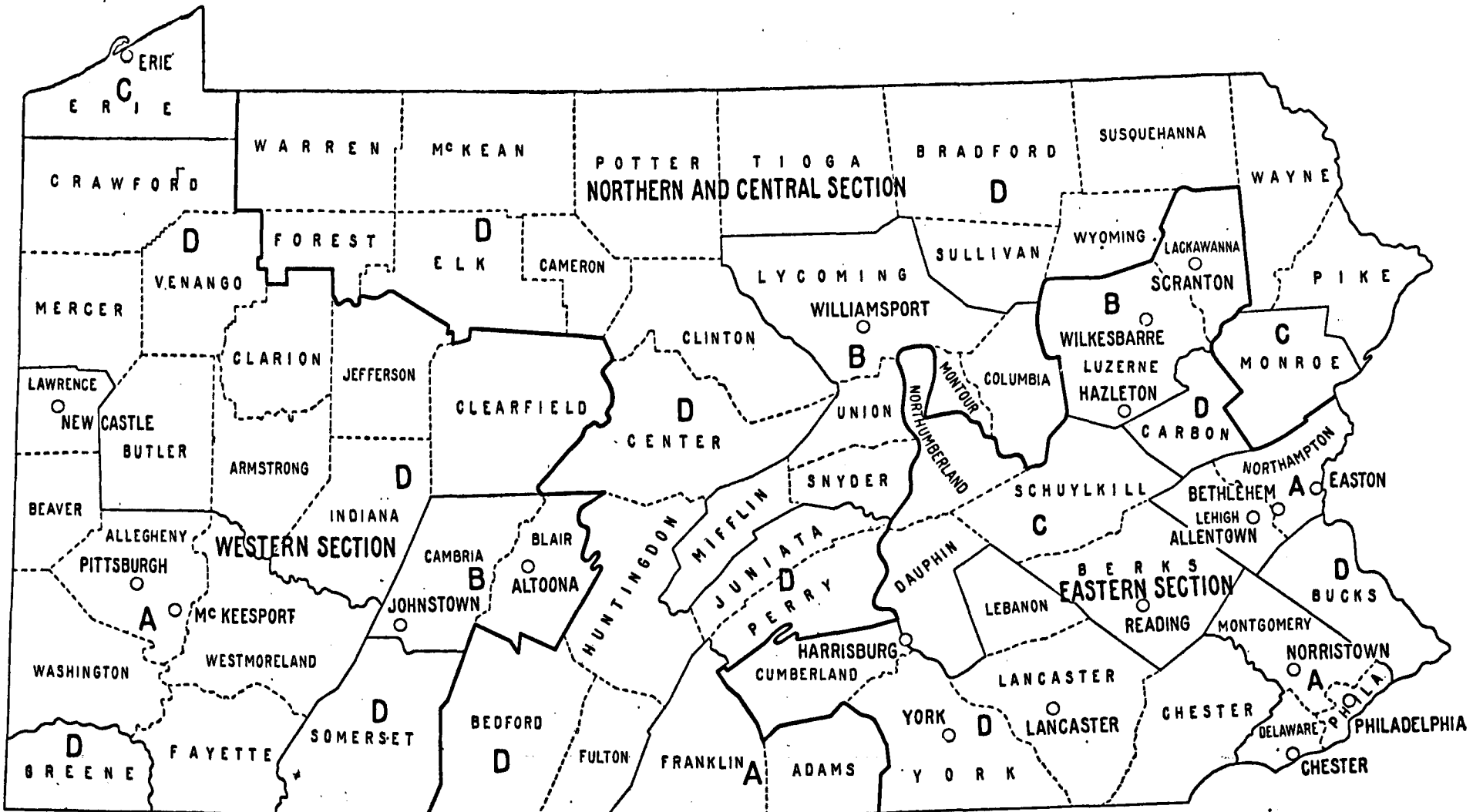


Fig. 7—Map of Pennsylvania showing traffic and population sections and sub-divisions. Traffic sections separated by heavy solid lines, sub-divisions by light solid lines.

## HIGHWAY TRANSPORTATION SURVEY

Table 5—Sections of the Pennsylvania State highways which carried a daily density of over 1,500 motor vehicles in 1924

Route number	Approximate mileage	Highway section	Primary or secondary	Average daily motor vehicles	Average daily trucks	Average daily 3-7½ ton trucks
<b>EASTERN SECTION</b>						
<i>Philadelphia District</i>						
130	7	Philadelphia—Media .....	P	7,171	637	175
142	3	Philadelphia—Bryn Mawr .....	P	6,929	776	198
142	6	Bryn Mawr—Wayne .....	P	5,407	605	153
151	6	Philadelphia—Willow Grove .....	P	4,626	472	67
132-180	10	Philadelphia—Chester—Del. Line ..	P	4,522	661	173
281	13	Philadelphia—Morrisville .....	P	3,744	446	194
142	14	Wayne—Jct. with Route 147 .....	P	3,357	301	103
133	6	Philadelphia—Jct. Routes 133 and 225 .....	S	3,171	276	109
142	12	Jct. with Route 147—Coatesville ..	P	2,545	187	65
153	8	Philadelphia—Springhouse .....	P	2,507	241	31
151	13	Willow Grove—Doylestown .....	P	1,954	134	27
131	23	Media—Avondale .....	P	1,945	181	42
225	13	Chester—Jct. Routes 142 and 225 ..	P	1,762	153	.....
178	4	Norristown—Center Square .....	P	1,665	170	27
146	21	Norristown—Pottstown .....	P	1,639	190	36
135	10	West Chester—Delaware Line .....	P	1,525	149	.....
<i>Scranton—Wilkes Barre District</i>						
5	17	Wilkes Barre—Scranton .....	P	4,007	553	87
9	11	Scranton—Factoryville .....	P	3,002	294	31
4-368	7	Pittston—Wilkes Barre .....	P	2,994	398	42
6	14	Scranton—Carbondale .....	P	2,877	466	39
4	18	Shickshinny—Jct. Routes 4 and 368 ..	P	1,950	284	77
168	10	Scranton—Moscow .....	P	1,802	125	26
<i>Reading District</i>						
149	13	Reading—Womelsdorf .....	P	3,067	276	46
146	15	Reading—Pottstown .....	P	2,581	205	40
157	15	Reading—Kutztown .....	P	2,420	256	55
160	14	Reading—Hamburg .....	P	1,944	206	26
<i>Allentown—Easton District</i>						
159	6	Allentown—Easton .....	P	3,066	297	46
157	18	Allentown—Kutztown .....	P	2,265	148	55
165-166	22	Easton—Stroudsburg .....	P	1,802	166	10
163	9	Allentown—Schnecksville .....	P	1,713	169	17
156-151	30	Easton—Doylestown .....	P	1,602	126	27
<i>Harrisburg District</i>						
129	16	Harrisburg—Elizabethtown .....	P	2,588	264	41
1	13	Harrisburg—Clarks Ferry .....	P	2,483	271	128
139	21	Harrisburg—Lebanon .....	P	1,943	161	27
34	17	Harrisburg—Carlisle .....	P	1,765	140	15
123	12	Harrisburg—Dillsburg .....	P	1,538	65	.....
<i>York—Lancaster District</i>						
128-126	34	Lancaster—Abbottstown .....	P	2,322	188	44
129	18	Lancaster—Elizabethtown .....	P	1,816	124	30
216	9	York—Red Lion .....	S	1,697	296	53
215-142	27	Lancaster—Coatesville .....	P	1,656	106	32

Table 5—Sections of the Pennsylvania State highways which carried a daily density of over 1,500 motor vehicles in 1924—Continued

Route number	Approximate mileage	Highway section	Primary or secondary	Average daily motor vehicles	Average daily trucks	Average daily 3-7½ ton trucks
<i>Sunbury—Pottsville District</i>						
161	15	Sunbury—Shamokin .....	P	2,391	329	22
140-141	21	Pottsville—Hamburg .....	P	2,095	228	37
162	6	Pottsville—Middleport .....	P	1,969	238	.....
290	4	Mahanoy City—Gilberton .....	S	1,837	189	.....
25	6	Sunbury—Selinsgrove .....	P	1,616	120	12
18	28	Sunbury—Muncy .....	P	1,572	93	9
163	9	Weissport—Mauch Chunk .....	P	1,529	182	8
Total	644					
WESTERN SECTION						
<i>Pittsburgh District</i>						
120	6	Pittsburgh—East Pittsburgh .....	P	3,272	346	63
108	5	Pittsburgh—Bridgeville .....	P	3,253	420	64
70	15	Pittsburgh—Springdale .....	P	2,688	468	88
119-120	28	Youngstown—East Pittsburgh .....	P	2,134	130	26
247	8	Pittsburgh—Castle Shannon .....	S	1,942	320	67
108	4	Bridgeville—Washington County Line .....	P	1,700	219	.....
<i>Erie District</i>						
272	9	Erie—Fairview .....	P	2,441	171	12
87	14	Erie—New York Line .....	P	2,390	120	8
86	14	Fairview—Ohio Line .....	P	1,718	94	7
<i>Altoona District</i>						
55	4	Altoona—Hollidaysburg .....	P	3,330	268	55
55	15	Altoona—Tyrone .....	P	1,726	117	10
113-50	17	Brownsville—Uniontown—Summit .....	P	2,410	181	21
116	5	Uniontown—Fair Chance .....	P	2,067	217	25
57	7	Philipsburg—Osceola .....	P	1,877	161	9
91	6	Oil City—Franklin .....	S	1,804	114	10
117	28	Uniontown—Greensburg .....	P	1,675	132	12
74	14	Mercer—Ohio Line .....	S	1,629	99	7
77	24	Newcastle—Beaver .....	P	1,504	96	26
Total	223					
NORTHERN AND CENTRAL SECTION						
58	3	Lock Haven—Mill Hall .....	P	2,131	259	.....
29	6	Lewistown—Reedsville .....	P	2,097	212	38
94	2	Warren—North Warren .....	P	1,886	132	17
18	12	Williamsport—Muncy .....	P	1,844	153	10
Total	23					
Grand Total ..		890				

It will be seen from this table that practically all the routes carrying heavy traffic are adjacent to or connect the larger cities. Of the 644 miles of highway in the eastern section carrying over 1,500 vehicles daily, 169 miles are in the Philadelphia area, 77 miles in the Scranton-Wilkes-Barre area, 57 adjacent to Reading, 85 in the Allentown-Easton area, 79 adjacent to Harrisburg, 88 in the Lancaster-York area and 89 in the Sunbury-Pottsville area. In the western division, 66 miles radiate out of Pittsburgh, 37 miles make up the important interstate route through Erie, and the remaining sections are adjacent to other important cities.

The predominance of the southeastern section is indicated by the fact that 72 per cent of the mileage which carried more than 1,500 vehicles per day is in this area. The western section includes 25 per cent of the State mileage which carried over 1,500 vehicles per day. In Allegheny

county of the western section several important traffic routes are not included in the State highway system. The northern and central section had a very low average density of traffic, only 23 miles carried over 1,500 vehicles daily.

It should also be noted that but 47 miles of the total mileage listed is on the secondary system.

The sections of highway listed in Table 5 are all to be regarded as important routes. Of almost equal significance for present and future planning, construction, and maintenance is the mileage of highways with traffic ranging between 600 and 1,500 motor vehicles per day. These sections are not so uniformly improved as are those of larger traffic density, yet the traffic which they must carry is rapidly increasing, and requires adequate improvement of the roads. Sections which carried traffic of from 600 to 1,500 vehicles in 1924 are listed in Table 6. This table also shows the estimated traffic density in 1930.

Table 6—Sections of the Pennsylvania State highways which carried a daily density of from 600 to 1,500 motor vehicles in 1924

Route number	Approximate mileage	Highway section	Primary or secondary	Average daily motor vehicles	Average daily trucks	Average motor daily vehicles
						1930
<b>EASTERN SECTION</b>						
<i>Philadelphia District</i>						
145	8	Philadelphia—Norristown .....	P	1,116	131	1,910
131	17	Avondale—Maryland line .....	P	1,086	66	1,760
150	17	Philadelphia—Morrisville .....	P	1,085	148	1,780
133	14	West Chester—Jct. Routes of 133 and 225 .....	S	1,055	100	1,710
147	22	West Chester—Pottstown .....	P	1,027	107	1,740
155	14	Centerville—Willow Grove .....	S	999	74	1,690
143	11	Norristown—Malvern .....	P	976	121	1,650
201	16	Philadelphia—Valley Forge .....	S	964	79	1,630
143	7	West Chester—Malvern .....	P	933	116	1,510
180	5	Chester—Jct. Routes 131 & 180 ..	P	916	112	1,700
197	14	Philadelphia—Center Square .....	S	776	69	1,330
178	13	Center Square—Doylestown .....	P	661	64	1,100
155	7	New Hope—Centerville—Doylestown .....	P	635	52	1,040
<i>Scranton—Wilkes Barre District</i>						
170	5	Wilkes Barre—Penobscot .....	P	1,042	96	1,760
232	15	Pittston—Exeter .....	P	886	75	1,490
<i>Reading District</i>						
148	11	Reading—Adamstown .....	P	1,401	212	2,320
149	14	Womelsdorf—Lebanon .....	P	1,390	129	2,280

Table 6—Sections of the Pennsylvania State highways which carried a daily density of from 600 to 1,500 motor vehicles in 1924—Continued

Route number	Approximate mileage	Highway section	Primary or secondary	Average daily motor vehicles	Average daily trucks	Average daily motor vehicles
		<i>Allentown—Easton District</i>				1930
163	14	Schnecksville—Weissport .....	P	1,297	122	2,280
153	33	Allentown—Springhouse .....	P	1,268	142	2,130
165-166	32	Easton—Stroudsburg (via secondary routes) .....	S	1,000	97	1,710
		<i>Harrisburg District</i>				
250-333	22	Harrisburg—York .....	P	1,490	134	2,430
35	33	Carlisle—Chambersburg .....	P	1,052	72	1,710
370	5	Harrisburg—Paxtonia .....	S	981	96	1,640
1	14	Clarks Ferry—Millersburg .....	P	756	82	1,270
41	7	Mt. Holly Springs—Carlisle .....	P	664	56	1,090
199	14	Millersburg—Lykens .....	P	602	59	1,010
		<i>York—Lancaster District</i>				
127	17	York—Maryland line .....	P	1,426	142	2,320
124	20	York—Dover—Dillsburg .....	S	1,158	115	1,880
148	20	Adamstown—Ephrata—Lancaster .....	P	1,125	92	1,850
136	13	Lancaster—Quarryville .....	P	986	101	1,600
230	14	Hanover—Spring Grove—Jct. of Routes 126 and 230 .....	S	855	84	1,390
137	30	Ephrata—Blue Ball—Downingtown .....	S	686	41	1,110
		<i>Sunbury—Pottsville District</i>				
161	21	Shamokin—Gilberton .....	P	1,480	197	2,430
199	20	Pottsville—Tower City .....	P	1,443	208	2,500
162	16	Summit Hill—Middleport .....	P	1,290	156	2,090
161	9	Gilberton—Pottsville .....	P	1,223	142	1,980
162	8	Manch Chunk—Summit Hill .....	P	1,099	153	1,880
185	10	Hazleton—Tamaqua .....	P	970	100	1,600
199	10	Tower City—Lykens .....	P	902	91	1,570
190	9	Hometown—Mahanoy City .....	S	803	83	1,300
170	5	Hazleton—Drums .....	P	765	93	1,290
<b>Total</b>	<b>606</b>	<b>WESTERN SECTION</b>				
		<i>Pittsburgh District</i>				
72-73	32	Bakerstown—Butler—Slippery Rock .....	P	1,469	68	2,390
108	13	Washington—Allegheny County line .....	P	1,065	79	1,900
72	12	Pittsburgh—Bakerstown .....	P	1,377	159	2,340
246	23	Pittsburgh—Jct. of Routes 78 and 347 .....	S	1,254	114	2,130
		<i>Erie District</i>				
84	34	Erie—Meadville .....	P	1,170	63	2,050
		<i>Altoona District</i>				
222	17	Johnstown—Scalp Level—Oglestown .....	S	1,174	89	1,350
269-317	25	Somerset—Johnstown .....	P	1,142	84	1,980
52	17	Johnstown—Ebensburg .....	P	1,109	101	1,910
53-276	22	Ebensburg—Holidaysburg .....	P	1,094	81	1,890
260	14	Williamsburg—Holidaysburg .....	P	755	99	1,290



## HIGHWAY TRANSPORTATION SURVEY

Table 6—Sections of the Pennsylvania State highways which carried a daily density of from 600 to 1,500 motor vehicles in 1924—Continued

Route number	Approximate mileage	Highway section	Primary or secondary	Average daily motor vehicles	Average daily trucks	Average daily motor vehicles 1930
80	8	Newcastle—New Wilmington .....	P	1,465	117	2,550
113	23	Washington—Brownsville .....	P	1,441	81	2,570
118	6	Bentleyville—Jct. of Routes 118 & 247 .....	S	1,431	214	2,560
233	16	Newcastle—Slippery Rock .....	S	1,413	123	2,460
81	12	Newcastle—Ohio line .....	P	1,388	95	2,410
70	11	Springdale—Butler County line .....	P	1,387	242	2,360
114	16	Washington—West Alexander .....	P	1,374	75	2,450
116	12	Fair Chance—West Virginia line .....	P	1,364	143	2,290
204	14	Beaver—Ohio line .....	P	1,364	101	2,490
205	13	Titusville—Oil City .....	S	1,334	178	2,160
82	7	Conneaut Lake—Meadville .....	P	1,289	34	2,200
59	7	Clearfield—Curwensville .....	P	1,265	102	2,100
119	21	Jennerstown—Youngstown .....	P	1,261	75	2,170
59	17	Du Bois—Curwensville .....	P	1,220	97	2,030
57	16	Clearfield—Philipsburg .....	P	1,193	91	1,980
68	6	Homer City—Indiana .....	P	1,182	94	2,050
315	13	Newcastle—Elwood City .....	S	1,112	82	1,930
247	40	Connellsville—Star Jct.—Castle Shannon .....	S	1,111	126	1,910
73	8	Slippery Rock—Harrisville .....	P	1,101	50	1,790
189	5	Kittanning—Stone House .....	P	1,084	106	1,800
68	8	Greensburg—New Alexandria .....	P	1,066	120	1,830
82	20	Greenville—Conneaut Lake .....	P	1,057	27	1,800
69	12	Greensburg—Mamont .....	S	1,052	58	1,800
238-320	12	Greenville—New Wilmington .....	P	1,037	55	1,790
50	23	Summit—Maryland line .....	P	1,010	26	1,720
268	21	Brownsville—Waynesburg .....	P	964	104	1,610
60	21	Brookville—DuBois .....	P	955	61	1,520
313	7	Philipsburg—Kylertown .....	P	946	95	1,540
69-188	17	North Washington—Jct. of routes 70 & 188 .....	S	908	72	1,560
82	15	Mercer—Greenville .....	P	881	31	1,540
218-233	20	Harrisville—Franklin .....	P	877	29	1,420
49-51	10	Somerset—Berlin .....	P	872	52	1,510
90-207	24	Meadville—Franklin .....	P	870	46	1,390
119	37	Bedford—Jennerstown .....	P	854	48	1,470
64	18	Clarion—Brookville .....	P	853	40	1,330
68	13	Blairsville—Homer City .....	P	831	65	1,440
71	8	Kittanning—Worthington .....	P	825	48	1,380
214	13	Butler—Karns City .....	S	806	43	1,310
79	15	Butler—Portersville .....	P	726	83	1,540
78	31	Beaver—Evansburg—Butler .....	S	722	50	1,240
65	26	Franklin—Clarion .....	P	683	41	1,210
76	19	Beaver—Coraopolis .....	P	682	62	1,210
187	19	New Salem—Jct. of routes 120 & 187 .....	P	672	76	1,150
118	16	Greensburg—West Newton .....	S	662	45	1,140
51	18	Berlin—Garrett—Salisbury .....	P	659	47	1,140
309	9	Evansburg—Valencia .....	S	630	57	1,020
89	8	Plum—Titusville .....	S	617	40	960
Total	929	NORTHERN AND CENTRAL SECTION				
27	8	Center Hall—Bellefonte .....	P	1,454	83	2,320
23	22	Lock Haven—Williamsport .....	P	1,421	115	2,290
9	19	Factoryville—Kingsley .....	P	1,420	132	2,410

Table 6—Sections of the Pennsylvania State highways which carried a daily density of from 600 to 1,500 motor vehicles in 1924—Continued

Route number	Approximate mileage	Highway section	Primary or secondary	Average daily motor vehicles	Average daily trucks	Average daily motor vehicles
						1930
43	24	Gettysburg—Chambersburg .....	P	1,313	77	2,100
96	2	Bradford—New York line .....	P	1,290	72	2,050
168	38	Moscow—Stroudsburg .....	P	1,266	104	2,070
19	10	Muncy—Picture Rocks .....	P	1,263	109	2,030
55-33	14	Water Street—Huntingdon—Mill Creek .....	P	1,190	92	2,010
4	23	Bloomsburg—Briar Creek—Shickshinny .....	P	1,165	126	1,980
126	13	Abbottstown—Gettysburg .....	P	1,129	55	1,790
167	5	Stroudsburg—Jct. of routes 167 & 220 .....	P	1,088	104	1,770
20	11	Trout Run—Williamsport .....	P	1,084	77	1,740
36	16	Chambersburg—Maryland line .....	P	1,066	78	1,710
57	18	Osceola—Tyrone .....	P	1,056	56	1,810
196	4	Mansfield—Putman .....	P	1,030	68	1,740
56	7	State College—Pleasant Gap .....	S	1,016	95	1,620
88	7	Warren—Irvineton .....	P	976	79	1,540
195-225	35	Selinsgrove—Clarks Ferry .....	P	965	54	1,630
107	2	Bellefonte—Milesburg .....	P	961	90	1,530
6-7	20	Carbondale—Honesdale—Indian Orchard .....	P	944	108	1,460
2-3	21	Sunbury—Danville—Bloomsburg ..	P	926	61	1,650
12-287	19	Towanda—Sayre .....	P	926	60	1,420
37	20	Chambersburg—McConnellsburg ..	P	916	73	1,490
17	4	Towanda—Monroe .....	P	910	64	1,400
97	5	Bradford—Lewis Run .....	S	884	78	1,410
15	3	Towanda—Wysox .....	P	880	82	1,350
33	4	Mill Creek—Mt. Union .....	P	863	72	1,390
55	10	Tyrone—Water Street .....	S	861	61	1,420
31-32	21	Thompsontown—Mifflintown—Lewistown .....	P	851	60	1,360
8	7	Milford—New Jersey line .....	P	851	52	1,180
123	23	Dillsburg—Gettysburg .....	P	845	35	1,340
107-245	27	Milesburg—Jct. of routes 57 & 245 ..	P	837	50	1,510
22-196	16	Lawrenceville—Mansfield .....	P	823	44	1,340
58	24	Bellefonte—Mill Hall .....	P	801	83	1,290
192	24	Reedsville—Mill Creek .....	P	739	63	1,250
21	14	Wellsboro—Putman .....	P	729	43	1,180
9-10-227	18	Kingsley—New York line .....	P	692	54	1,180
174	29	Carbondale—Kingsley .....	P	687	98	1,120
42	12	Gettysburg—Littlestown—Maryland line .....	P	675	81	1,070
164	22	Stroudsburg—Kresgeville .....	P	666	95	1,360
230	7	Littlestown—Hanover .....	S	666	65	1,070
298	8	Gettysburg—Maryland line .....	P	666	32	1,060
39	31	McConnellsburg—Bedford .....	P	659	52	1,120
Total	667					
Grand Total	2,202					

Of the State highway mileage carrying between 600 and 1,500 motor vehicles per day, the eastern section had 28 per cent, the western section 42

per cent and the northern and central section 30 per cent. Of the total mileage which carried over 600 vehicles per day, 1,250 miles, or 40 per cent,

were located in the eastern section, 1,152 miles, or 37 per cent in the western section and 690 miles, or 23 per cent in the northern and central section. This group includes 45 per cent of the total State highway mileage in the eastern section, 35 per cent in the western section and 16 per cent in the northern and central section. The estimate of traffic in 1930 indicates that by that date there will be approximately 1,404 miles of highway added to the 890 miles which carried over 1,500 vehicles daily in 1924. Of the total mileage expected to carry over 1,500 vehicles in 1930, 49 per cent will be in the eastern, 36 per cent in

the western, and 15 per cent in the northern and central section.

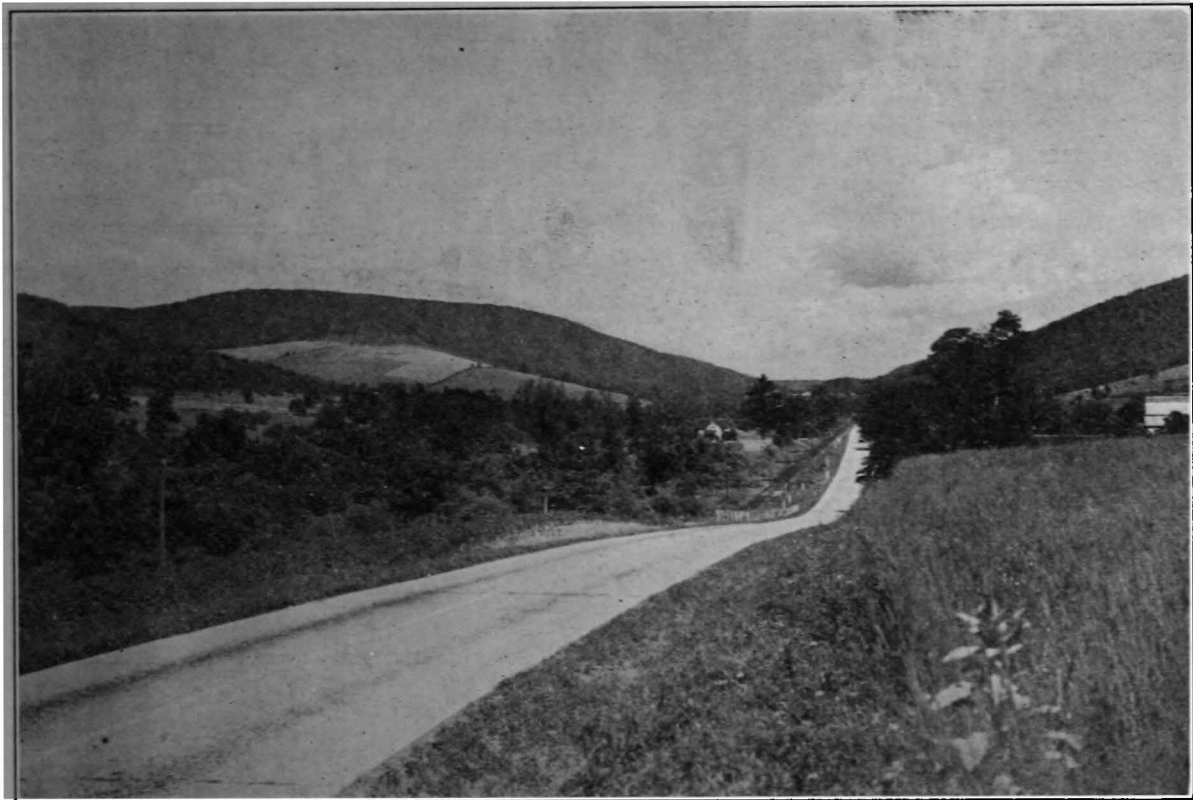
The greatest density of traffic is found in the immediate vicinity of the larger cities and on the principal through routes. The concentration of traffic about these centers of population is evident from the traffic map. The principal through routes are also evident as broad bands crossing the Commonwealth and, in general, connecting the important cities. The average daily and maximum daily traffic on State routes near the gateways to the larger cities are shown in Tables 7 to 14.

Table 7—Daily density of traffic on State highways near city limits of principal cities in 1924

City	Number of roads	Average daily number of vehicles			Maximum daily total vehicles
		Motor trucks	Passenger cars	Total vehicles	
Philadelphia .....	13	4,938	42,034	46,972	123,490
Pittsburgh .....	9	2,491	17,220	19,711	52,760
Scranton .....	5	1,762	12,226	13,988	52,460
Reading .....	8	1,844	16,495	18,339	50,420
Erie .....	6	747	9,345	10,092	37,340
Harrisburg .....	6	2,424	19,710	22,134	57,080
Wilkes-Barre .....	6	1,903	13,428	15,331	55,660

Table 8—Daily density of traffic on State highways near city limits of Philadelphia in 1924

Route	Station	Distance from station to city line	Average daily number of vehicles			Maximum daily total vehicles
			Motor trucks	Passenger cars	Total vehicles	
		<i>Miles</i>				
130 .....	726	$\frac{1}{2}$	811	8,303	9,114	25,060
142 .....	1,050	$2\frac{3}{4}$	776	6,153	6,929	19,060
151 .....	1,057	1	694	6,108	6,802	18,710
133 .....	36	$\frac{1}{2}$	536	5,632	6,168	13,020
180 .....	738	$\frac{1}{2}$	767	3,998	4,765	13,100
281 .....	124	$\frac{1}{2}$	336	3,273	3,609	8,180
153 .....	1,060	$1\frac{1}{2}$	341	3,210	3,551	9,760
145 .....	1,052	1	169	1,277	1,446	3,980
150 .....	117	1	193	1,074	1,267	3,480
197 } .....	274	$1\frac{1}{2}$	110	900	1,010	2,780
373 }						
201 .....	1,078	$\frac{1}{2}$	68	836	904	2,490
362 .....	1,088	$2\frac{1}{2}$	80	740	820	2,260
198 .....	1,077	1	57	530	587	1,610
<b>Total</b> .....	.....	.....	4,938	42,034	46,972	123,490

*Susquehanna Trail in Tioga County***Table 9—Daily density of traffic on State highways near city limits of Pittsburgh in 1924**

Route	Station	Distance from station to city line	Average daily number of vehicles			Maximum daily total vehicles
			Motor trucks	Passenger cars	Total vehicles	
		<i>Miles</i>				
120 .....	88	½	417	3,432	3,849	9,920
108 .....	387	2½	472	3,187	3,659	9,880
246 .....	390	½	274	2,739	3,013	8,140
70 .....	381	2½	478	2,271	2,749	7,420
247 .....	7	½	320	1,622	1,942	5,240
228 .....	5	3	234	1,498	1,732	4,680
72 .....	2	5	166	1,270	1,436	3,880
257 .....	394	3½	91	815	906	2,450
76 .....	385	1½	39	386	425	1,150
<b>Total .....</b>			<b>2,491</b>	<b>17,220</b>	<b>19,711</b>	<b>52,760</b>

## HIGHWAY TRANSPORTATION SURVEY

Table 10—Daily density of traffic on State highways near city limits of Scranton in 1924

Route	Station	Distance from station to city line	Average daily number of vehicles			Maximum daily total vehicles
			Motor trucks	Passenger cars	Total vehicles	
		<i>Miles</i>				
5 .....	852	1	719	4,454	5,173	19,400
6 .....	853	4½	585	3,025	3,610	13,500
9 .....	856	½	275	2,535	2,810	10,540
168 .....	50	7½	140	1,884	2,024	7,590
335 .....	860	10	43	328	371	1,390
<b>Total</b> .....			1,762	12,226	13,988	52,460

Table 11—Daily density of traffic on State highways near city limits of Reading in 1924

Route	Station	Distance from station to city line	Average daily number of vehicles			Maximum daily total vehicles
			Motor trucks	Passenger cars	Total vehicles	
		<i>Miles</i>				
157	431	½	416	3,513	3,929	10,800
146	420	½	219	3,157	3,376	9,280
149	430	½	281	2,837	3,118	8,570
160	434	½	329	2,771	3,100	8,520
148	427	½	349	1,960	2,309	6,350
147	423	1½	89	823	912	2,510
310	451	½	83	716	799	2,200
274	444	1	78	718	796	2,190
<b>Total</b> .....			1,844	16,495	18,339	50,420

Table 12—Daily density of traffic on State highways near city limits of Erie in 1924

Route	Station	Distance from station to city line	Average daily number of vehicles			Maximum daily total vehicles
			Motor trucks	Passenger cars	Total vehicles	
		<i>Miles</i>				
87	39	1¾	180	2,380	2,560	9,470
272	765	5	171	2,270	2,441	9,030
86	755	1	155	2,064	2,219	8,210
84	754	½	108	1,475	1,583	5,860
258	187	½	50	640	690	2,550
88	762	½	83	516	599	2,220
<b>Total</b> .....			747	9,345	10,092	37,340

Table 13—Daily density of traffic on State highways near city limits of Harrisburg in 1924

Route	Station	Distance from station to city line	Average daily number of vehicles			Maximum total vehicles
			Motor trucks	Passenger cars	Total vehicles	
		<i>Miles</i>				
34	30	1	908	6,926	7,834	17,740
129	709	$\frac{1}{2}$	452	3,699	4,151	11,420
1	703	$\frac{1}{2}$	349	2,854	3,203	8,810
30	683	$1\frac{1}{2}$	309	2,035	2,344	6,450
140	717	$1\frac{1}{4}$	230	2,112	2,342	6,440
139	712	$\frac{1}{2}$	176	2,084	2,260	6,220
Total .....			2,424	19,710	22,134	57,080

Table 14—Daily density of traffic on State highways near city limits of Wilkes-Barre in 1924

Route	Station	Distance from station to city line	Average daily number of vehicles			Maximum daily total vehicles
			Motor trucks	Passenger cars	Total vehicles	
		<i>Miles</i>				
5	951	$\frac{1}{2}$	545	3,375	3,920	14,700
11	953	4	391	2,784	3,175	11,910
368	58	3	378	2,743	3,121	9,870
4	950	6	419	2,448	2,867	10,750
169	955	$\frac{3}{4}$	74	1,131	1,205	4,520
170	958	$\frac{1}{2}$	96	947	1,043	3,910
Total .....			1,903	13,428	15,331	55,660

These data represent the average and maximum daily traffic recorded at traffic survey stations near the city gateways. In several cases the stations were located at some distance from the city and the totals as shown do not represent the actual total number of vehicles entering or leaving the city but are indicative of the importance of these cities as sources of traffic on the State highways.

On thirteen of the State highways serving Philadelphia, there was a daily average traffic of 46,972 motor vehicles, of which 5,000 were motor trucks. On the maximum traffic day 123,490 motor vehicles used these same highways.

On nine of the State routes serving Pittsburgh,

there were 19,711 motor vehicles daily, with a maximum traffic on these same highways of 52,760 motor vehicles. The county highways radiating from Pittsburgh also carry a large daily volume of traffic.

The more important through traffic routes carry distinctive names and markers in addition to the official route numbers. Among these are the Lincoln Highway, the Susquehanna Trail, the Lakes-to-Sea Highway, the Lackawanna Trail, the William Penn Highway and the Roosevelt Highway. The density of traffic on different sections of these highways is shown in the following tabulation.

## HIGHWAY TRANSPORTATION SURVEY

## Lincoln Highway

Section	Approximate mileage	Average daily density of motor vehicles in 1924
Morrisville—Philadelphia ..	13	3,357
Philadelphia—Wayne .....	9	5,914
Wayne—Coatesville .....	26	2,982
Coatesville—York .....	47	1,939
York—Gettysburg ..	27	1,487
Gettysburg—Chambersburg ..	24	1,313
Chambersburg—McConnellsburg .....	20	916
McConnellsburg—Bedford ..	31	659
Bedford—Jennerstown .....	37	854
Jennerstown—Greensburg ..	30	1,556
Greensburg—Pittsburgh ..	23	2,699

## Susquehanna Trail

Lawrenceville—Trout Run ..	53	729
Trout Run—Williamsport ..	11	1,084
Williamsport—Muncy .....	13	1,844
Muncy—Sunbury .....	27	1,572
Sunbury—Clarks Ferry .....	40	1,104
Clarks Ferry—Harrisburg ..	13	2,483
Harrisburg—York .....	22	1,490
York—Maryland State line ..	17	1,426

## Lakes-to-Sea Highway

Erie—Meadvile .....	34	1,170
Meadville—Franklin .....	24	870
Franklin—Clarion .....	26	683
Clarion—Brookville .....	18	853
Brookville—Du Bois .....	21	955
Du Bois—Clearfield .....	24	1,220
Clearfield—Philipsburg .....	16	1,193
Philipsburg—Osceola .....	7	1,877
Osceola—Tyrone .....	18	1,056
Tyrone—Water Street .....	10	861

## Lackawanna Trail

Great Bend—Kingsley .....	18	692
Kingsley—Factoryville .....	19	1,420
Factoryville—Scranton .....	11	3,002
Scranton—Stroudsburg .....	47	1,407
Stroudsburg—Easton .....	22	1,802
Easton—Willow Grove .....	43	1,662
Willow Grove—Philadelphia ..	6	4,626

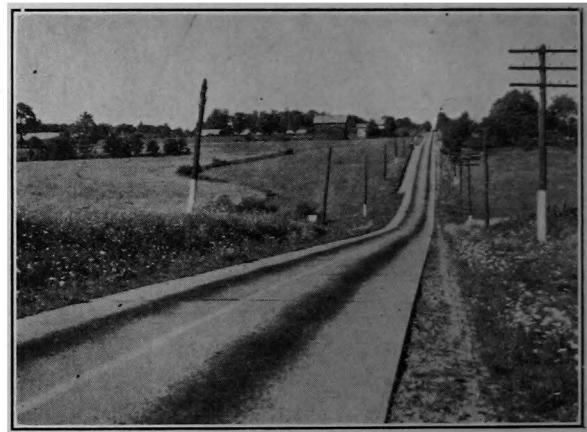
## William Penn Highway

Easton—Allentown .....	6	3,066
Allentown—Reading .....	33	2,321
Reading—Womelsdorf .....	13	3,067
Womelsdorf—Lebanon .....	14	1,390
Lebanon—Harrisburg .....	21	1,943
Harrisburg—Clarks Ferry ..	13	2,483
Clarks Ferry—Lewistown ..	46	798
Lewistown—Reedsville .....	6	2,097
Reedsville—Mill Creek .....	24	739
Mill Creek—Water Street ..	14	1,190
Water Street—Hollidaysburg ..	23	755
Hollidaysburg—Mundy's Corners .....	29	1,090
Mundy's Corners—Pittsburgh ..	60	532 <sup>1</sup>

## Roosevelt Highway

Section	Approximate mileage	Average daily density of motor vehicles in 1924
Port Jervis—Milford .....	7	851
Milford—Indian Orchard ..	30	244 <sup>1</sup>
Indian Orchard—Carbondale ..	20	944
Carbondale—Scranton .....	14	2,877
Scranton—Jct. of routes 9 & 365 .....	3	3,002
Junction of routes 9 & 365 to Tunkhannock .....	16	579
Tunkhannock—Wyalusing—Wysox .....	41	172 <sup>1</sup>
Wysox—Towanda .....	3	880
Towanda—Mansfield .....	36	227
Mansfield—Wellsboro .....	17	729
Wellsboro—Larabee .....	75	343
Larabee—Warren .....	60	473
Warren—Corry .....	31	192 <sup>1</sup>
Corry—Waterford .....	18	212 <sup>1</sup>
Waterford—Erie .....	12	1,292

<sup>1</sup>Traffic influenced by construction activities during period of survey.



Lakes-to-Sea Highway Near Erie

The wide variation in density of traffic on the different sections of these routes, and the rapid decrease in traffic with distance from centers of population indicates that even on these "through" routes the major part of the traffic is local in character. This is evident from the traffic on the Lincoln Highway between Chambersburg and Jennerstown as compared with the traffic on the

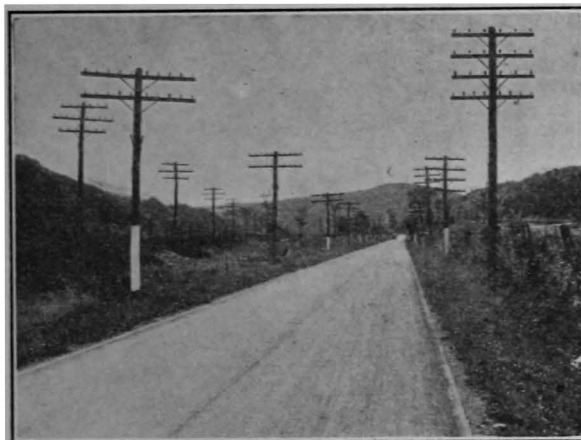
other sections of the route; from the traffic on the northern sections of the Susquehanna and Lackawanna Trails as compared with the other sections

of these routes; and from the traffic on all sections of the Roosevelt Highway except in the vicinity of Scranton.

## THE DENSITY OF MOTOR TRUCK TRAFFIC

Motor truck traffic, on the primary highway system<sup>11</sup> constituted 8.9 per cent of total motor vehicle traffic measured in vehicle-miles. The ratio of truck traffic to total traffic, however, varied considerably on different routes. On the routes located in important industrial or mining areas, the ratio of truck traffic to total traffic was high. On those in important pleasure-resort areas, and those which form the principal approaches to these areas, truck traffic was small in proportion to total traffic. The ratio of truck traffic to total traffic on the routes in Table 15 indicates these variations.

<sup>11</sup> The primary system is used in this discussion because it includes the important highways. Areas containing the heavy-trucking routes of the primary system contain the important routes of the secondary system. The volume of truck traffic is considerably less on the secondary system.



*William Penn Highway Near Mill Creek*

Table 15—Ratio of truck traffic to total traffic on selected routes of the primary system in 1924

Route		Average daily traffic		Ratio of truck traffic to total traffic
Number	Description	Total	Trucks	
70	Pittsburgh—Springdale .....	2,638	468	17.4
5-6	Wilkes-Barre—Scranton—Carbon- dale .....	3,497	514	14.7
132-180	Philadelphia—Chester—Delaware line .....	4,522	661	14.6
4	Wilkes-Barre—Shickshinney .....	1,950	284	14.6
150	Philadelphia—Bristol—Trenton ...	1,085	148	13.6
43-126	Gettysburg—Chambersburg .....	1,313	77	5.9
82-84	Erie—Conneaut Lake .....	1,190	58	4.9
123	Harrisburg—Gettysburg .....	1,083	45	4.2
50	Summit—Maryland line .....	1,010	26	2.6



AVERAGE DAILY TOTAL NUMBER OF TRUCKS

0-39	0
40 AND OVER TO SCALE	200
	400

AVERAGE DAILY NUMBER OF 5 TO 7½-TON LOADED TRUCKS

0-4	-----
5-9	.....
10-19	.....
20 AND OVER	————

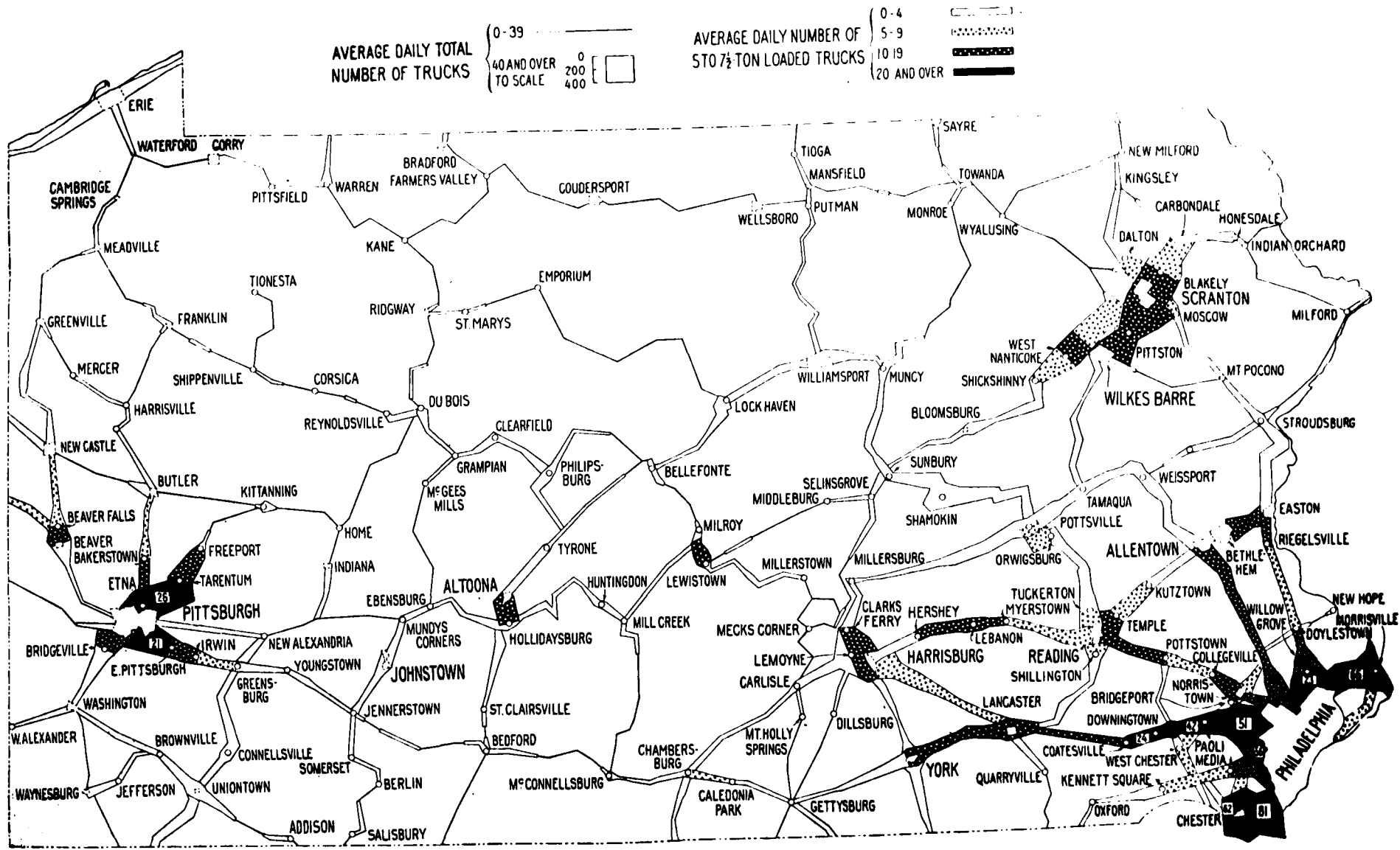
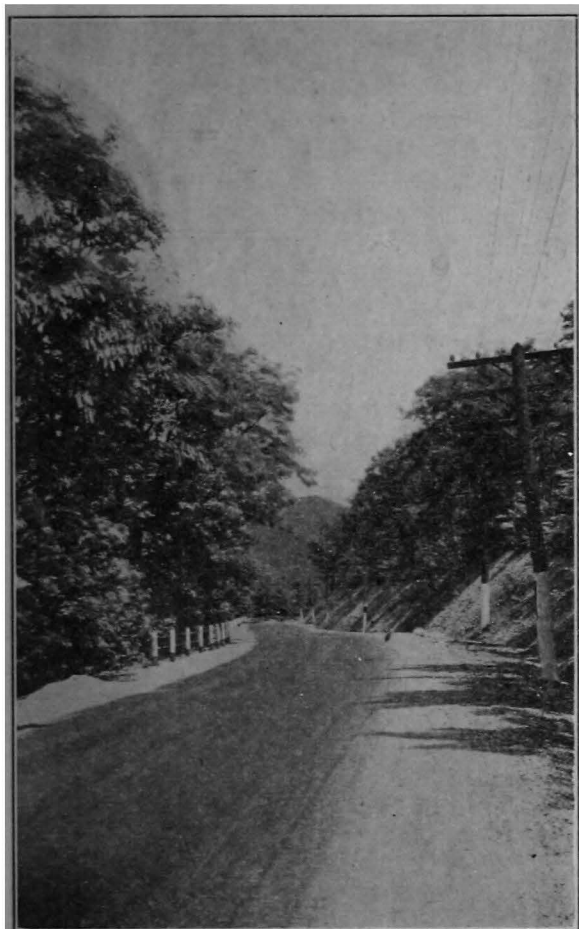


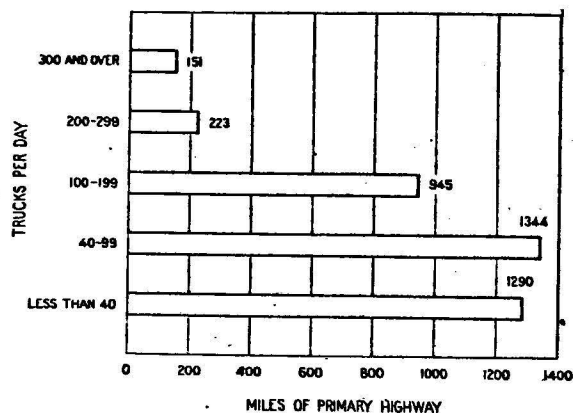
Fig. 8—Map of Pennsylvania showing average daily density of motor truck traffic on the Primary Highway System



*Lincoln Highway on the East Side of Tuscarora Mountain*

Motor truck traffic on the primary highway system is shown in Figure 8.<sup>12</sup> The density of motor truck traffic on the primary system varied from 10 trucks per day on several unimportant sections to 908 trucks per day on Route 34 between Harrisburg and Lemoyne and 661 trucks per day between Philadelphia and the Delaware line on Route 132-180. As indicated by Table 16, and Figure 9, approximately 60 per cent of the mileage of the primary system carried less than 100 trucks per day and 9.5 per cent carried 200 or more trucks per day.

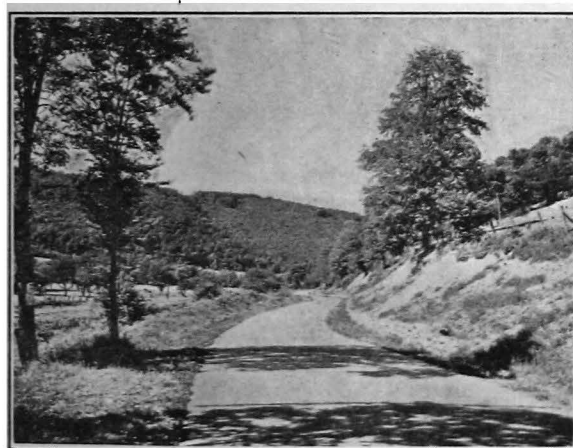
<sup>12</sup> For density of loaded and empty trucks by capacity classes at transport survey stations see Appendix III.



*Fig. 9—Mileage of primary highways by truck traffic classes*

**Table 16—Mileage of primary highways carrying various numbers of motor trucks per day**

Average daily truck traffic	Mileage of the primary system	
	Miles	Per cent
Less than 40 .....	1,290	32.6
40-99 .....	1,344	34.0
100-199 .....	945	23.9
200-299 .....	223	5.7
300 & over .....	151	3.8
<b>Total .....</b>	<b>3,953</b>	<b>100.0</b>



*Roosevelt Highway Near Coudersport*

The sections of the primary system on which the density of motor truck traffic in 1924 was more than 200 per day are shown in Appendix IV.

The eastern section shows its predominant importance in truck traffic as well as in total traffic. Half of the routes (Appendix IV) carrying more than 400 trucks per day are located in the Philadelphia territory, two in the Scranton and Wilkes-Barre territory, and one in the Harrisburg territory.

Although the highest density of motor truck traffic was found on route 34 between Harrisburg and Lemoyne, the comparative importance of this section is considerably lessened by the fact that its length is only one mile. Two routes out of Philadelphia, No. 132-180, to the Delaware line via Chester, and No. 130, to Media, were next

in importance and carried on an average day 661 and 637 trucks respectively. The other three routes out of Philadelphia which carried over 400 trucks per day were route 151 to Willow Grove, route 281 to Morrisville and route 142 to Coatesville. The combined length of these five important trucking routes in the Philadelphia area is 71 miles.

In the Scranton and Wilkes-Barre area there are two routes, aggregating 31 miles, on which the truck traffic exceeded 400 trucks per day. These routes are No. 5 from Scranton to Wilkes-Barre and No. 6 from Scranton to Carbondale.

In the Pittsburgh area, route 70, Pittsburgh to Springdale, and route 108, Pittsburgh to Bridgeville, carried 468 and 420 trucks per day respectively.

### LOADED 5 TO 7½ TON TRUCK TRAFFIC

Small, light trucks operate on all sections of the State highway system although they occur in varying numbers upon different routes. The larger-capacity trucks, especially those of 5-ton or greater capacity, do not operate on all highways, their use being restricted to certain limited areas. This is indicated by Figure 8 which, by symbols within the traffic bands, shows loaded 5 to 7½-ton truck traffic on the primary system.<sup>12</sup> There must be a sufficient volume of tonnage to require such vehicles or some special group of commodities requiring a large-capacity vehicle before any noticeable number of large-capacity trucks operate. The larger the total truck movement in an area, the greater is the probability that a considerable number of large-capacity trucks and heavy loads will be found on the highways. The use of all trucks, in respect to number and size, depends upon the amount and type of commodities hauled and, consequently, upon the population and industries of the area served. It is not surprising, therefore, that the greatest movement of loaded 5 to 7½-ton trucks was found in the territory adjacent to Philadelphia, Pittsburgh, Scranton, Wilkes-Barre, and other large cities.

The mileage of the primary system is classified in Table 17 and Figure 10 according to the density of loaded 5 to 7½-ton truck traffic.

Table 17.—Mileage of the primary highways carrying various numbers of loaded 5 to 7½-ton trucks per day in 1924.

Daily loaded 5 to 7½-ton truck traffic	Mileage of the primary system	
	Miles	Per cent
Less than 5 .....	3,309	83.7
5-9 .....	286	7.2
10-19 .....	268	6.8
20 and over .....	90	2.3
Total .....	3,953	100.0

On 83.7 per cent of the primary-system mileage there was a density of less than 5 loaded 5 to 7½-ton trucks. There were 644 miles, 16.3 per cent of the mileage of the primary system, on which the density of these trucks exceeded 5 per day. The routes included in these 644 miles are shown in Appendix V.

<sup>12</sup> For density of loaded 5 to 7½-ton trucks at transport survey stations see Appendix III.

## CONCENTRATION OF TRUCK TRAFFIC AROUND THE LARGE CITIES

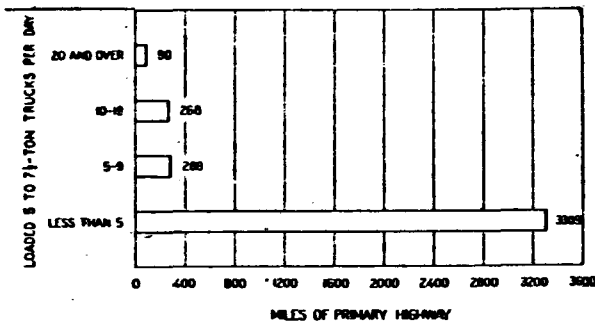


Fig. 10—Mileage of primary highways carrying various numbers of loaded five to seven and one-half ton trucks daily

The most important trucking area from the standpoint of total truck traffic and large-capacity truck traffic, is in southeastern Pennsylvania, especially the territory immediately adjacent to the City of Philadelphia. The important routes serving Philadelphia, in order of the density of their total motor truck traffic, are given in Table 18.

The arrangement of the routes (Table 18) indicates the total motor truck traffic importance of each route near Philadelphia. It will be seen that the total truck traffic on a route does not indicate clearly the importance of the route as a carrier of large-capacity trucks. For example, route 180 to Chester carried 190 trucks of 3 to 7½-ton capacity and 81 loaded 5 to 7½-ton trucks and is,

for this reason, a more important trucking route than route 142 to Paoli, which carried a greater total truck traffic but a lesser traffic of large-capacity trucks.

It will be noted that routes 281 and 151, to Trenton and Willow Grove, respectively, also had approximately the same density of total truck traffic. The route to Trenton, however, carried 141 trucks of 3 to 7½-ton capacity while the route to Willow Grove carried only 67, less than half the number on the Trenton route. The number of loaded 5 to 7½-ton trucks was 66 on Route 281 to Trenton and only 23 on Route 151 to Willow Grove.

Motor truck traffic into and out of Philadelphia on route 281 is influenced to a great extent by Trenton, New York City, and intermediate points. This is the main route between Philadelphia and New York City and carries a large volume of "through" traffic. Of all trucks moving into or out of Philadelphia on this route, 66.2 per cent originated at or were destined to New Jersey and New York points. Truck traffic on this route is influenced to a much greater extent by cities outside Pennsylvania than traffic on any other route in the Commonwealth. On route 180—132, Philadelphia to Wilmington, Del., a considerable part of the traffic also is due to cities in other

Table 18—Average daily density of total truck traffic by capacity classes, and traffic of 5 to 7½-ton loaded trucks near Philadelphia on the principal primary highways in 1924

Routes from Philadelphia		Daily total truck traffic			Daily traffic of loaded 5 to 7½-ton trucks
Number	To	All trucks	½ to 2½-ton trucks	3 to 7½-ton trucks	
142	Paoli .....	605	452	153	55
180	Chester .....	600	410	190	81
281	Trenton .....	336	195	141	66
151	Willow Grove .....	329	262	67	23
130	Media .....	301	224	77	17

states. The only other routes where truck traffic of any importance is due to outside influence are the routes into Erie from Buffalo on the east and Ashtabula and Cleveland on the west; the route into Beaver Falls from Youngstown, Ohio; and the route into Uniontown from Morgantown, W. Va.

The City of Pittsburgh is the center of the second most important motor trucking area. In this area there are three main trucking routes as shown in Figure 8. The first is route 70 from Pittsburgh northeast to Tarentum on the road to Kittanning; the second, the Lincoln Highway, route 20 to East Pittsburgh on the road to Greensburg; and the third, route 108 from Pittsburgh to Bridgeville on the road to Washington. The average daily density of motor truck traffic on each of these routes is shown in Table 19.

Route 70, to Tarentum, is the most important of the three main routes and carried, on an average day, 457 trucks of which 88 were 3 to 7½-ton trucks and 26 were loaded 5 to 7½-ton trucks. It is interesting to compare this route, the most important State route in the Pittsburgh area, with the principal routes in the Philadelphia area. Three routes in the Philadelphia area carry considerably more 3 to 7½-ton trucks and loaded 5 to 7½-ton trucks than route 70 from Pittsburgh to Tarentum.

Four additional State highways leading out of Pittsburgh are shown in Figure 8. With the exception of the route north to Bakerstown, they are relatively unimportant in comparison with the

three main routes. The route to Bakerstown had an average daily traffic of 166 trucks of which 43 were 3 to 7½-ton trucks and 11 were loaded 5 to 7½-ton trucks. There is an important motor truck movement northwest of Pittsburgh to Beaver and intermediate points. This traffic uses a county road on the east side of the Ohio River and is, consequently, not shown in Figure 8. The average daily number of trucks on this county road was 274 of which 20 were loaded 5 to 7½-ton trucks.

The third important area of motor truck traffic is in the northeast adjacent to the cities of Scranton and Wilkes-Barre. This, the anthracite coal area, has two important trucking routes. The first is a combination of route 5 from Wilkes-Barre to Scranton and route 6 from Scranton to Carbondale. Motor truck traffic was greatest just south of Scranton where the average daily number of all trucks was 626, of which 73 were 3 to 7½-ton trucks and 13 were loaded 5 to 7½-ton trucks. Between Scranton and Carbondale there was an average daily traffic of 364 trucks, of which 39 were of 3 to 7½-ton capacity.

The second route, on the west bank of the Susquehanna River, parallels the first route from Pittston to Wilkes-Barre and then continues southwest, through a number of small but fairly important towns. The average daily density of traffic on this highway was 378 motor trucks between Pittston and Wilkes-Barre (route 368), including an average of 42 trucks of 3-ton or larger capacity. South of Wilkes-Barre (route

Table 19—Average daily density of total truck traffic by capacity classes and traffic of 5 to 7½-ton loaded trucks near Pittsburgh on the principal primary highways in 1924

Route from Pittsburgh		Daily total truck traffic			Daily traffic of loaded 5 to 7½-ton trucks
Number	To	All trucks	½ to 2½-ton trucks	3 to 7½-ton trucks	
70	Tarentum .....	457	369	88	26
20	East Pittsburgh .....	417	343	74	21
108	Bridgeville .....	368	304	64	14

4) the total truck traffic reached 390 and the traffic of 3 to 7½-ton trucks was 77 per day.

Reading and Harrisburg are centers of population in the next most important area of motor truck concentration. Reading is the hub of important highways leading to Allentown, Pottsville, Harrisburg, and Philadelphia. The route to Allentown carried 268 trucks per day between Reading and Temple of which 55 were 3 to 7½-ton trucks, and 14 were loaded 5 to 7½-ton trucks. This route is the most important highway out of Reading from the standpoint of both total and large-capacity trucks.

Traffic on the important routes out of Harrisburg, with the exception of the route to Lancaster, is predominantly a local movement.

There are, in the southeastern section, several additional important areas of motor truck concentration. Pottsville and Shamokin are centers of population and industry in one of these areas. Coal, the principal commodity transported by trucks on these highways, accounted for 7 per cent of the motor truck movement. The distribution of vegetables, fresh meat, bread, and other food products constitutes a substantial part of the total truck movement in the area.

The cities of Allentown and Bethlehem form

the center of another area. The remaining areas surround York and Lancaster, that around Lancaster, which is the center of an agricultural rather than an industrial region, being the least important.

Two additional areas of motor truck traffic importance are found in the western section around Erie and Altoona. East of Erie on route 87 there was an average daily traffic of 180 trucks of which 10 were of 3-ton or larger capacity. West of Erie on route 86-272 the density of total truck traffic was 129, of which 12 were 3-ton or larger trucks. Traffic of loaded 5 to 7½-ton trucks was 2 east and 4 west of Erie on the above-mentioned routes. That the traffic of these large trucks was not greater is due mainly to the 20,000-pound gross load limitation of Ohio. The use of trailers, especially on route 86-272 west of Erie, is also due to this limitation. Of the loaded trucks on this route 5.3 per cent were truck-and-trailer combinations, the highest percentage of such combinations on any route.

South of Altoona on route 55 to Hollidaysburg the density of truck traffic was 268 trucks per day of which 55 were 3 to 7½-ton trucks. The number of loaded 5 to 7½-ton trucks on this route was 10 per day.

## THE EFFECT OF SMALL POPULATION AND MOUNTAINS IN THE NORTHERN AND CENTRAL SECTION OF PENNSYLVANIA

The distribution of the total truck traffic and of loaded 5 to 7½-ton trucks (fig 8) shows the comparative unimportance of the northern and central section with respect to the provision of highway improvements for motor truck traffic.

The absence of large-capacity trucks and the small number of all trucks are evident in the entire northern and central section.

As it has been found that the concentration of motor trucks occurs around large centers of population and industry, so also it is true that an absence of motor truck traffic characterizes the highways in sparsely populated areas. As shown in Figure 8, the density of truck traffic on practically all highways in the north was less than 40 per day. These trucks were small in capacity and,

for the most part, equipped with pneumatic tires. In this section of Pennsylvania, therefore, where there are no large centers of population and where the population of many townships is decreasing, pavements designed to serve motor truck traffic will be unnecessary for a considerable number of years.

The south-central is of slightly more importance than the northern section from the standpoint of total truck traffic. With the exception of route 29 north of Lewistown, however, the average density of 3 to 7½-ton truck traffic was less than 20 per day. The mountains hinder the free movement of motor truck traffic in this section and together with the relatively small population in the area account for the absence of any appreciable volume of motor truck traffic.

## MOTOR TRUCK LOADING

The motor truck movement over the State highway system as a whole is one of predominantly small-capacity trucks with light gross loads. This is seen in the fact that 56.6 per cent of the gross loads recorded were less than 6,000 pounds and only 2.4 per cent were over 24,000 pounds, as shown in Table 20.

**Table 20—Distribution of loaded motor trucks by gross weight groups in 1924**

Gross weight	Loaded trucks
Pounds	Per cent
Under 6,000 .....	56.6
6,000—11,000 .....	23.7
12,000—17,000 .....	11.0
18,000—23,000 .....	6.3
24,000 and over .....	2.4
<b>Total. ....</b>	<b>100.0</b>

Further evidence of the relatively light gross loading is seen in the comparatively low average gross weight of 7,600 pounds<sup>14</sup> for all loaded

trucks, a weight which is fairly close to the average for 1½-ton trucks. As shown in Table 21,

**Table 21—Average gross weights of loaded motor trucks of various capacities**

Motor truck capacity	Average gross weight	Motor truck capacity	Average gross weight
	Tons		Pounds
½	2,490	3½	16,890
¾	4,190	4	17,700
1	4,120	5	20,490
1¼	5,170	5½	22,500
1½	7,020	6	21,990
2	9,390	6½	22,590
2½	11,480	7½	23,930
3	12,890	Average	7,600

average gross weights ranged from 2,490 pounds for ½-ton trucks to 23,930 pounds for 7½-ton trucks<sup>15</sup>.

<sup>14</sup> Average gross load or weight refers, in this report, to the combined weight of truck and net load and is used here only in connection with loaded trucks.

<sup>15</sup> For average gross weight of loaded trucks by capacity classes at transport survey weight stations see Appendix VI.

**Table 22.—Routes of the primary system on which gross loads of 24,000 pounds or more are over 5 per day in 1924<sup>1</sup>**

Number	Route		Gross loads per day of or in excess of 24,000 pounds	Gross loads per day between 18,000 and 24,000 pounds
	From	To		
142	Philadelphia .....	Paoli .....	19	23
281	Philadelphia .....	Trenton, N. J. ....	15	31
130	Philadelphia .....	Lansdowne .....	11	41
1	Harrisburg .....	Millersburg .....	7	43
132	Chester .....	Wilmington, Del. ....	6	42
151	Philadelphia .....	Willow Grove .....	6	15
157	Reading .....	Temple .....	6	11

<sup>1</sup> Includes only those routes on which motor trucks were weighed.

Heavy gross loads are confined to certain areas, which are substantially those areas where the greatest concentration of both total and large-capacity trucks exists. The probability of heavy gross loads is naturally greater in areas where a large volume of commodities is hauled on large-capacity trucks.

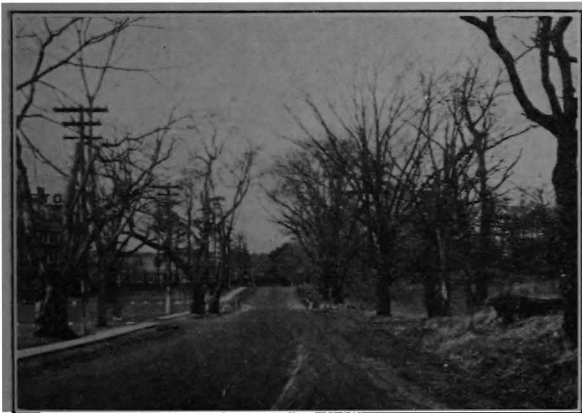
Reference to Table 22 shows that routes of the primary system having an average daily traffic of more than 5 gross loads of, or in excess of, 24,000 pounds are all in the southeastern part of Pennsylvania. The average daily number of various gross loads, according to classes, is shown in Appendix VII for those routes of the highway system where motor trucks were weighed.

Five of the routes included in Table 22 are also the most important trucking routes in the Philadelphia area from the standpoint of total truck traffic and the number of large-capacity trucks. Route 281 between Morrisville and Trenton, at the State line, carried on an average day 79 gross loads of 24,000 pounds or more, and 94 loads between 18,000 and 24,000 pounds. These trucks were engaged in a short-haul movement of sand and gravel from gravel pits near Morrisville to Trenton.

Route 157 (Table 22) was previously found to be the most important trucking route out of Reading. On route 1, designated here as the route from Harrisburg to Millersburg, there were 7 gross loads of 24,000 or more pounds per day and 43 between 18,000 and 24,000 pounds. These loads were part of a movement of river coal just north of Harrisburg. Trucks engaged in this movement constituted 22.4 per cent of the loaded truck traffic just north of Harrisburg and averaged 20,450 pounds gross weight.

It is evident that the highways in southeastern Pennsylvania, the most important trucking area carry more heavy gross loads than the highways of any other section. A smaller daily number of heavy gross loads was found on the highways of the Pittsburgh and Scranton—Wilkes-Barre areas. In general, heavy gross loads occur, with some degree of frequency or regularity, only on important highways radiating from the larger centers of population and industry.

On highways in the northern part of the Commonwealth, west of Scranton and Wilkes-Barre, and in the central section heavy gross loads either did not occur or, where they were found, were few and infrequent.



*Lincoln Highway at Philadelphia City Line Before and After Construction of Dual Type Pavement*



## CHAPTER IV

### HIGHWAY UTILIZATION

During the year period, November 1923 to November 1924, traffic over the rural highways of Pennsylvania was approximately 3,487,210,000 vehicle-miles. The total mileage of rural highways, including approximately 1,000 miles of the State highway system which were located within cities or boroughs, was approximately 93,194 miles. Upon the various systems the daily utilization varied from an average daily traffic of 1,051 on the 3,953 miles of the State primary system to 29 on the 80,736 miles of the township system.

The distribution of vehicle-mileage on the different highway systems and the approximate mileage of each system as of December 31, 1924 is shown in Table 23, and a comparison of traffic

on the primary and secondary systems and other rural highways is shown in Figures 11 and 12. It is estimated that, providing there is no marked change in the mileage of the various highway systems, this relative distribution of traffic by highway systems, will remain approximately constant during the next five years.

The State highway system with 11.0 per cent of the rural highway mileage carried 68.3 per cent of the traffic measured in vehicle-miles. That part of the State system which is designated as primary, comprising 4.2 per cent of total mileage carried 43.5 per cent of the traffic. Because of the large volume of traffic carried by the primary system it is evident that this system as a unit should be given first consideration in a plan of

**Table 23—Motor vehicle utilization of Pennsylvania rural highways and highway mileage by systems in 1924**

Road system	Miles	Per cent of total mileage	Daily vehicle—miles	Annual vehicle—miles	Per cent of total vehicle—mileage	Vehicle—miles per mile (Average daily <sup>1</sup> )
<b>Primary:</b>						
Improved .....	3,223	3.4	3,901,000	1,423,865,000	40.8	1,210
Unimproved ...	730	0.8	254,000	92,710,000	2.7	348
Total .....	3,953	4.2	4,155,000	1,516,575,000	43.5	1,051
<b>Secondary:</b>						
Improved .....	2,728	2.9	1,617,000	590,205,000	16.9	593
Unimproved ...	3,593	3.9	754,000	275,210,000	7.9	210
Total .....	6,321	6.8	2,371,000	865,415,000	24.8	375
<b>Total State .....</b>	<b>10,274</b>	<b>11.0</b>	<b>6,526,000</b>	<b>2,381,990,000</b>	<b>68.3</b>	<b>635</b>
<b>State aid:</b>	<b>505</b>	<b>0.6</b>	<b>173,000</b>	<b>63,145,000</b>	<b>1.8</b>	<b>343</b>
County .....	1,679	1.8	514,000	187,610,000	5.4	306
Township .....	80,736	86.6	2,341,000	854,465,000	24.5	29
Total .....	93,194	100.0	9,554,000	3,487,210,000	100.0	103

<sup>1</sup> Average daily density.

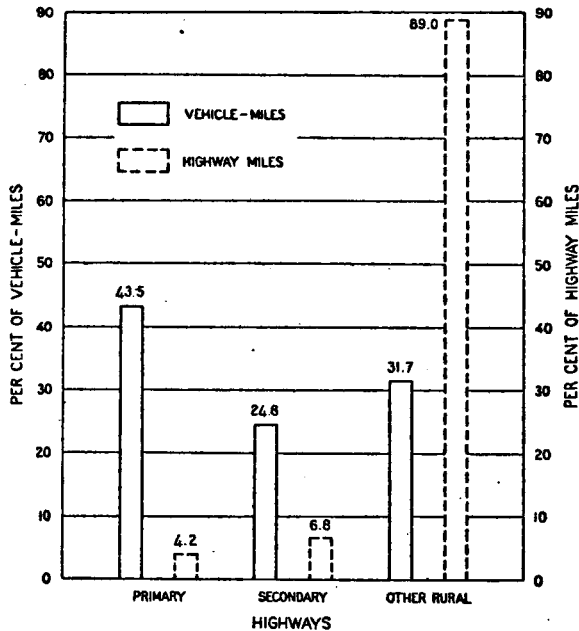


Fig. 11—Comparison of total traffic on the primary, secondary and other rural highways

highway improvement. With the exception of that part of the designated State primary system which is located within the limits of municipalities of over 2,500 population this system corresponds very closely with the designated Federal-aid system.

The State secondary system, with 6.8 per cent of the highway mileage, carried 24.8 per cent of the total rural highway traffic. As a unit this system is secondary in importance to the primary system, and should be so considered. The secondary system, however, includes a limited mileage of heavy-traffic routes, particularly in the vicinity of the larger cities, and the planning of improvements for these sections should take precedence over the light-traffic routes of the primary system.

The township system, with 86.6 per cent of the mileage, carried only 24.5 per cent of the traffic. Traffic on the township system is widely distributed. Although there were variations in the amount of traffic on different township roads, the amount of township highway mileage which carried a large volume of traffic was very small.

Within the different systems variations in traffic were also large. In the most densely populated section comprising Delaware, Lehigh, Montgomery, Northampton and Philadelphia Counties, traffic on the State system was 1,440 vehicle-miles per mile, and in the most sparsely populated section comprising 20 counties in the northern and central part of the Commonwealth traffic on the State system was only 289 vehicle-miles per mile. On individual sections of the State system average daily traffic varied from over 9,000 vehicle-miles per mile to less than 50 vehicle-miles per mile.

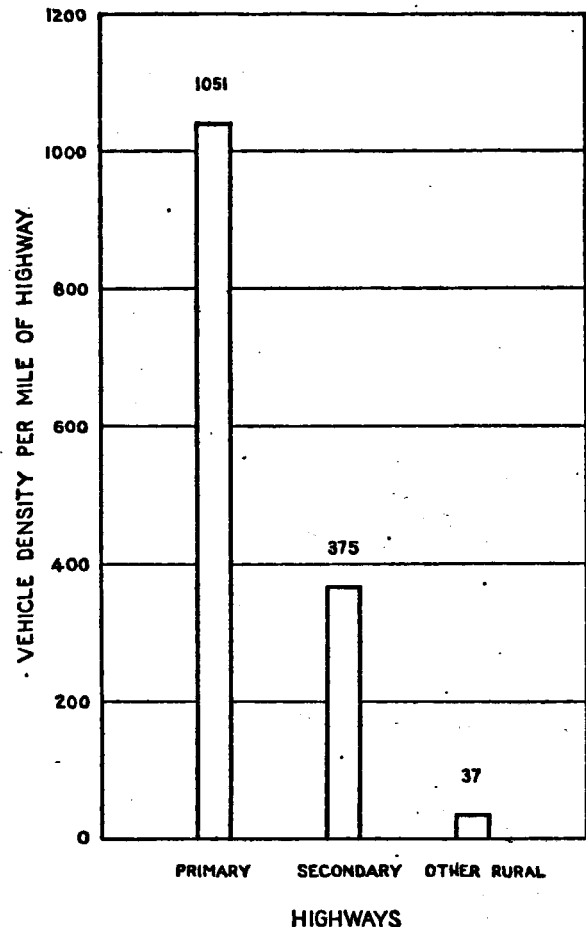


Fig. 12—Traffic density on the primary, secondary and other rural highways

A comparison of routes on the primary systems also indicates large variations in traffic volume. Daily traffic on the Lincoln Highway from the New Jersey line through Philadelphia to Pitts-

burgh, including approximately 290 miles of State highway, was approximately 550,000 vehicle-miles or an average of over 1,900 vehicle-miles per mile. Daily traffic on the primary highway crossing the northern part of the Commonwealth from Scranton, through Towanda, Wellsboro, Coudersport and Warren to the junction with route 84, south of Erie, including about 295 miles of State highway, was approximately 97,000 vehicle-miles, or an average of approximately 330 vehicle-miles per mile.

The differences in traffic on the improved and unimproved sections of the State highway system are also marked. Improved sections, as classi-

fied in Table 23, include concrete, asphalt, brick, bituminous macadam, and similar types; unimproved sections include earth, gravel, and similar types. On the primary system, average traffic on the improved sections was over three times the average traffic on the unimproved sections, and on the secondary system, average traffic on the improved sections was almost three times that on the unimproved sections.

In Table 24, the distribution of vehicle-mileage, into truck-mileage and passenger-car-mileage is shown by highway systems. The distribution of truck-miles and passenger-car-miles is very similar to the distribution of total vehicle-miles.

Table 24—Motor truck and passenger car utilization of Pennsylvania rural highways by systems in 1924

Road system	Daily truck-miles	Percentage of total truck-miles	Daily passenger-car-miles	Percentage of total passenger-car-miles	Annual truck-miles	Annual passenger-car-miles	Ratio of truck-miles to total vehicle-miles
<b>Primary:</b>							
Improved .....	345,000	38.8	3,556,000	41.0	125,925,000	1,297,940,000	8.8
Unimproved ...	24,000	2.7	230,000	2.7	8,760,000	83,950,000	9.4
Total .....	369,000	41.5	3,786,000	43.7	134,685,000	1,381,890,000	8.9
<b>Secondary:</b>							
Improved .....	152,000	17.1	1,465,000	16.9	55,480,000	534,725,000	9.4
Unimproved ...	66,000	7.4	688,000	8.0	24,090,000	251,120,000	8.8
Total .....	218,000	24.5	2,153,000	24.9	79,570,000	785,845,000	9.2
<b>Total State ..</b>	<b>587,000</b>	<b>66.0</b>	<b>5,939,000</b>	<b>68.6</b>	<b>214,255,000</b>	<b>2,167,735,000</b>	<b>9.0</b>
State aid .....	15,000	1.7	158,000	1.8	5,475,000	57,670,000	8.7
County .....	45,000	5.1	469,000	5.4	16,425,000	171,185,000	8.8
Township <sup>1</sup> .....	242,000	27.2	2,099,000	24.2	88,330,000	766,135,000	<sup>2</sup>
<b>Total .....</b>	<b>889,000</b>	<b>100.0</b>	<b>8,665,000</b>	<b>100.0</b>	<b>324,485,000</b>	<b>3,162,725,000</b>	<b>9.3</b>

<sup>1</sup> Estimated.

<sup>2</sup> Due to the small number of vehicles on any section of the township system an accurate expression of this ratio is not obtainable. It is, however, between 8 and 11 per cent of the total vehicle-miles.

## CHAPTER V

### COMPOSITION OF HIGHWAY TRAFFIC

#### Passenger Cars

The comparative use of the State highway system by vehicles of Pennsylvania and foreign registration, by city and farm-owned vehicles, and by various other classes of vehicle use can be expressed accurately in motor vehicle miles<sup>16</sup>.

The total passenger car use of the primary highway system on an average day during the traffic survey was 3,786,000 passenger-car-miles. The comparative use of this system by various classes of traffic use is shown in Table 25.

There are, however, wide variations in the composition of passenger car traffic on different parts of the primary system. Foreign traffic is largely limited to the areas adjacent to State boundaries and to the principal through routes. Touring traffic is largely limited to the main through routes such as the Lincoln Highway, the Susquehanna Trail the Lackawanna Trail, the National Pike, the Lakes-to-Sea Highway and the William Penn Highway.

Business and non-business traffic are quite evenly distributed over the primary system. Business

traffic is of greater importance on the routes adjacent to the larger cities and in the industrial areas. Non-business traffic is of greater importance on the principal through routes, the scenic routes, and in areas adjacent to pleasure resorts and places of historic interest.

Farm-owned traffic is local in character and is largely limited to a movement between farm areas and the market towns of these areas.

The composition of passenger car traffic shown in table 25, is based upon the year period. There is, however, a large seasonal variation in the composition of this traffic. Non-business and touring traffic are predominantly summer movements. Foreign traffic is also greater in summer than in

Table 25—Composition of passenger car traffic on the primary highway system as observed on the principal traffic routes in 1924

Type of passenger car traffic	Daily passenger-car-miles	Per cent of daily passenger-car-miles
State of registration:		
Pennsylvania .....	3,254,000	86.0
Foreign .....	532,000	14.0
Type of trip:		
Touring .....	219,000	5.8
Non-touring .....	3,567,000	94.2
Type of usage:		
Business .....	1,999,000	52.8
Non-business .....	1,787,000	47.2
Place of ownership:		
City .....	3,519,000	92.9
Farm .....	267,000	7.1
All Types .....	3,786,000	100.0

<sup>16</sup> The various types of traffic as used in this and the following section are defined as follows:

**State of Registration.**

Pennsylvania—includes traffic of all motor vehicles registered in Pennsylvania.

Foreign—includes traffic of all motor vehicles not registered in Pennsylvania.

**Place of Ownership.**

Farm—includes traffic of all motor vehicles owned by persons residing on farms.

City—includes traffic of all motor vehicles owned by persons residing in cities, villages or urban areas.

**Type of Usage.**

Business—indicates that the car on the trip recorded was being used for business purposes.

Pleasure—indicates that the car on the trip recorded was being used for pleasure or recreational purposes.

**Type of Trip.**

Touring—includes all trips of more than one day duration taken primarily for recreation.

Non-touring—includes all other trips.

**Type of Trucking.**

For-hire—includes all trucks engaged in hauling commodities on a contract or tariff basis.

winter except in the areas adjacent to State lines where little seasonal variation in the proportion of State and foreign traffic is observed. Business traffic and traffic of farm-owned cars show less seasonal variation than non-business traffic and traffic of city-owned cars. A marked variation in

the proportion of business and non-business usage is also observed between Sundays and other days of the week. Sunday traffic is predominantly non-business in character. A larger proportion of business traffic in any day is observed during the morning hours than during the afternoon hours.

Table 26—Distribution of passenger car traffic on the primary highway system by length of trip<sup>1</sup>

Length of trip	Per cent of cars observed	Cumulative per cent
<i>Miles</i>		
0- 9 .....	22.3	
10- 19 .....	22.0	44.3
20- 29 .....	11.2	55.5
30- 39 .....	6.9	62.4
40- 49 .....	3.8	66.2
50- 59 .....	4.9	71.1
60- 69 .....	3.0	74.1
70- 79 .....	2.0	76.1
80- 89 .....	2.0	78.1
90- 99 .....	1.9	80.0
100-149 .....	5.9	85.9
150-199 .....	3.0	88.9
200-299 .....	3.5	92.4
300 & over .....	7.6	100.0
Total .....	100.0	

<sup>1</sup> Based on 156,000 cars observed at 100 selected points on the principal traffic routes of the primary highway system. Length of trip is calculated from origin to destination, including street mileage as well as State highway mileage.

The number of passengers per car also varies considerably with the type of passenger car use. The average number of passengers per car for all types of traffic was 2.6; touring and non-business usage averaged more than 3 persons per car and business traffic averaged 2.0 persons per car.

Over half of the passenger car traffic observed on the principal traffic routes of the primary highway system was made up of cars traveling less than 30 miles per trip. The distribution of this traffic by length of trip is shown in Table 26.

A larger proportion of long-distance trips were found on the important through routes. \*On these routes, trips of over 100 miles made up 24.1 per cent of the traffic; on the remaining routes such traffic was 15.2 per cent of the total.

#### Composition of Highway Traffic— Motor Trucks

Daily truck-mileage on the State highway system was approximately 587,000 truck-miles. Of this sum approximately 369,000 truck-miles were on the primary system and 218,000 truck-miles on the secondary system.

Table 27—Distribution of truck-miles by State of registration

State of registration	State highway system					
	Total		Primary		Secondary	
	Daily truck-miles	Per cent	Daily truck-miles	Per cent	Daily truck-miles	Per cent
Pennsylvania .....	561,000	95.6	350,000	94.9	211,000	96.8
Foreign .....	26,000	4.4	19,000	5.1	7,000	3.2
Total .....	587,000	100.0	369,000	100.0	218,000	100.0

The utilization of Pennsylvania highways by motor trucks of foreign registration is of less importance than in the case of passenger cars. The relative use of these highways by trucks of Pennsylvania and foreign registration is shown in Table 27.

Traffic of trucks of foreign registration is of little significance except in parts of the Commonwealth adjacent to the surrounding States, and within these areas is important only on the principal interstate highways.

Trucks operating for hire, either on a contract or tariff basis, produce 13.8 per cent of the motor-truck-mileage on the State highway system. The average cargo of trucks operated for hire is approximately double the average load of other trucks. The distribution of traffic of trucks operated for hire and of privately operated trucks is shown in Table 28.

Table 28—Distribution of traffic of trucks operated for hire and of privately operated trucks

Type of trucking	Daily truck-miles	Percentage of daily truck-miles
For hire .....	81,000	13.8
Privately operated .	506,000	86.2
Total .....	587,000	100.0

As between contract haulage and tariff haulage the former is of considerably greater importance in terms of tonnage transported.

Motor trucking is primarily a short-haul movement. The distribution of truck traffic by trip-mileage, based on the operation of 452,000 loaded trucks, is shown in Table 29.

Of all loaded motor trucks observed, 80.6 per cent operate less than 30 miles per trip. Those traveling less than 50 miles per trip are 91.2 per cent of all loaded trucks, and only 2.7 per cent of the loaded trucks make trips of 100 miles or more. The long-haul transportation of commodities by

motor truck is largely limited to the movement of a small number of commodities where speed of delivery or special packing requirements are the determining factor.

Table 29—Distribution of loaded trucks by trip-mileage

Length of trip	Loaded trucks	Cumulative per cent
Miles	Per cent	
0-9 .....	37.4	
10-19 .....	29.6	67.0
20-29 .....	13.6	80.6
30-49 .....	10.6	91.2
50-99 .....	6.1	97.3
100 & over .....	2.7	100.0
Total .....	100.0	

The average net cargo weight and gross weight of loaded trucks, and the average weight of empty trucks by capacity groups is shown in Table 30.

Table 30—Average net and gross weight of loaded trucks by capacity groups, and average weight of empty trucks

Capacity group	Average weight		
	Net cargo	Gross	Empty
Tons	Pounds	Pounds	Pounds
½-1½	1,050	4,160	3,110
2 -2½	3,410	10,270	6,860
3 -4	5,790	15,450	9,660
5 -7½	8,420	20,620	12,200

Net cargo tonnage represents the weight of commodities carried; gross tonnage includes the total weight of truck and load for all trucks, loaded and empty.

The total daily ton-mileage utilization of the State highway system is approximately 405,000 net cargo ton-miles, and 1,804,000 gross ton-miles. The distribution of this tonnage by highway systems is shown in Table 31.

## HIGHWAY TRANSPORTATION SURVEY

The importance of the Pennsylvania State highway system is clearly indicated in Table 31. Daily commodity transportation is 405,000 ton-miles, and during the year period this movement

is approximately 148,000,000 ton-miles. The total tonnage transported on the State highway system is probably between 5,000,000 and 6,000,000 tons for the year period.

Table 31—Daily net cargo and gross ton-miles of truck traffic by highway systems

Highway system	Daily net ton-miles-cargo		Daily gross ton-miles	
	Ton-miles	Per cent	Ton-miles	Per cent
Primary, total .....	265,000	65.4	1,160,000	64.3
Improved .....	252,000	62.2	1,098,000	60.9
Unimproved .....	13,000	3.2	62,000	3.4
Secondary, total .....	140,000	34.6	644,000	35.7
Improved .....	101,000	25.0	461,000	25.6
Unimproved .....	39,000	9.6	183,000	10.1
Total State system ....	405,000	100.0	1,804,000	100.0

## CHAPTER VI

### HIGHWAY TRAFFIC AND POPULATION

The volume of highway traffic in an area is closely related to the population of the area.

Highway traffic is predominantly local in nature and the influence upon the volume of traffic in an area, of traffic originating at points more than 40 or 50 miles distant is generally small, except in areas which attract large numbers of tourists such as parks pleasure resorts, and in areas of relatively low population density which are traversed by highway routes connecting important centers of population.

The largest volume of traffic is found in the areas adjacent to the larger cities and in the areas having the greatest density of population. The concentration of traffic on the routes leading into the cities of Philadelphia, Pittsburgh, Scranton, Reading, Erie, Harrisburg, Wilkes-Barre, Allentown, Bethlehem, Johnstown, Altoona, Chester, Lancaster, and York, the 14 largest cities, is apparent. Traffic, measured in vehicle-miles, on the primary and secondary State highway systems in the Counties of Bucks, Chester, Delaware, and Montgomery, the area of which is approximately equivalent to that of a semi-circle of 36-mile radius drawn about the City of Philadelphia, is approximately one-sixth of the total traffic on the State highway system. A large part of this traffic, particularly in Bucks and Chester Counties which have a relatively low density of population compared with the other counties, originates in Philadelphia County, which, being co-extensive with the City of Philadelphia, has no State highways. Traffic on the State highway system of these four counties, which comprise 4.6 per cent of the area of the Commonwealth, is approximately equal to the traffic in 22 northern counties which comprise 36.6 per cent of the total area. The Counties of Bucks, Chester, Delaware, Montgomery and Philadelphia comprise 27.5 per cent of the total population, as compared with 9.2 per cent for the 22 northern counties. Similar, al-

though less pronounced, variations are found in other localities.

On the basis of total motor vehicle traffic, motor truck traffic, the composition of truck traffic, population density, and population trends, three geographical sections are apparent. Within each of these major sections the distribution of highway traffic and population again indicates certain natural divisions. Divisions have all been made on county lines, as the commonly accepted boundaries, although the natural divisions of traffic and population do not in all cases follow county boundaries.

The three major sections are: The eastern, which includes 18 counties each of which had a population density of more than 100 persons per square mile in 1920 and an increasing population between 1910 and 1920; the western, which includes 20 counties, 15 of which had a population density of more than 90 persons per square mile in 1920, and 17 of which had an increasing population between 1910 and 1920; and the northern and central, which includes 29 counties, the majority of which show a low density of population and 18 of which show a decrease in population between 1910 and 1920. The total population within this area decreased 1.9 per cent during these years. Within each section the following divisions were made:

#### Division A.

Philadelphia, Delaware, Montgomery, Lehigh and Northampton Counties. These counties range in density of population from 13,712.6 persons per square mile in Philadelphia County to 411.8 persons per square mile in Montgomery County. The rate of increase in population between 1910 and 1920 ranges from 17.5 per cent in Montgomery County to 46.8 per cent in Delaware County.



**Division B.**

Lackawanna and Luzerne Counties. Both these counties exceed 400 persons per square mile, but the rate of increase is considerably lower than in division A.

**Division C.**

Dauphin, Berks, Schuylkill and Northumberland Counties. These counties rank below divisions A and B in both population density and rate of increase. Population density ranges from 293.6 persons per square mile in Dauphin County to 232.2 persons per square mile in Berks County. The rate of population increase between 1910 and 1920 ranges from 12.5 per cent in Dauphin County to 4.7 per cent in Schuylkill County.

**Division D.**

The remaining counties in the eastern section, i. e., Bucks, Carbon, Chester, Cumberland, Lancaster, Lebanon and York Counties. Population density in these counties ranges from 110.9 in Cumberland County to 175.4 in Lebanon County. The rate of population increase between 1910 and 1920 for all counties except Carbon, which shows an increase of 18.4 per cent, ranges between 4.1 and 7.8 per cent.

**Western section****Division A.**

Allegheny, Westmoreland, Fayette, Washington, Beaver and Lawrence Counties. With the exception of Allegheny County, which has a population density of 1,635.6 persons per square mile, these counties range from 219.2 to 263.3 persons per square mile. The rate of population increase ranges from 12.3 per cent in Fayette County to 42.5 per cent in Beaver County.

**Division B.**

Blair and Cambria Counties. Blair County has 240.3 persons per square mile and Cambria County 275.9 persons per square mile. The rate of population increase between 1910 and 1920 was 17.9 per cent in

Blair County and 19.1 per cent in Cambria County.

**Division C.**

Erie County. This county has a population density of 196.6 persons per square mile and an increase of 32.9 per cent between 1910 and 1920. It is classed separately because of its location and the importance of interstate traffic on its highways.

**Division D.**

The remaining counties in the western section, i. e., Mercer, Armstrong, Indiana, Somerset, Butler, Clearfield, Venango, Greene, Jefferson, Clarion and Crawford Counties. Population density in this group ranges from 134.0 persons per square mile in Mercer County to 58.2 persons per square mile in Crawford County. Population changes between 1910 and 1920 range from an increase of 22.2 per cent in Indiana County to a decrease of 1.6 per cent in Jefferson County. Three counties, Jefferson, Clarion and Crawford show decreasing population during this period; three counties, Greene, Butler and Venango, increases of less than 10 per cent; two counties, Armstrong and Clearfield, increases of between 10 and 20 per cent; and three counties, Indiana, Somerset and Mercer, increases of over 20 per cent.

**Northern and central section****Division A.**

Adams and Franklin Counties. These counties are on the border between the relatively densely populated eastern section and the sparsely populated central section. Population density is 65.5 persons per square mile in Adams and 82.9 persons per square mile in Franklin County. Both counties show small increases in population between 1910 and 1920. In highway traffic this section, particularly Adams County, is peculiar in the large amount of traffic originating in other sections, due to the importance of the Gettysburg National Park as an attraction to tourists.

## Division B.

Columbia, Montour, Mifflin, Lycoming, Snyder and Union Counties. These counties form the most densely populated part of the northern and central section. Population density ranges from 108.3 persons per square mile in Montour County to 52.0 persons per square mile in Union County. Three of these counties, Mifflin, Lycoming, and Snyder, increased in population between 1910 and 1920; and three, Columbia, Montour and Union decreased during the same period. Increases or decreases are small except in Mifflin County which shows an increase of 13.2 per cent.

## Division C.

Monroe County. This county, having a population density of 39.0 persons per square mile and an increase of 5.9 per cent between 1910 and 1920, is classed separately because of its very heavy traffic in proportion to population and motor vehicle registration. The relatively heavy traffic is due to the importance of the county as a summer-resort area and to the fact that it is traversed by an important "through-traffic" route, the Lackawanna Trail.

## Division D.

The remaining counties of the northern and central section, i. e., Bedford, Bradford, Cameron, Centre, Clinton, Elk, Forest, Fulton, Huntingdon, Juniata, McKean, Perry, Pike, Potter, Sullivan, Susquehanna, Tioga, Warren, Wayne and Wyoming Counties. Of these counties Centre, Clinton, Huntingdon, McKean and Warren show increases of population ranging from 1.1 to 6.4 per cent; all other counties show a decreasing population between 1910 and 1920. Persons per square mile range from 49.6 in McKean to 12.5 in Pike County.

These sections and divisions are shown in Figure 7, and summary of their population and traffic data is shown in Table 32. Traffic data are presented as daily vehicle-miles on the State high-

way system, including the primary and secondary systems. This item represents the volume of traffic on the State highway system in each area, and vehicle-miles per mile indicates the average density of traffic in the area.

Analysis of the distribution of population, motor vehicle registration, area, mileage of State highways, and vehicle-mileage on the State highway system, (Table 32) indicates that highway traffic expressed in vehicle-miles, does not vary in exact ratio with any one of these factors.

Vehicle-mileage varies directly with population but the proportion of population exceeds the proportion of vehicle-mileage in the densely populated areas (divisions A and B of the eastern, and divisions A and B of the western section); in all other sections the proportion of vehicle-mileage exceeds the proportion of population.

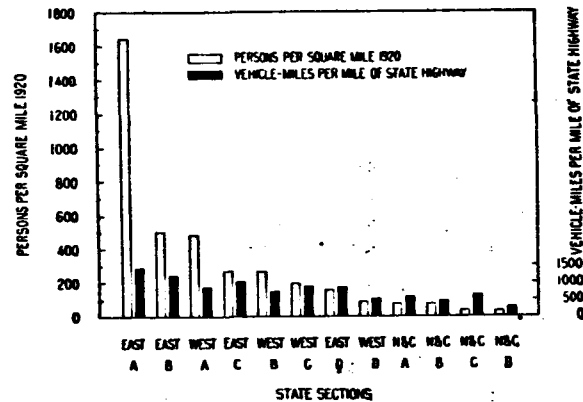


Fig. 13—Density of population and density of motor vehicle traffic on State highways by sections of the Commonwealth

The relationship between population and traffic on the State highway system is more definitely indicated by a comparison of population density and traffic density. In Figure 13, population density per square mile and vehicle-miles per mile of State highway are plotted for each section. To facilitate comparison the sections have been arranged in order of population density. The decrease in traffic density with decrease in population density is apparent but is marked by certain irregularities. Analysis of this comparison will indicate that a number of factors affect the re-

relationship between population and traffic on the State highway system and preclude the expression of this relationship by any simple mathematical formula. The most apparent lack of direct relationship is found in divisions A and B of the eastern section and division A of the western section where the ratio of traffic density on the State highway system to population density is far below the corresponding ratio in the other groups. The

explanation of this variation is found in two factors:

1. The population in these sections is largely urban in character and the traffic on city streets may therefore be expected to be greater in proportion to traffic on rural highways in these sections than in the other sections, as shown by Table 33.

Table 32—Population, traffic on State highway system, and motor vehicle registration, by sections

Section	Percentage					Persons per square mile 1920	Percentage increase in population 1910-1920 <sup>1</sup>	Daily vehicle-miles		
	Population 1920	Vehicle-miles on State highway system	Motor vehicle registration 1924	Area	State highway miles			per highway mile	per registered vehicle	per person
<b>Eastern</b>										
A	28.6	11.6	23.0	3.4	5.1	1,645.4	19.9	1,440	2.66	.30
B	7.8	5.5	6.3	2.9	2.9	504.3	12.4	1,204	4.58	.53
C	8.0	10.3	8.4	5.9	6.4	265.1	8.6	1,015	6.49	.97
D	8.0	16.9	10.8	10.1	12.7	154.8	6.7	851	8.29	1.58
Total	52.4	44.3	48.5	22.3	27.1	456.9	14.8	1,039	4.82	.63
<b>Western</b>										
A	23.3	13.5	22.3	9.4	9.9	483.0	19.0	873	3.20	.43
B	3.8	2.8	3.5	2.8	2.4	260.7	18.6	721	4.21	.55
C	1.8	2.8	2.4	1.7	2.0	196.6	32.9	883	6.09	1.18
D	8.7	14.3	10.8	19.4	17.9	87.7	10.0	507	6.97	1.23
Total	37.6	33.4	39.0	33.3	32.2	219.4	17.3	658	4.52	.67
<b>Northern and Central</b>										
A	1.1	2.9	1.4	2.9	3.3	75.7	2.9	553	10.66	1.95
B	2.4	4.6	3.0	6.3	6.5	73.8	2.4	450	7.97	1.42
C	0.3	1.4	0.5	1.4	1.4	39.0	5.9	636	15.30	3.85
D	6.2	13.4	7.6	33.8	29.5	35.9	-4.5	289	9.33	1.61
Total	10.0	22.3	12.5	44.4	40.7	44.0	-1.9	348	9.39	1.66
<b>Grand Total</b>	100.0	100.0	100.0	100.0	100.0	194.5	13.8	635	5.27	0.75

<sup>1</sup> Minus (—) indicates decrease.

2. In these sections and also in division B of the western section there is a greater number of persons per car than in other sections; i. e., there is a small proportion of car ownership from which a lower car use in relation to population would naturally follow. The number of persons per car in the various sections is shown in Table 34.

Comparison of daily vehicle-miles per person and daily vehicle-miles per registered vehicle in

the different areas (Table 32) also indicates the factors which affect the relationship of population and traffic. This comparison is shown graphically in Figure 14. The sections are arranged in order of population density, and therefore in approximate order of traffic density. Although total motor vehicle traffic on the State highway system and density of traffic on individual routes in the densely populated areas is much greater than the total density of traffic by routes in the sparsely populated areas, vehicle-mileage on the State sys-

Table 33—Distribution of urban and rural population and cities of over 10,000 population by sections<sup>1</sup>

Section	Percentage of total urban population of Commonwealth	Percentage of total rural population of Commonwealth	Ratio of urban to total population of section	Number of cities with a population of over 10,000				
				Total	10,000-25,000	25,000-50,000	50,000-100,000	over 100,000
	Per cent	Per cent	Per cent					
Eastern								
A	39.4	9.3	88.3	7	1	2	3	1
B	9.6	4.5	79.5	11	8	1	1	1
C	7.7	8.4	62.5	10	8	....	1	1
D	5.3	13.0	42.2	9	7	1	1	....
Total	62.0	35.2	76.0	37	24	4	6	3
Western								
A	23.8	22.5	65.6	25	22	2	....	1
B	3.4	4.3	58.4	2	....	....	2	....
C	1.9	1.5	70.3	1	....	....	1	....
D	4.3	16.7	31.9	7	7	....	....	....
Total	33.4	45.0	57.3	35	29	2	3	1
Northern and Central								
A	0.5	2.2	28.5	2	1	1	....	....
B	1.6	3.9	42.6	1	1	....	....	....
C	0.2	0.4	41.7	....	....	....	....	....
D	2.3	13.3	24.1	2	2	....	....	....
Total	4.6	19.8	29.5	5	4	1	....	....
Grand total	100.0	100.0	64.3	77	57	7	9	4

<sup>1</sup> Based on 1920 census.

Table 34—Estimated number of persons per registered motor vehicle, 1924

Section	Estimated persons per car
<b>Eastern:</b>	
A .....	9.46
B .....	9.12
C .....	6.96
D .....	5.41
Total .....	8.08
<b>Western:</b>	
A .....	7.91
B .....	8.15
C .....	5.74
D .....	5.92
Total .....	7.24
<b>Northern and central:</b>	
A .....	5.53
B .....	5.67
C .....	4.08
D .....	5.72
Total .....	5.62
<b>Grand Total ..</b>	<b>7.45</b>

tem per person and per registered vehicle is greater in the sparsely populated areas than in the densely populated areas. This relationship is the natural result of the higher proportion of urban population in the densely populated areas and the resulting lesser use per vehicle and per person of State highways in these areas, as compared with the sparsely populated areas in which a larger proportion of total motor vehicle traffic is found on the State highways.

The effect of variations in persons per car is shown by the relative height of the two columns for each area. In the sections having the larger number of persons per car, vehicle-mileage per car is relatively greater than vehicle-mileage per person; in the areas having the smaller number of persons per car, vehicle-mileage per person is relatively greater than vehicle-mileage per car. The greatest divergence is seen in division C of the northern and central section, in which persons

per car is lower than in any other section and is only 55 per cent of the State average.

The presence or absence of important traffic routes which are not included in the State highway system must also be considered in an analysis of the relation of traffic on the State highways to population. Several counties have county highway systems which include important traffic routes. This is particularly true in division A of the western section in which 44 per cent of the total mileage of designated county highways is located. In this area the county highways are equivalent in mileage to 73 per cent of the State highways. Allegheny County, the first county to develop a distinct county highway system, has 467 miles of county highways, including several routes of considerable traffic importance. Other areas in which county highways form an important part of the total highway mileage are division B of the eastern section and division B of the western section. In these areas, however, the county highways are generally of less traffic importance.

The effect of these county highways in diffusing traffic and lowering the density of traffic on the State highways is evident from Figure 14. The relatively lower vehicle-mileage per person and per vehicle in divisions A and B of the western section indicates the effect of important county highways in these areas.

In certain sections traffic originating without the area may form an important part of the total traffic in the area. This is particularly true in areas which attract large volumes of foreign

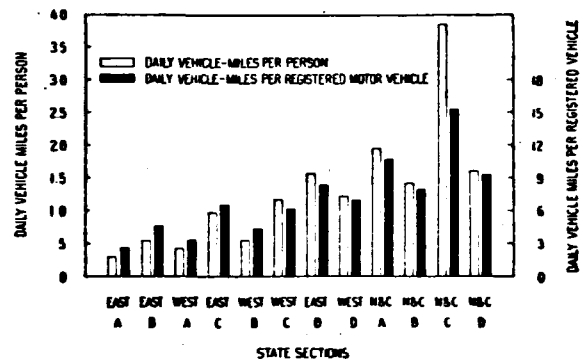


Fig. 14—Daily traffic on State highways per person and per registered motor vehicle by sections of the Commonwealth

traffic, such as parks, pleasure resorts, and places of historic interest, and areas adjacent to but not including large cities. The effect of such foreign traffic will be to abnormally increase the vehicle-mileage per person and per vehicle.

Reference to Figure 14 will indicate that three areas appear to have abnormally high vehicle-mileage per person and per vehicle. These areas in order of importance are: division C, northern and central section; division A, northern and central section; and division D, eastern section. Division C of the northern and central section (Monroe County) is an important summer resort area which attracts a large volume of summer traffic, and is also traversed by an important "through-traffic" route, the Lackawanna Trail. Division A of the northern and central section includes Adams County, in which is located the Gettysburg National Park which attracts a large number of tourists.

Division D of the eastern section includes Bucks and Chester Counties which are adjacent to Philadelphia and Cumberland County which is adjacent to Harrisburg.

The effect of foreign traffic, i. e. traffic originating at points outside the area of a county or State, is particularly marked in the case of Bucks and Chester Counties. The daily vehicle-miles per person on the State highways of Bucks County are more than three times the State average and are nearly double the average for counties of similar population density. The corresponding ratios for Chester County are not as high as in Bucks County but greatly exceed those of other counties of similar population density. In both these counties traffic originating in Philadelphia forms an important part of the total highway traffic. Foreign traffic in Bucks County probably exceeds that in Chester County due to the fact that the principal route from Philadelphia to Trenton, N. J., and New York City passes through this county.

Subject to the variations produced by the factors discussed above—variations in urban and rural population and resulting variations in the distribution of traffic between rural highways and city streets, variations in motor vehicle owner-

ship, variations in important traffic routes which are not included in the State highway system, and variations in the amount of foreign traffic on the highways of an area—the population of an area is a reliable measure of the total traffic on the State highway system within areas of considerable size.

For small areas or individual routes other factors are involved which may largely vitiate the value of this measure of traffic. Traffic between two centers of population may be concentrated on one route or may use two or more alternative routes. A poor highway surface or congested traffic conditions will discourage the use of a route. An excellent highway surface, adequate width, and scenic or other attractions along the way will increase the traffic on the route.

Population is of particular importance in anticipating the traffic needs of an area. Population trends for areas of considerable size can be accurately determined and generally change slowly. Future population can be predicted with reasonable accuracy and serves therefore the most reliable basis of anticipating future highway needs.

An analysis of the relation of highway traffic to the population of a State is also valuable as a guide to highway finance. The preceding analysis indicates that although there is a definite relationship between population and traffic, there is no uniform mathematical relationship, particularly when applied to relatively small areas such as county units. Because of the many variables which affect this relationship it is evident that the distribution of highway construction or maintenance funds upon the basis of population, motor vehicle registration, highway mileage or similar methods might under certain circumstances result in an inequitable distribution to certain areas.

The variations in population density and in population trends within counties are also great. To obtain an accurate picture of population density and trends, population data were computed on a township basis. The eastern section and divisions A, B and C of the western section include nearly all the important areas of dense population and also of rapidly increasing population. In the re-

maining sections small areas of dense population are found at the larger cities or boroughs but these sections include no population centers of first importance. Regions of rapidly increasing population in these sections are also small in area and scattered in location. The proportion of the area of each section having a density of population of less than 100 persons per square mile, 100—199 persons per square mile, and 200 or more persons per square mile; and the proportion of the total population of the section residing in each of these areas are shown in Table 35.

For the entire Commonwealth, classified on the basis of township units, 13.4 per cent of the area

has a population of 200 or more persons per square mile, and this area includes 77.9 per cent of the population; 75.0 per cent of the area has a population of less than 100 persons per square mile, and this area includes only 14.1 per cent of the population. The largest proportion of densely populated area is found in division A of the eastern section and the smallest proportion in division D of the northern and central section.

These variations in the amount of densely populated areas and variations in the proportion of the total population residing in such areas indicate marked differences in the demands for highway service in the area. In an area such as

**Table 35—Area and population by sections classified by density of population per square mile, 1920**

Section	Percentage of total area having a population of—			Percentage of total population residing in areas having a population of—		
	Less than 100 persons per square mile	100 to 199 persons per square mile	200 and over persons per square mile	Less than 100 persons per square mile	100 to 199 persons per square mile	200 and over persons per square mile
<b>Eastern:</b>						
A .....	31.1	17.9	51.0	1.3	1.5	97.2
B .....	63.5	5.2	31.3	4.2	1.4	94.4
C .....	60.5	20.2	19.3	11.4	10.3	78.3
D .....	62.1	20.0	17.9	21.7	16.8	61.5
Total .....	57.2	17.7	25.1	6.4	5.2	88.4
<b>Western:</b>						
A .....	41.3	16.3	42.4	3.9	5.0	91.1
B .....	44.3	27.2	28.5	9.2	13.9	76.9
C .....	69.0	19.9	11.1	13.8	11.7	74.5
D .....	75.5	16.7	7.8	36.7	25.4	37.9
Total .....	62.9	17.6	19.5	12.6	10.9	76.5
<b>Northern and Central:</b>						
A .....	84.0	8.2	7.8	53.2	15.9	30.9
B .....	89.1	5.0	5.9	37.0	10.1	52.9
C .....	89.9	5.9	4.2	47.5	27.4	25.1
D .....	94.8	3.2	2.0	70.5	11.4	18.1
Total .....	93.1	3.9	3.0	59.9	12.0	28.1
Grand total	75.0	11.6	13.4	14.1	8.0	77.9

division A of the eastern section where only 31.1 per cent of the area has a population of less than 100 persons per square mile, it is evident that a highway system designed to carry a large volume of traffic between the important centers of population will be required.

The routes connecting the important centers of population must be of sufficient width and of a type adequate to carry a large volume of traffic. Such routes should be as direct as possible and all obstructions to the free and rapid movement of traffic such as railway grade crossings, sharp curves, heavy grades and congestion areas in the smaller villages should be eliminated.

Traffic originating in the sparsely populated sections of such an area will be relatively unimportant and can be served by short "feeder" routes connecting these sections with the main routes.

In divisions A and B of the eastern section and division A of the western section traffic originating in the densely populated areas forms the predominant part of highway traffic, as over 90 per cent of the total population of these sections resides in areas having a population of 200 or more persons per square mile.

In contrast with these areas are the northern and central section and division D of the western section in which less than 50 per cent of the population resides in areas having a population of 200 or more persons per square mile and from 75.5 to 94.8 per cent of the area has a population of less than 100 persons per square mile. In these areas the volume of traffic is smaller and its sources more scattered, resulting in lower density of traffic on the highways. Very few important centers of population are found in this region; the area has only one city with a population of over 25,000 and only 12 cities of over 10,000 population in 1920 (Table 33); and traffic from the sparsely populated sections forms a predominant part of the total. The population and traffic data indicates that except in the immediate vicinity of the larger cities, Williamsport, Butler, Sharon, Oil City, Bradford, Meadville, Warren, Du Bois and Chambersburg, and on the important "through-traffic"

routes such as the Lincoln Highway, the Lakes-to-Sea Highway, the William Penn Highway, the Susquehanna Trail and the Lackawanna Trail, traffic in this area is very light. Here the demand is principally for highways which will serve as large an area as possible. Highway width in excess of the normal two-lane road is not required. In these areas expensive removal of obstructions to the rapid movement of traffic is secondary in importance to the provision of a large mileage of serviceable highways.

Division D of the eastern section and divisions B and C of the western section are partially in the first and partially in the second class. In the areas near the important centers of population either included in the section or contiguous to it heavy traffic will be concentrated on a few important routes; in the outlying areas very few heavy routes are to be found.

The proportion of the area of each section which increased in population between 1910 and 1920 and the rate of increase or decrease in areas having less than 100 inhabitants per square mile, 100 to 199, and 200 or more inhabitants per square mile in each section is shown in Table 36.

Table 36 indicates that in every section the areas having a population in 1920 of 100 or more persons per square mile increased in population between 1910 and 1920. The areas which had in 1920 a population of less than 100 persons per square mile decreased in population between 1910 and 1920 except in divisions A and B of the western section.

If this trend continues—and its continuance may reasonably be expected, although the rate of increase and decrease may change—the greatest increase in traffic will be found in the densely populated areas. In small areas of sparse population surrounded by or contiguous to areas of dense population, traffic originating in the densely populated areas will dominate the highways of the smaller area but in the northern and central section, where areas of increasing population are small, a rapid increase in traffic is not expected.



**Table 36—Area increasing in population and rate of increase or decrease for areas of different present population density by sections, 1910 to 1920**

Section	Percentage of area increasing in population	Percentage of area decreasing in population	Percentage of population increase, 1910 to 1920 <sup>1</sup>			
			Total area	Area having less than 100 persons per square mile 1920	Area having 100 to 199 persons per square mile 1920	Area having over 200 persons per square mile 1920
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
<b>Eastern:</b>						
A .....	62.3	37.7	19.9	-6.3	3.4	20.7
B .....	59.3	40.7	12.4	-4.1	10.9	13.3
C .....	43.2	56.8	8.6	-4.0	5.4	11.2
D .....	39.1	60.9	6.7	-5.4	1.7	13.4
Total .....	46.4	53.6	14.8	-5.0	3.4	17.3
<b>Western:</b>						
A .....	71.6	28.4	19.0	7.3	20.8	19.4
B .....	73.2	26.8	18.6	1.8	13.4	22.1
C .....	45.9	54.1	32.9	-1.1	15.6	45.6
D .....	45.4	54.6	10.0	-1.0	16.2	18.6
Total .....	55.2	44.8	17.3	0.7	17.0	20.6
<b>Northern and Central</b> .....						
A .....	43.8	56.2	2.9	-1.2	4.7	9.9
B .....	32.8	67.2	2.4	-6.6	4.7	9.3
C .....	26.9	73.1	5.9	-6.5	14.1	28.2
D .....	21.6	78.4	-4.5	-9.0	15.0	4.7
Total .....	24.8	75.2	-1.9	-7.9	11.1	7.9
<b>Grand total</b> .....	<b>39.7</b>	<b>60.3</b>	<b>13.8</b>	<b>-4.5</b>	<b>11.2</b>	<b>18.1</b>

<sup>1</sup> Minus (—) indicates decrease.

## CHAPTER VII

### FORECAST OF HIGHWAY TRAFFIC

All highway improvements, although varying in degree of permanency are of the nature of permanent improvements. Proposed highway improvements to be adequate must be planned so as to provide service for future traffic as well as for present traffic. The building of a highway which will not meet traffic demands during the expected life of the improvement will result in traffic congestion and early reconstruction and is therefore an uneconomic investment of public funds. Building in excess of traffic needs is also uneconomic as it involves an outlay of funds which could be used more advantageously for other highway improvements. When the trend of traffic increase is unknown the principle of stage construction in highway development is a conservative method of adjusting highway improvement to traffic needs. A knowledge of future traffic, insofar as it can be predicted with reasonable accuracy, is, however, extremely valuable in the establishment of a sound plan of highway improvement.

Prediction on the basis of past trends of development has been found accurate for population, business conditions, railway traffic and other eco-

nomie factors. This method, however, is possible only when the trend is known over a considerable period of years and when the period is one of normal development.

No comprehensive record of highway traffic over a series of years is available in Pennsylvania and the direct prediction of traffic on the basis of past trends is therefore impossible. Records of motor vehicle registration for a series of years are available and the experience of other States has indicated that there is a close and practically constant relation between the rates of growth of highway traffic and motor vehicle registration.

In Massachusetts records of highway traffic at 3-year intervals are available since 1909. A summary of the motor vehicle traffic at 18 common stations and motor vehicle registration in that State for the same years, is given in Table 37.

That traffic and registration have increased at nearly equal rates throughout the 16 years covered by the traffic records is shown by comparison of the indices computed with the average year as a base, as shown in the table.

**Table 37—Massachusetts motor vehicle traffic and registration by years, 1909 to 1924**

Year	Motor vehicle traffic at 18 stations		Motor vehicle registration	
	Number of passenger cars and trucks	Index <sup>1</sup>	Number of passenger cars and trucks	Index <sup>1</sup>
1909 .....	2,974	12.0	23,971	11.0
1912 .....	6,891	27.8	50,132	23.1
1915 .....	12,660	51.1	102,633	47.3
1918 .....	21,022	84.8	193,497	89.2
1921 .....	36,396	146.9	360,732	166.3
1924 .....	68,720	277.4	570,578	263.0

<sup>1</sup> Indices based on the traffic and registration of the average year, which are taken as 100.0.

In Maine, Maryland and Wisconsin, also, both traffic and registration records are available for a number of years. The agreement between the traffic and registration trends in these States is indicated in Table 38, which presents the indices of registration and traffic with the average year 1919 to 1924 as a base.

The number of traffic stations in these States varies from 26 in Maine to 200 in Maryland. In Figure 15 the curves of traffic and motor vehicles registration in the three States have been brought into proximity by the adjustment of the plotting scales,<sup>17</sup> and to the data least-square lines of trend have been fitted (shown by the dotted lines). It will be seen that the trends of traffic and registration in Maine and Maryland are almost parallel. In Wisconsin the traffic appears to be increasing at a slightly faster rate than the registration, but this divergence is partially explained by the fact that traffic data for 1919 are probably low.<sup>18</sup>

Traffic and registration in these widely separated areas have obviously increased at approximately equal rates despite differences in industrial development, wealth and population. It may, therefore, be assumed that what is true of these States, widely separated in location and greatly different in character, will also be true in Pennsylvania, namely, that registration and traffic increase at approximately equal rates, and that the prediction of motor vehicle registration may be

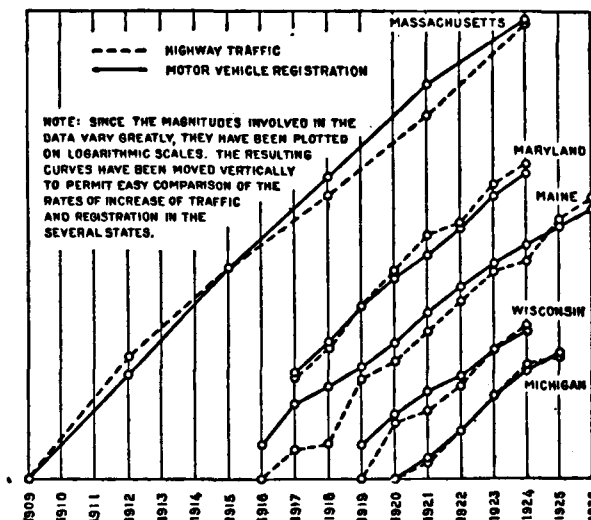


Fig. 15—Trends of highway traffic and motor vehicle registration in Massachusetts, Maryland, Maine, Wisconsin and Michigan

taken as the basis for a prediction of motor vehicle traffic.

It may not be assumed that the future traffic will be distributed in exactly the same proportions as the present traffic on the various routes and sections of routes. The development of new highways, the construction of parallel or "by-pass"

<sup>17</sup> Since the data are plotted on a logarithmic scale, adjustment of the curves does not affect the comparability of the trend rates.

<sup>18</sup> The Wisconsin Highway Department states that the 1919 traffic average is low in comparison with later years. This was the first year the traffic was observed and not all data were recorded.

Table 38—Indices of registration and traffic in Maine, Maryland and Wisconsin

Year	Maine		Maryland		Wisconsin	
	Registration	Traffic	Registration	Traffic	Registration	Traffic
1919 .....	61.8	61.7	59.8	56.6	63.4	53.1
1920 .....	72.7	70.5	73.0	72.2	78.7	78.3
1921 .....	89.6	87.3	85.1	92.0	91.7	84.8
1922 .....	107.0	106.9	103.5	100.5	102.6	101.1
1923 .....	125.5	131.3	128.3	130.3	122.7	129.5
1924 .....	143.4	141.7	150.0	150.0	140.9	153.1

routes adjacent to the larger cities, unusual industrial or resort developments, and suburban expansion will affect the traffic in smaller areas. But with respect to an entire highway system, all the facts that it is possible to analyze indicate that the forecast of expected registration over a short period will give a reasonable measure of the traffic that may be expected.

The estimate of future traffic on the basis of predicted motor vehicle registration neglects, of course, such factors as the effect of major mechanical improvements to vehicles and assumes further, that the average mileage per vehicle per year will show no important change over the prediction period. It would seem, from the nature of the case, that any such change would be gradual, and would not be likely to affect greatly a prediction made for a period of five or ten years in the future.

Another factor that must be considered is the effect of traffic congestion upon the rate of traffic increase. With respect to the traffic on an entire State highway system, the effect of this factor is likely to be of little importance for the State system as a whole, at least during the next few years, although it may operate to reduce somewhat the rate of traffic increase on highways near the large centers of population.

It appears reasonable, therefore, that a prediction of future motor vehicle traffic may be made upon the basis of a prediction of motor vehicle registration. The latter can be made upon the basis of records of past years, available for the Commonwealth. The increase of motor vehicle registration is a function of two variables: (1) The increase in population; and (2) the increasing use of motor vehicles in proportion to population, which can be measured by the number of persons per motor vehicle.

The population of Pennsylvania by decades is shown in Table 39.

From the data shown in Table 39 and interpolation for inter-censal years it is possible to obtain a reliable forecast of population for a short period of years. The interpolated population values for

<sup>19</sup> For a detailed discussion of methods of forecasting motor vehicle registration see Lowell J. Reed, "A Form of Saturation Curve," *Journal American Statistical Association*, September, 1925.

Table 39—Population of Pennsylvania, 1790 to 1920

Year	U. S. Census	Increase over preceding census enumeration	
		Number	Per cent
1790 .....	434,373		
1800 .....	602,365	167,992	38.7
1810 .....	810,091	207,726	34.5
1820 .....	1,049,458	239,367	29.5
1830 .....	1,348,233	298,775	28.5
1840 .....	1,724,033	375,800	27.9
1850 .....	2,311,786	587,753	34.1
1860 .....	2,906,215	594,429	25.7
1870 .....	3,521,951	615,736	21.2
1880 .....	4,282,891	760,940	21.6
1890 .....	5,258,113	975,222	22.8
1900 .....	6,302,115	1,044,002	19.9
1910 .....	7,665,111	1,362,996	21.6
1920 .....	8,720,017	1,054,906	13.8

the years 1913 to 1920 and predicted values from 1920 to 1930 are shown in Table 40.

The growth of motor vehicle registration in proportion to population appears to follow the same general characteristics as the growth of population, namely, an early growth slow in number of vehicles but at a rapid rate, followed by a gradual decrease in the rate of growth. Applying the same general method of forecasting that is used for population to motor vehicle registration and combining with the estimated increase of motor vehicle registration in proportion to population, the estimated increase in population, the predicted registration to 1930, as shown in Table 40, is obtained.<sup>19</sup>

It is estimated that the registration of motor vehicles in Pennsylvania in 1930 will be 2,086,000, an increase of 69.7 per cent over the 1924 registration.

The resulting numbers of persons per car in each year to 1930 are also shown in Table 40. On the basis of predicted population and motor vehicle registration it is estimated that in 1930 there will be one registered motor vehicle for each 4.75 persons. The actual and estimated registration and persons per registered vehicle from

HIGHWAY TRANSPORTATION SURVEY

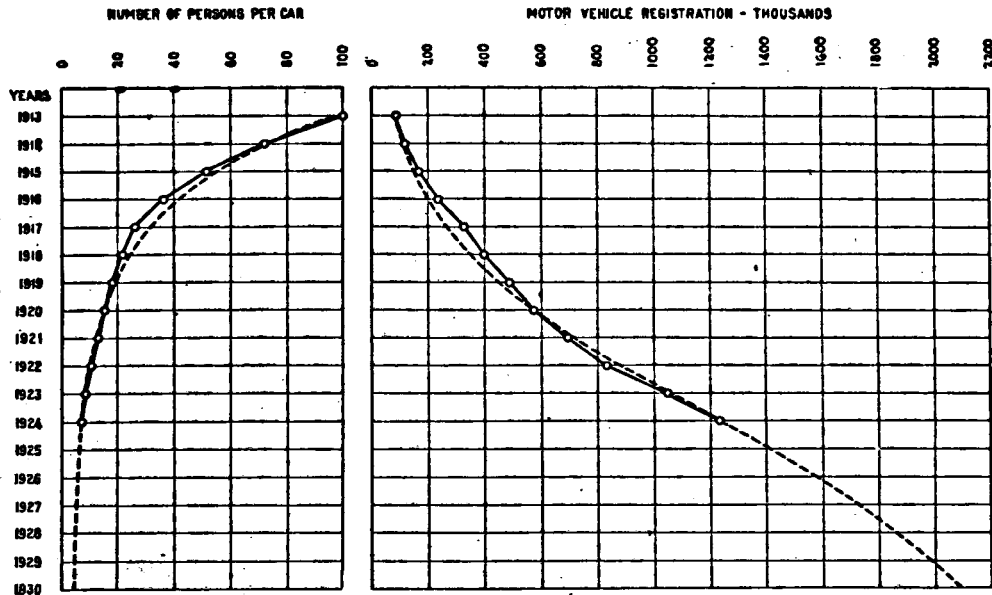


Fig. 16—Motor vehicle registration and persons per car

Table 40—Comparison of population and the number of motor vehicles in Pennsylvania

Year	Registration (thousands)		Population (thousands)	Persons per car	
	Actual	Estimated		Actual	Estimated
1913	78.9	80	7,883	99.9	98.4
1914	111.3	109	8,002	71.9	73.6
1915	160.6	147	8,122	50.6	55.3
1916	230.6	197	8,241	35.8	41.9
1917	325.2	262	8,360	25.7	31.9
1918	394.2	344	8,480	21.5	24.6
1919	482.1	447	8,600	17.8	19.3
1920	570.2	570	8,720	15.3	15.3
1921	689.6	714	8,840	12.8	12.4
1922	829.7	876	8,959	10.8	10.2
1923	1,064.6	1,050	9,078	8.53	8.65
1924	1,228.6	1,229	9,199	7.49	7.48
1925	1,362.8	1,406	9,318	6.84	6.63
1926	1,490.9	1,574	9,437	6.33	6.00
1927	1,592.2	1,728	9,556	6.00	5.53
1928		1,864	9,675		5.19
1929		1,999	9,793		4.94
1930		2,086	9,911		4.75

1913 to 1924 and the projection of these trends to 1930 are shown in Figure 16.

Applying the principle developed above, that the rate of traffic increase is equivalent to the rate of increase in motor vehicle registration, it is estimated that traffic for the Commonwealth as a whole will increase 69.7 per cent between 1924 and 1930.

The present number of persons per car varies considerably in different parts of the Commonwealth, as does also the rate of population growth.<sup>20</sup>

To allow for differences in the increase in registration and in traffic in the different counties the number of persons per car based on estimated population in 1924 for each county were obtained. To this 1924 value for each county was applied the rate of State average decrease in persons per car between 1924 and 1930. The estimated registration for each county in 1930 was then obtained by applying the estimated number of persons per car in 1930 for each county to the estimated 1930 population of the county. From the actual county registration in 1924 and the

estimated registration in 1930 the percentage increase in registration and in traffic for the county was obtained. This method results in the same total for the Commonwealth as a whole and reflects the difference between counties in intensity of registration in 1924 as well as differences in county rates of population growth. The expected registration and traffic growth, 1924 to 1930, varies from 11.1 per cent in one of the northern counties which has a rapidly decreasing population, to 84.7 per cent. in Delaware County which has the highest rate of population increase of all the counties.

The expected average daily traffic in 1930 at each of the survey stations as determined by applying the county rates of traffic increase to each of these stations is shown in Appendix II.

Because of possible industrial and suburban developments as well as changes in the highway system both as to location of routes, routing of traffic, and types of improvement it is not expected that these estimates will in all cases reflect exactly the actual traffic in 1930, but it is believed that they will reflect with reasonable accuracy the traffic in areas of considerable size and on routes of considerable length.

<sup>20</sup> See discussion of Motor Vehicle Traffic and Population, pp—

## APPENDIX I

### COMMODITIES TRANSPORTED

The kinds of commodities hauled on the highways of Pennsylvania vary, to a great extent, with the type of industries in the several sections. Products of manufacture, as shown in Table 41 form the principal class of commodities transported over the highways. This class includes a large number of individual commodities and is the most important part of the commodity movement on practically every highway.

**Table 41—Classification of commodities carried by motor truck<sup>1</sup>**

Class of commodities	Net cargo tonnage
	Per cent
Products of manufacture .....	60.3
Products of mines .....	13.1 <sup>2</sup>
Products of animals .....	10.9
Products of agriculture .....	9.0
Products of forests .....	6.7 <sup>2</sup>
<b>Total .....</b>	<b>100.0</b>

<sup>1</sup> Based on an analysis of 216,000 net tons of commodities.

<sup>2</sup> Short-haul movements occurring only on certain areas.

The more important commodity items in products of manufacture are gasoline, groceries, and used household furniture. These are commodities which are hauled on practically all of the State highways; and together they constitute over 14 per cent of all motor truck tonnage. The average length of haul of these commodities varies greatly. The transportation of gasoline is a short haul movement. Used household furniture, on the other hand, is consistently hauled longer distances than any other commodity. Most of the trucks hauling this commodity travel over 50 miles per trip, the predominant length of trip being between 100 and 150 miles. The average net load of used household furniture is approximately 3,000 pounds and of gasoline 4,000 pounds.

Products of mines are the next most important class of commodities from the standpoint of per-

centage of total net tonnage. The important commodities in this class are clay, gravel, sand, stone, and coal. The transportation of these commodities depends largely upon the location of pits, quarries, and mines and is naturally confined to certain areas. In such areas the movement of these commodities is an important part of the total net tonnage. For example, on route 228, northeast of Pittsburgh, coal constitutes 64.6 per cent of the total motor truck net tonnage. Trucks engaged in this movement carry an average net load of 8,300 pounds over an average distance of 16 miles. On route 281, between Morrisville and Trenton, N. J., 48.6 per cent of the motor truck tonnage hauled is sand and gravel. This is a short-haul movement of 3 miles, the net loads averaging 10,970 pounds. Although these products of mines are a considerable part of the motor truck tonnage in certain areas, their relative importance in highway transportation is lessened by the fact that they occur as motor-truck commodities in a very limited number of areas and are hauled for short distances only.

Products of animals, composing 10.9 per cent of total tonnage, are the third largest class of commodities. Of this class milk and cream are the principal individual commodities. Their total tonnage is 60.2 per cent. of the tonnage of products of animals and 6.3 per cent of all motor truck tonnage. Milk, cream and other dairy products, although their tonnage is not great, are hauled on practically all routes of the highway system. The balance of the net tonnage of products of animals is composed chiefly of meat and packing house products.

Products of agriculture of some kind are hauled on all highways, even though their tonnage is but 9.0 per cent of total net tonnage. The most important commodities in this class are fresh fruits and vegetables which together constitute 5.4 per cent of all motor truck tonnage and 60.0 per

cent of products of agriculture. They form one of the most important individual commodity movements on nearly every highway. The average net load of fruits and vegetables weighs approximately 2,000 pounds and is hauled between 20 and 30 miles. There are some products of agriculture which are grown and hauled only in certain areas. Raw tobacco, for instance, composes 14.0 per cent of the total net tonnage of commodities on route 148, north of Lancaster. These special movements, however, do not form an appreciable proportion of the total tonnage.

Products of forest, the least important class of commodities, are, like products of mines, restricted to certain areas. They constitute a considerable part of the total net tonnage on a very few routes. One of these is route 4, southwest of Wilkes-Barre, where the tonnage of products of forests is 38.8 per cent. of the total motor truck tonnage. The movement of products of forests is limited in most cases to 25 miles, most of the hauls being under 20 miles. Net loads range from 2,000 to 4,000 pounds.

Table 42 shows the classification of motor trucks according to the nature of their origin and destination based on data obtained with respect to 215,045 loaded trucks.

The importance of retail deliveries to consumers is indicated by the fact that 21.9 per cent of all loaded trucks originate at retail establishments and the same proportion terminate at consumers. Movements to and from retail establishments, wholesale establishments and con-

sumers, which may be classed as the distribution of consumption goods comprise 56.3 per cent of the origins and 50.1 per cent of the destinations.

Manufacturing companies are also important sources and destinations of motor trucks; this movement is composed of the transfer of goods in process between manufacturing plants and the delivery of finished materials. Farms are the origin of 7.8 per cent and the destination of 6.9 per cent of all trucks. Movement to and from terminals constitutes approximately 6 per cent of the truck movement. Construction and repair jobs, which are the destination of 11.0 per cent of all trucks, are the principal destinations in the movement of building materials.

Table 42—Types or origin and destination of loaded trucks

Types of origin or destination	Loaded trucks by types of origin	Loaded trucks by types of destination
	Per cent	Per cent
Retail establishments .....	21.9	28.0
Wholesale establishments .....	20.9	10.2
Original source of supply <sup>1</sup> .....	6.0	1.1
Manufacturing companies .....	18.4	12.9
Terminals <sup>2</sup> .....	6.0	6.3
Farms .....	7.8	6.9
Consumers <sup>3</sup> .....	13.5	21.9
Storage <sup>4</sup> .....	1.9	0.8
Construction and repairs .....	3.0	11.0
Miscellaneous .....	0.0	0.0
<b>Total .....</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Includes mines, quarries, sand and gravel pits, and gas and oil wells.

<sup>2</sup> Railroad and motor truck terminals.

<sup>3</sup> Residences, institutions, hotels and restaurants.

<sup>4</sup> Warehouses and stock and junk yards.







MOTOR VEHICLE TRAFFIC AT TRANSPORT SURVEY STATIONS—Continued

County	Route no.	(New) Station No.	Average daily number of motor vehicles—1924				Forecast of average daily traffic 1930	County	Route no.	(New) Station No.	Average daily number of motor vehicles—1924				Forecast of average daily traffic 1930
			Trucks	Passenger-cars	Total	Maximum					Trucks	Passenger-cars	Total	Maximum	
Butler	281	P 21	868	5,788	6,676	18,360	10,970	Carbon	P 162	135	119	745	864	2,380	1,450
		124	336	2,273	3,009	8,180	5,980			568	128	773	899	2,470	1,540
		S 584	88	859	947	2,600	1,580			549	214	1,320	1,574	4,320	2,630
		P 525	146	1,426	1,572	4,320	2,580			196	164	1,212	1,378	3,780	2,300
	S 326	S 526	75	733	808	2,220	1,330	570	200	1,482	1,682	4,680	2,800		
		P 527	415	2,706	3,121	8,580	5,130	571	38	354	392	1,040	670		
		528	25	229	254	700	420	137	40	516	566	1,580	950		
		529	29	265	294	810	480	572	29	378	407	1,120	700		
	S 362	530	52	477	529	1,460	870	574	64	627	676	2,450	1,530		
		531	24	226	250	690	410	574	70	606	676	2,680	1,640		
		532	23	873	896	1,070	1,000	575	94	1,548	1,642	6,160	2,630		
		126	77	1,520	1,597	4,310	2,600	576	34	181	177	660	500		
	P 71	533	64	1,299	1,333	3,030	2,170	577	21	207	223	1,370	810		
		534	72	1,438	1,510	4,080	2,460	577	21	207	223	1,370	810		
		126	79	1,604	1,773	4,790	2,860	P 778	73	1,194	1,266	4,750	2,020		
		535	64	1,393	1,427	3,850	2,320	579	18	216	229	1,800	1,000		
	P 73	536	59	1,121	1,174	4,340	1,910	580	48	463	511	1,900	1,040		
		537	50	1,051	1,101	4,070	1,790	581	116	1,126	1,243	4,660	1,330		
		538	18	135	208	550	310	582	74	717	791	2,970	1,230		
		539	11	148	159	590	290	583	75	673	743	2,760	1,190		
	S 75	127	35	482	517	1,400	840	584	161	1,453	1,614	5,070	2,570		
		540	42	569	611	1,650	1,000	139	46	522	568	2,130	1,040		
		541	39	536	575	1,550	940	585	70	800	870	3,290	1,300		
		542	56	771	827	2,230	1,350	P 140	34	102	136	500	220		
	S 78	P 79	22	1,118	1,232	3,410	2,000	P 141	66	668	719	2,700	1,130		
		543	23	167	189	510	1,030	586	90	871	961	3,600	1,300		
		129	50	879	929	2,510	1,510	587	29	279	308	1,180	490		
		544	28	406	429	1,180	700	588	37	363	400	1,440	550		
S 214	545	57	1,004	1,001	2,880	1,730	P 589	32	313	345	1,200	380			
	546	14	143	157	420	260	S 590	15	144	159	600	230			
	547	10	98	108	290	180	591	39	374	412	1,540	640			
	548	88	376	414	1,120	670	592	22	218	240	800	380			
S 246	549	26	259	284	770	400	593	22	218	240	800	380			
	550	59	594	653	1,760	1,060	594	6	57	63	240	100			
	551	55	551	606	1,640	900	595	5	53	58	230	90			
	129	90	1,088	1,178	3,180	2,080	596	132	1,189	1,315	4,600	2,100			
P 52	130	122	1,143	1,265	3,420	2,180	142	15	154	169	680	270			
	552	95	807	992	2,680	1,710	597	10	96	108	400	240			
	553	96	904	1,000	2,700	1,720	598	23	240	260	2,770	1,630			
	554	59	1,028	1,087	2,940	1,870	599	170	1,657	1,768	5,500	2,370			
S 251	555	57	1,002	1,059	2,860	1,820	600	128	1,249	1,377	5,020	2,490			
	P 52	22	883	405	1,090	700	601	119	1,162	1,281	3,530	2,040			
	556	51	806	947	2,540	1,630	602	42	698	810	2,560	1,440			
	557	39	376	414	1,120	710	603	45	1,007	1,053	2,900	1,710			
S 221	558	84	446	480	1,760	830	143	199	1,908	2,102	5,700	3,410			
	133	81	990	1,061	2,860	1,830	604	84	796	842	2,430	1,430			
	559	94	1,148	1,242	3,350	2,140	605	117	1,111	1,229	3,380	1,900			
	560	185	1,639	1,771	4,780	3,060	606	37	359	378	1,330	610			
S 222	561	76	761	837	2,280	1,440	607	93	856	949	2,610	1,540			
	562	68	659	725	1,900	1,250	608	149	1,376	1,525	4,100	2,480			
	P 52	93	930	1,023	2,780	1,760	144	70	1,074	1,114	3,150	1,960			
	563	08	160	176	490	300	609	31	310	337	910	540			
S 222	564	16	160	176	490	300	610	31	310	337	910	540			
	565	52	388	420	1,130	720	611	25	248	273	1,140	670			
	134	26	827	852	1,300	420	P 24	843	2,745	3,088	8,400	5,010			
	566	12	143	155	570	180	145	196	2,732	2,930	8,060	4,700			
Cameron	276	P 503	08	930	1,023	2,780	1,760	Chester	P 131	595	5	53	58	230	90
		564	16	160	176	490	300			602	42	698	810	2,560	1,440
		565	52	388	420	1,130	720			603	45	1,007	1,053	2,900	1,710
		566	26	827	852	1,300	420			604	84	796	842	2,430	1,430
	P 105	134	12	143	155	570	180	605	117	1,111	1,229	3,380	1,900		
		507	16	187	203	750	240	606	37	359	378	1,330	610		
		S 184	508	26	827	852	1,300	420	607	93	856	949	2,610	1,540	
			509	08	930	1,023	2,780	1,760	608	149	1,376	1,525	4,100	2,480	
	510		16	160	176	490	300	609	31	310	337	910	540		
	511		25	248	273	1,140	670	610	31	310	337	910	540		
	S 184	512	25	248	273	1,140	670	611	25	248	273	1,140	670		
		513	26	827	852	1,300	420	612	25	248	273	1,140	670		
514		12	143	155	570	180	613	25	248	273	1,140	670			
515		16	187	203	750	240	614	25	248	273	1,140	670			
S 184	516	16	187	203	750	240	615	25	248	273	1,140	670			
	517	16	187	203	750	240	616	25	248	273	1,140	670			
	518	16	187	203	750	240	617	25	248	273	1,140	670			
	519	16	187	203	750	240	618	25	248	273	1,140	670			
S 184	520	16	187	203	750	240	619	25	248	273	1,140	670			
	521	16	187	203	750	240	620	25	248	273	1,140	670			
	522	16	187	203	750	240	621	25	248	273	1,140	670			
	523	16	187	203	750	240	622	25	248	273	1,140	670			
S 184	524	16	187	203	750	240	623	25	248	273	1,140	670			
	525	16	187	203	750	240	624	25	248	273	1,140	670			
	526	16	187	203	750	240	625	25	248	273	1,140	670			
	527	16	187	203	750	240	626	25	248	273	1,140	670			
S 184	528	16	187	203	750	240	627	25	248	273	1,140	670			
	529	16	187	203	750	240	628	25	248	273	1,140	670			
	530	16	187	203	750	240	629	25	248	273	1,140	670			
	531	16	187	203	750	240	630	25	248	273	1,140	670			
S 184	532	16	187	203	750	240	631	25	248	273	1,140	670			
	533	16	187	203	750	240	632	25	248	273	1,140	670			
	534	16	187	203	750	240	633	25	248	273	1,140	670			
	535	16	187	203	750	240	634	25	248	273	1,140	670			
S 184	536	16	187	203	750	240	635	25	248	273	1,140	670			
	537	16	187	203	750	240	636	25	248	273	1,140	670			
	538	16	187	203	750	240	637	25	248	273	1,140	670			
	539	16	187	203	750	240	638	25	248	273	1,140	670			
S 184	540	16	187	203	750	240	639	25	248	273	1,140	670			
	541	16	187	203	750	240	640	25	248	273	1,140	670			
	542	16	187	203	750	240	641	25	248	273	1,140	670			
	543	16	187												



MOTOR VEHICLE TRAFFIC AT TRANSPORT SURVEY STATIONS—Continued

County	Route no.	(New) Station No.	Average daily number of motor vehicles—1924				Forecast of average daily traffic 1930	County	Route no.	(New) Station No.	Average daily number of motor vehicles—1924				Forecast of average daily traffic 1930
			Trucks	Passengers	Total	Maximum					Trucks	Passengers	Total	Maximum	
Delaware	S 140	173	96	895	961	2,700	1,640	P 86	756	51	1,532	1,328	5,120	2,420	
		717	230	2,112	2,343	6,440	3,930		P 87	89	180	2,380	2,500	9,470	4,500
	P 100	718	78	718	791	2,180	1,320	184	86	2,254	2,340	8,890	4,100		
		718	91	898	929	2,560	1,580	759	159	2,116	2,275	8,420	4,080		
	P 100	719	691	766	2,110	1,220	700	142	1,846	2,028	7,500	3,530			
		720	40	372	412	1,130	690	761	76	2,571	2,647	9,700	4,740		
	P 100	721	50	460	510	1,400	820	S 145	91	566	657	2,430	1,180		
		722	70	651	721	1,980	1,210		P 186	5	128	145	580	1,800	
	P 130	723	82	789	850	2,340	1,420	S 304	83	516	590	2,220	1,070		
		724	102	949	1,051	2,800	1,700		S 762	84	298	343	2,000	2,030	
	P 130 & 225	725	88	818	906	2,490	1,520	S 258	187	50	640	670	2,570	1,240	
		726	84	782	7,824	8,586	10,890		15,890	752	79	1,076	1,156	4,270	2,070
	P 131 & 185	727	801	3,156	3,457	8,850	6,880	764	44	564	608	2,250	1,000		
		728	811	3,308	3,114	95,080	16,830	765	171	2,270	2,441	9,030	4,870		
	P 131 & 185	727	830	3,478	3,812	10,480	7,040	P 272	40	171	2,180	2,351	8,350	3,910	
		728	179	1,718	1,849	5,200	3,490		P 50	766	51	1,150	1,181	2,190	1,990
	181	729	208	2,032	2,240	6,100	4,140	767	809	2,659	2,878	7,740	4,810		
		730	194	1,308	1,443	3,970	2,660	S 119	98	1,157	1,255	3,380	2,110		
	182	P 95	534	3,756	4,200	11,580	7,920	768	98	1,157	1,255	3,380	2,110		
		S 176	84	818	902	2,480	1,670	41	106	1,374	1,480	4,000	2,480		
	S 138	730	79	773	852	2,340	1,570	188	357	3,020	3,277	8,850	5,500		
		P 731	506	4,207	4,803	13,210	8,870	769	162	1,911	2,073	5,600	3,480		
	P 135	732	86	5,632	6,168	18,020	11,890	42	189	1,432	1,600	4,820	2,680		
		733	178	1,806	2,044	5,820	3,780	770	246	2,298	2,534	6,840	4,250		
	P 142	734	118	1,187	1,300	3,580	2,400	771	164	1,399	1,503	4,220	2,620		
		S 144	177	605	4,802	5,407	10,420	9,900	772	122	1,044	1,166	3,150	1,960	
	S 179	735	40	421	497	1,280	800	43	106	1,500	1,606	4,340	2,700		
		736	28	212	235	660	430	189	152	1,620	1,772	4,780	2,970		
	180	P 178	600	5,133	5,733	10,100	6,900	190	118	1,420	1,538	4,150	2,580		
		737	45	414	459	1,260	850	773	128	1,815	1,943	5,250	3,200		
P 180	738	767	3,938	4,765	13,100	8,800	774	105	2,389	2,534	6,840	4,250			
	739	805	4,210	5,018	13,800	9,270	775	147	1,568	1,705	4,900	2,840			
P 225	740	117	844	941	2,640	1,610	776	112	1,122	1,234	3,330	2,070			
	S 742	48	343	391	1,080	720	777	36	359	395	1,070	680			
Elk	P 89	741	106	705	871	2,400	1,610	778	102	1,023	1,125	3,040	1,840		
		742	48	343	391	1,080	720	779	14	148	197	730	390		
P 97	743	74	779	863	2,360	1,580	191	78	1,040	1,166	3,210	1,980			
	744	109	1,146	1,294	3,450	2,330	780	68	917	948	2,700	1,580			
P 99	745	276	2,092	3,178	8,740	5,870	781	78	1,092	1,170	2,940	1,880			
	746	28	346	374	1,380	580	782	100	1,397	1,497	4,120	2,410			
Erie	P 84	747	84	424	468	1,700	710	783	98	1,246	1,344	3,700	2,100		
		748	40	481	521	1,930	810	784	99	1,251	1,350	3,710	2,170		
P 84	749	29	354	383	1,420	1,310	785	58	740	798	2,190	1,290			
	750	40	532	572	2,120	800	786	48	615	653	1,870	1,070			
P 85	751	48	487	525	2,530	1,080	787	80	1,141	1,220	3,360	1,900			
	752	43	569	612	2,200	950	788	81	1,013	1,094	3,010	1,760			
P 86	753	80	769	730	2,730	1,320	789	53	665	718	1,970	1,100			
	754	83	1,134	1,217	4,500	2,190	790	54	729	787	2,160	1,270			
P 86	755	104	1,475	1,543	5,840	2,840	791	91	1,132	1,223	3,360	1,970			
	756	98	1,778	1,810	6,870	3,310	792	44	1,042	1,132	3,060	1,920			
P 86	757	127	1,698	1,810	6,700	3,200	793	129	1,482	1,611	4,430	2,540			
	758	155	2,064	2,219	8,210	3,990	794	104	22	381	408	1,110	650		
P 86	759	70	259	279	1,030	1,500	795	50	792	872	2,290	1,300			
	760	127	1,698	1,810	6,700	3,200	796	15	366	403	1,110	650			
Franklin	P 86	761	80	769	730	2,730	1,320	797	19	178	197	640	370		
		762	83	1,134	1,217	4,500	2,190	798	24	325	349	690	400		
Fayette	P 50	763	104	1,475	1,543	5,840	2,840	799	104	22	381	408	1,110	650	
		764	98	1,778	1,810	6,870	3,310	800	50	792	872	2,290	1,300		
Forest	P 98	765	117	844	941	2,640	1,610	801	15	366	403	1,110	650		
		766	106	705	871	2,400	1,610	802	19	178	197	640	370		
Franklin	P 85	767	48	343	391	1,080	720	803	24	325	349	690	400		
		768	106	705	871	2,400	1,610	804	24	325	349	690	400		
P 85	769	106	705	871	2,400	1,610	805	24	325	349	690	400			
	770	106	705	871	2,400	1,610	806	24	325	349	690	400			
P 85	771	106	705	871	2,400	1,610	807	24	325	349	690	400			
	772	106	705	871	2,400	1,610	808	24	325	349	690	400			
P 85	773	106	705	871	2,400	1,610	809	24	325	349	690	400			
	774	106	705	871	2,400	1,610	810	24	325	349	690	400			
P 85	775	106	705	871	2,400	1,610	811	24	325	349	690	400			
	776	106	705	871	2,400	1,610	812	24	325	349	690	400			
P 85	777	106	705	871	2,400	1,610	813	24	325	349	690	400			
	778	106	705	871	2,400	1,610	814	24	325	349	690	400			
P 85	779	106	705	871	2,400	1,610	815	24	325	349	690	400			
	780	106	705	871	2,400	1,610	816	24	325	349	690	400			
P 85	781	106	705	871	2,400	1,610	817	24	325	349	690	400			
	782	106	705	871	2,400	1,610	818	24	325	349	690	400			
P 85	783	106	705	871	2,400	1,610	819	24	325	349	690	400			
	784	106	705	871	2,400	1,610	820	24	325	349	690	400			
P 85	785	106	705	871	2,400	1,610	821	24	325	349	690	400			
	786	106	705	871	2,400	1,610	822	24	325	349	690	400			
P 85	787	106	705	871	2,400	1,610	823	24	325	349	690	400			
	788	106	705	871	2,400	1,610	824	24	325	349	690	400			
P 85	789	106	705	871	2,400	1,610	825	24	325	349	690	400			
	790	106	705	871	2,400	1,610	826	24	325	349	690	400			
P 85	791	106	705	871	2,400	1,610	827	24	325	349	690	400			
	792	106	705	871	2,400	1,610	828	24	325	349	690	400			
P 85	793	106	705	871	2,400	1,610	829	24	325	349	690	400			
	794	106	705	871	2,400	1,610	830	24	325	349	690	400			
P 85	795	106	705	871	2,400	1,610	831	24	325	349	690	400			
	796	106	705	871	2,400	1,610	832	24	325	349	690	400			
P 85	797	106	705	871	2,400	1,610	833	24	325	349					

		797	81	290	321	380	520			P 32	849	60	928	988	3,700	1,520
	P 121 & 193	195	4	152	156	420	250			S 193	850	48	789	784	2,940	1,210
	S 122	798	5	47	52	140	80			S 194	210	32	194	226	850	850
	S 224	799	27	246	278	750	440				211	48	285	343	1,290	530
		800	43	401	444	1,220	720				851	28	169	197	740	800
		801	51	470	521	1,430	840		Lackawanna	P 5	212	626	3,888	4,514	10,790	7,500
		802	61	564	625	1,720	1,010				802	719	4,454	5,173	19,400	8,000
		803	70	653	723	1,990	1,160			P 6	48	804	1,887	2,251	8,440	3,740
	S 264	804	5	71	79	220	180				213	121	904	1,025	8,840	1,700
		805	14	127	141	390	230				853	585	3,025	3,610	13,540	6,000
		806	7	66	73	200	120				854	506	2,930	3,490	13,110	5,810
		807	6	60	66	180	110			P 9	855	348	1,803	2,151	8,070	3,580
	S 340	808	19	178	197	540	320				49	313	2,382	3,195	8,790	5,310
	S 341	809	29	268	297	820	480				214	376	2,739	3,115	11,680	5,180
		810	22	208	230	630	370			P 168	856	275	2,535	2,810	10,540	4,670
		811	16	148	164	450	260				50	140	1,884	2,024	7,500	3,360
Fulton	P 37 & 224	196	106	931	1,037	2,800	1,760				857	70	947	1,017	8,810	1,690
	P 37	812	47	495	542	1,460	920				858	109	1,472	1,581	5,930	2,630
		813	85	372	407	1,100	690			P 174	215	114	562	678	2,540	1,120
	S 38	814	21	212	238	630	360				859	111	545	666	2,460	1,000
	P 39	197	31	570	601	1,620	1,020			S 335	860	43	323	371	1,390	620
		815	20	360	390	1,030	650			S 365	861	54	525	579	2,170	960
	P 192	198	18	174	192	520	300		Lancaster	128	P 51	198	1,991	2,187	6,010	2,530
		816	17	163	180	490	280				862	184	1,965	2,049	5,640	3,310
		817	12	122	134	360	210				863	172	1,739	1,911	5,260	3,090
	S 224	199	24	134	158	430	250				864	194	1,902	2,156	5,930	3,480
Greene	P 110	200	32	268	300	810	490				865	293	2,950	3,252	8,940	5,260
		818	43	361	404	1,090	660				S 366	70	710	780	2,140	1,260
		819	30	247	277	750	450			P 129	216	120	1,657	1,777	4,890	2,870
	S 111	201	49	512	560	1,510	910				867	147	2,015	2,162	5,950	3,490
		820	49	519	568	1,530	930				868	132	1,816	1,948	5,300	3,150
	P 208	45	118	916	1,084	2,790	1,690				869	108	1,474	1,682	4,350	2,560
		821	79	611	690	1,860	1,180				870	101	1,385	1,486	4,050	2,400
		822	132	1,023	1,155	3,120	1,890				871	125	1,709	1,831	5,040	2,900
Huntingdon	P 325	202	12	222	234	630	380				872	118	1,621	1,739	4,780	2,810
	P 33	46	98	1,074	1,172	3,160	1,980			P 186 & 345	873	161	2,204	2,365	6,500	3,830
	S 49	823	72	791	868	2,390	1,390				217	13	119	132	2,900	480
		824	24	239	268	710	420				218	102	944	1,046	2,880	1,600
		825	88	375	416	1,120	670				874	124	1,141	1,265	3,480	2,040
	S 55	S 208	108	1,862	1,470	5,440	3,500				875	74	685	759	2,000	1,230
	S 55	S 204	62	813	875	3,240	1,410			S 137	219	28	457	486	1,330	790
		S 226	53	654	707	2,620	1,140				876	84	546	580	1,620	940
		P 327	64	783	847	3,180	1,440			S 137	877	45	739	784	2,160	1,270
		828	120	1,477	1,597	5,910	2,720				878	46	746	792	2,180	1,280
		829	26	339	365	1,350	590				879	28	374	397	1,030	640
	S 56	830	60	599	659	1,780	1,060			S 138	220	31	721	802	2,210	1,300
	P 121	831	60	603	663	1,790	1,130				880	34	751	835	2,300	1,350
	P 192	832	12	159	171	630	290				881	31	717	798	2,190	1,290
	S 261	883	22	284	306	1,130	490				882	94	832	928	2,570	1,500
	S 346	884	16	213	229	850	370				883	147	1,310	1,457	4,010	2,300
	S 352	205	38	606	644	1,740	1,120				S 394	104	990	1,084	2,930	1,720
Indiana		835	34	550	584	1,580	1,010				885	19	179	198	640	320
		836	10	156	166	450	260				S 395	26	244	270	870	440
		887	28	373	396	1,070	690				P 347	97	1,195	1,292	3,650	2,050
	P 68	47	94	1,087	1,181	3,190	2,050				52	35	901	996	2,710	1,500
		206	66	824	892	2,410	1,550				888	77	879	966	2,690	1,540
		888	95	1,087	1,182	3,190	2,050				889	69	783	852	2,340	1,380
		889	62	708	770	2,080	1,340				890	95	1,065	1,191	3,220	1,920
	S 223	840	27	273	300	810	720				891	127	1,446	1,573	4,890	2,540
	S 223	207	30	538	568	1,530	990				892	130	1,479	1,609	4,420	2,800
		841	18	319	337	910	580				893	79	902	981	2,700	1,580
Jefferson		208	48	398	446	1,650	700				894	69	783	852	2,340	1,380
	P 59	842	91	1,135	1,226	4,540	1,910			P 215	P 221	38	1,582	1,665	4,590	2,600
	P 60	843	39	697	736	2,720	1,150				895	96	1,314	1,910	5,250	3,090
		844	39	691	730	2,700	1,140				896	35	1,608	1,693	4,690	2,740
		845	20	258	278	1,030	430				S 397	19	393	392	1,050	670
		846	39	799	838	3,100	1,310			S 244	222	66	532	599	1,640	970
		847	26	238	264	980	3,090				898	45	396	411	1,130	660
Juniata		P 31	847	437	491	1,840	760				899	58	465	523	1,440	840
		848	92	748	840	3,150	1,290			S 230	900	39	800	399	1,100	640

MOTOR VEHICLE TRAFFIC AT TRANSPORT SURVEY STATIONS—Continued

County	Route no.	(New) Station No.	Average daily number of motor vehicles—1924				Forecast of average daily traffic 1930	County	Route no.	(New) Station No.	Average daily number of motor vehicles—1924				Forecast of average daily traffic 1930	
			Trucks	Passenger-cars	Total	Maximum					Trucks	Passenger-cars	Total	Maximum		
Lawrence	S 832 S 844 P 77 P 80 P 81	901	21	192	213	590	840	Luzerne	S 226 S 297 P 4 P 5 S 11 P 169 P 170 S 177 S 184 P 185 P 232 S 227 S 261 P 18 P 18 P 19 20 P 21 P 23 S 176 S 240	943	133	1,212	1,345	3,700	2,300	
		902	32	209	331	910	640			944	129	1,178	1,307	3,590	2,290	
		903	94	777	861	2,370	1,390			945	42	373	414	1,140	750	
		904	63	533	646	1,790	1,040			946	47	414	461	1,270	810	
		905	68	626	694	1,910	1,120			947	236	91	700	791	2,180	1,380
		906	43	400	443	1,220	720			948	115	898	1,001	2,750	1,770	
		907	20	192	202	560	330			949	56	390	2,282	2,872	10,020	4,510
		908	81	286	317	870	510			947	127	600	687	3,510	1,580	
		909	52	586	937	3,470	1,630			949	124	727	851	3,190	1,440	
		910	64	1,080	1,144	4,230	1,990			950	179	1,049	1,226	4,600	2,070	
	911	136	1,571	1,707	6,320	2,970	951	419	2,448	2,867	10,750	4,840				
	912	133	1,525	1,658	6,140	2,890	952	237	545	3,472	4,017	15,060	6,780			
	913	82	947	1,029	3,810	1,790	953	545	3,375	3,323	14,700	6,620				
	914	106	1,438	1,544	5,710	2,680	954	323	2,000	2,492	9,710	3,920				
	915	107	1,450	1,557	5,760	2,710	955	238	3,062	3,492	13,100	5,860				
	916	73	891	1,064	3,940	1,850	956	391	2,784	3,175	11,910	5,360				
	917	123	1,290	1,413	5,230	2,460	957	239	26	403	429	1,610	720			
	918	19	244	268	970	480	958	15	239	258	1,950	490				
	919	36	406	502	1,860	870	959	74	1,131	1,205	4,520	2,030				
	920	70	872	942	3,480	1,640	960	96	946	1,042	3,910	1,760				
921	101	1,261	1,362	5,040	2,370	961	240	672	785	2,870	1,290					
922	76	956	1,032	3,820	1,790	962	75	725	800	3,009	1,350					
923	77	604	681	1,870	1,110	963	35	341	378	1,410	640					
924	186	1,066	1,202	3,310	1,960	964	94	947	1,042	3,910	1,780					
925	130	1,020	1,150	3,160	1,870	965	94	919	1,019	3,800	1,710					
926	61	544	605	1,960	980	966	53	511	564	2,120	970					
927	203	2,002	2,205	6,060	3,590	967	241	123	806	934	3,500	1,580				
928	182	1,792	1,974	5,430	3,210	968	97	610	707	2,650	1,190					
929	177	1,743	1,920	5,280	3,130	969	108	942	1,050	2,940	1,770					
930	46	428	474	1,300	770	970	242	96	1,044	4,280	1,920					
931	25	227	252	690	410	971	963	53	573	631	2,370	1,090				
932	36	331	367	1,010	600	972	964	102	639	741	2,780	1,250				
933	34	314	348	990	570	973	965	36	353	389	1,480	660				
934	51	417	468	1,290	760	974	58	373	3,121	3,870	5,270					
935	76	623	699	1,920	1,140	975	208	2,284	2,492	9,340	3,990					
936	72	589	661	1,820	1,080	976	58	639	697	2,610	1,120					
937	41	337	373	1,040	620	977	100	1,108	1,208	4,530	1,940					
938	183	1,454	1,637	4,500	2,660	978	161	1,778	1,939	7,270	3,110					
939	136	1,414	1,560	4,760	2,520	979	200	2,296	2,406	9,020	3,850					
940	121	1,253	1,374	3,790	2,240	980	198	2,132	2,325	8,720	3,720					
941	108	1,124	1,232	3,390	3,010	981	90	954	1,046	3,920	1,690					
942	35	283	323	890	530	982	144	1,533	1,677	6,290	2,600					
943	41	338	379	1,040	620	983	92	974	1,096	4,000	1,710					
944	49	402	451	1,240	730	984	20	206	229	860	240					
945	183	1,344	1,529	4,200	2,860	985	76	997	1,073	4,020	1,770					
946	217	1,538	1,805	4,960	3,160	986	78	1,016	1,094	4,100	1,780					
947	263	1,859	2,112	5,810	3,700	987	47	606	655	2,480	1,050					
948	126	1,712	1,833	5,050	3,220	988	19	242	261	980	420					
949	118	1,569	1,707	4,690	2,990	989	41	404	445	1,670	710					
950	188	1,413	1,601	4,400	2,990	990	103	1,149	1,251	4,690	2,000					
951	105	792	897	2,470	1,570	991	146	1,635	1,781	6,690	2,850					
952	125	945	1,070	2,940	1,870	992	120	1,346	1,466	5,500	2,350					
953	125	945	1,070	2,940	1,870	993	108	1,215	1,323	4,960	2,120					
954	196	1,483	1,679	4,670	2,940	994	8	80	33	120	50					
955	199	1,810	2,008	5,520	3,520	995	35	344	379	1,420	670					
956	104	1,140	1,244	3,420	2,180	996	11	103	114	430	180					
957	140	1,278	1,413	3,900	2,480	997	117	1,134	1,261	4,660	2,000					

HIGHWAY TRANSPORTATION SURVEY

		985	69	669	738	2,770	1,180				P 1088	60	774	824	3,130	1,400
	S 240	986	44	431	475	1,780	760				1,039	20	201	281	1,060	470
	S 268	987	29	281	310	1,160	500			P 192	261	63	776	839	3,150	1,410
	S 289	988	11	104	115	430	180		Monroe -----	P 184	1,040	67	647	714	2,680	1,230
	S 321	989	2	20	22	80	40			P 164	262	96	578	674	2,530	1,640
		990	11	108	114	430	180			S 165	1,041	94	566	659	2,470	1,610
	S 308	991	21	202	223	840	380			P 166	1,042	67	558	615	2,310	1,000
	S 321	992	4	85	89	150	60			P 167	263	180	1,825	1,961	7,350	3,190
	S 331	993	14	133	147	560	240			P 167 & 220	264	180	1,240	1,870	5,140	2,230
	S 353	994	12	117	129	480	210			P 167	265	37	545	582	2,180	960
McKean -----	F 96	995	9	88	97	360	160			P 167	1,048	77	729	806	3,020	1,310
		996	30	498	523	1,950	840			P 168 & 254	1,048	41	383	434	1,630	710
		996	80	503	533	1,970	850			P 168	266	67	1,170	1,237	4,640	2,010
		997	25	820	845	1,280	650				267	171	1,791	1,962	7,360	3,190
	F 96	997	38	638	676	2,500	1,080				1,045	105	1,102	1,207	4,630	1,990
		246	70	1,191	1,261	4,670	2,010				1,046	71	748	819	3,070	1,330
		998	74	1,246	1,320	4,880	2,100			S 169	1,047	20	194	214	800	350
		999	29	496	525	1,940	840			S 171	1,048	59	579	638	2,390	1,040
	S 97	1,000	27	448	475	1,760	780				1,049	10	97	107	400	170
		1,001	28	434	460	1,700	730		Montgomery -----	P 143	1,050	776	6,158	6,929	19,060	11,870
		248	76	790	866	3,200	1,380			P 148	268	140	987	1,127	3,100	1,930
	F 100	1,002	79	824	903	3,340	1,440				1,051	156	1,106	1,262	3,470	2,160
		1,003	29	428	455	1,680	1,450			P 145	62	124	935	1,059	2,910	1,810
	101	P 249	20	294	314	1,160	500				1,052	169	1,277	1,446	3,930	2,480
		S 1,004	18	188	201	740	320			P 146	1,053	99	744	843	3,320	1,440
		1,005	31	453	494	1,790	770				269	125	1,089	1,214	3,340	2,080
	S 210	1,006	41	301	322	1,190	510			P 146	270	253	1,664	1,917	5,270	3,280
		1,007	23	295	318	1,180	1,280				1,054	260	1,751	2,017	5,550	3,440
		1,008	47	614	661	2,450	1,050			P 146	1,055	130	1,186	1,266	3,480	2,170
Mercoer -----	F 73	260	56	1,117	1,173	4,340	2,030			P 151	1,056	186	1,621	1,807	4,970	3,100
		1,009	59	1,180	1,239	4,580	2,140				68	329	2,908	3,237	8,900	5,540
	S 74	61	164	2,336	2,500	8,250	4,320				1,057	694	5,108	6,802	19,710	11,650
		261	58	1,020	1,078	3,990	1,890				1,058	515	4,530	5,045	13,870	8,640
		1,010	49	806	915	3,390	1,580				1,059	849	3,070	3,419	9,400	5,890
		1,011	67	1,176	1,243	4,600	2,150			P 158	64	122	1,150	1,272	3,500	2,180
		1,012	159	2,249	2,408	8,910	4,160				1,060	841	3,210	3,551	9,760	6,080
	S 80	1,013	24	307	331	1,220	570				1,061	260	2,444	2,704	7,440	4,630
		262	80	802	832	3,080	1,440				1,062	106	1,027	1,136	3,120	1,950
	F 82	1,014	28	756	784	2,900	1,960			S 155	1,063	139	1,733	1,872	5,150	3,210
		1,015	29	782	811	3,000	1,400			S 158	1,064	98	908	1,004	2,760	1,720
		1,016	24	645	669	2,480	1,160				1,065	48	443	491	1,350	840
		1,017	46	1,239	1,285	4,750	2,220				1,066	59	541	600	1,630	1,020
		1,018	55	1,461	1,516	5,610	2,620			P 178	271	212	1,859	2,071	5,700	3,550
		1,019	28	621	644	2,380	1,110				272	43	458	506	1,390	870
		1,020	26	689	715	2,650	1,240				1,067	68	597	665	1,830	1,140
	S 208	263	29	436	459	1,700	790				1,068	123	1,131	1,259	3,460	2,180
		1,021	28	644	672	2,490	1,160			S 197	273	66	677	743	2,040	1,270
		1,022	24	552	576	2,130	1,000			S 197 & 373	274	110	900	1,010	2,780	1,730
		1,023	24	567	581	2,150	1,000			S 197	1,069	66	677	743	2,040	1,270
		1,024	23	514	536	1,980	990				1,070	62	632	694	1,910	1,190
	S 213	1,025	10	132	142	520	250				1,071	82	842	924	2,540	1,580
	F 338	264	60	1,177	1,237	4,580	2,140				1,072	100	1,022	1,122	3,090	1,920
		265	111	1,074	1,185	4,380	2,050			S 198	1,073	41	383	424	1,170	730
	P 258-320	266	115	1,416	1,531	5,690	2,650			S 198	1,074	126	1,170	1,296	3,590	2,220
		1,026	61	1,175	1,236	4,570	2,140				1,075	120	1,118	1,233	3,380	2,110
		1,027	19	245	264	980	460				1,076	46	422	468	1,290	800
	S 246	1,028	24	319	342	1,260	590				1,077	57	530	597	1,610	1,020
	S 312	1,029	39	754	796	2,930	1,370				275	100	743	849	2,330	1,450
	F 320	1,030	45	593	638	2,360	1,100			S 201	1,078	69	636	904	2,490	1,550
		267	31	308	329	900	400				1,079	44	537	581	1,600	1,000
Mifflin -----	F 23	1,081	45	801	846	1,300	580				1,080	37	1,067	1,154	3,170	1,930
		1,082	88	256	294	1,100	500				1,081	55	678	733	2,000	1,000
		268	229	2,046	2,275	8,520	3,330			S 202	1,082	44	407	451	1,240	770
	F 20	1,083	238	2,125	2,364	8,390	3,980			S 225	1,083	149	1,055	1,204	3,310	2,090
		1,084	197	1,732	1,949	7,310	3,280			S 270	1,084	51	471	522	1,440	890
		1,085	182	1,619	1,801	6,750	3,030				1,085	43	399	442	1,220	790
		1,086	90	800	830	3,340	1,500				1,086	12	112	124	340	210
	F 33	269	50	770	820	3,080	1,390			S 234	1,087	69	643	711	1,990	1,220
		1,087	50	771	821	3,080	1,380			S 362	1,088	80	740	870	2,220	1,400
	33	S 260	69	760	819	3,070	1,380			S 373	1,089	56	462	518	1,420	890

COMMONWEALTH OF PENNSYLVANIA



MOTOR VEHICLE TRAFFIC AT TRANSPORT SURVEY STATIONS—Continued

County	Route no.	(New) Station No.	Average daily number of motor vehicles—1924				Forecast of average daily traffic 1930	County	Route no.	(New) Station No.	Average daily number of motor vehicles—1924				Forecast of average daily traffic 1930
			Trucks	Passenger cars	Total	Maximum					Trucks	Passenger cars	Total	Maximum	
Montour -----	O. E.	1,090	88	268	801	880	520	Pike -----	S 298	1,131	41	288	424	1,170	640
	O. R.	1,350	274	1,582	1,856	5,100	3,180		1,132	54	496	550	1,510	840	
	P 2	1,851	872	3,074	3,448	9,480	5,900		1,133	48	442	490	1,350	740	
	P 3	1,091	44	522	566	2,120	1,440		287	36	390	326	1,220	450	
	S 240-250	1,092	75	901	978	3,860	1,860		1,134	19	142	161	600	280	
	240	278	104	654	758	2,840	1,150		89	60	910	970	3,640	1,350	
	P 158	1,098	68	429	497	1,830	780		1,135	45	697	732	2,740	1,030	
	P 159	65	142	1,579	1,721	4,780	2,080		298	26	470	498	1,800	680	
	165	68	290	2,448	2,708	7,450	4,680		1,136	26	472	498	1,870	690	
	168	1,094	834	3,060	3,424	9,420	5,920		1,137	26	471	497	1,860	680	
Northampton -----	P 1,095	165	1,628	1,698	4,860	2,980	1,138	8	104	112	410	120			
	P 1,096	175	1,623	1,798	4,940	3,110	1,139	22	314	336	1,240	370			
	S 1,097	166	1,582	1,698	4,870	2,940	1,140	18	259	377	1,020	310			
	P 1,098	117	1,083	1,200	3,300	2,080	289	26	404	480	1,500	480			
	P 1,099	105	969	1,073	3,850	1,860	2,080	1,141	15	232	247	910	370		
	P 1,100	178	1,636	1,812	4,980	3,130	1,142	10	157	187	620	180			
	S 1,101	180	1,678	1,853	5,100	3,200	1,143	16	242	258	900	200			
	S 1,102	114	1,051	1,165	3,200	2,010	1,144	5	80	88	310	98			
	S 1,108	98	904	1,022	2,760	1,730	1,145	7	98	105	380	120			
	S 1,104	119	1,097	1,216	3,840	2,100	1,146	5	59	63	230	70			
Northumberland ---	S 175 & 297	277	1,460	1,646	4,530	2,540	1,147	11	149	159	580	180			
	S 175	1,105	154	1,210	1,860	3,750	2,360	1,147	11	149	159	580	180		
	P 1,106	52	408	460	1,200	800	1,148	5	62	67	250	70			
	P 1,107	52	481	533	1,470	920	1,149	9	112	121	450	130			
	P 1,108	24	223	247	680	430	P 69	298	2,430	3,726	7,500	4,410			
	S 297	1,109	148	1,160	1,308	3,600	2,260	S 1,150	71	583	654	1,800	1,090		
	S 1	1,110	18	173	191	720	340	P 1,151	276	2,257	2,533	6,970	4,100		
	P 2	278	51	976	1,027	3,850	1,700	1,152	122	1,001	1,123	3,090	1,820		
	P 18	1,111	42	794	836	3,140	1,590	1,153	217	1,777	1,994	5,480	3,230		
	P 161	279	118	1,068	1,786	6,700	2,980	1,154	161	1,230	1,391	3,820	2,250		
Perry -----	P 161	290	68	1,290	1,368	5,090	2,250	1,155	151	1,147	1,289	3,570	2,100		
	P 161	1,112	75	1,062	1,137	4,200	1,880	1,156	124	942	1,066	4,000	1,720		
	P 161	1,113	120	1,695	1,815	6,510	3,010	1,157	161	1,219	1,360	3,820	2,050		
	P 161	67	856	2,078	2,434	9,130	4,040	1,158	146	1,115	1,261	4,730	2,040		
	P 161	281	130	1,305	1,436	5,380	2,380	1,159	70	146	1,064	1,210	1,940		
	P 161	1,114	248	1,461	1,699	6,370	2,820	1,160	247	1,797	2,044	5,620	3,310		
	P 161	1,115	596	3,488	4,078	15,290	6,760	1,161	244	1,770	2,014	5,540	3,260		
	P 161	1,116	236	1,381	1,617	6,090	2,680	1,161	224	1,624	1,848	5,080	2,940		
	P 161	1,117	45	443	488	1,830	810	1,162	139	1,008	1,148	3,160	1,480		
	P 161	1,118	60	538	643	2,410	1,070	1,163	158	1,348	1,534	5,750	2,430		
Snyder -----	P 80 & 40	1,119	58	521	574	2,150	960	1,164	168	1,148	1,349	3,710	2,180		
	P 80	282	82	844	870	1,030	570	1,165	164	1,115	1,249	4,710	2,050		
	S 80	1,120	33	351	384	1,060	580	1,166	92	798	890	2,450	1,160		
	P 80	1,121	51	547	593	1,640	910	1,167	192	1,004	1,126	3,120	1,810		
	P 80	1,122	35	377	412	1,130	630	1,168	296	1,206	1,434	3,040	1,330		
	P 80	1,123	34	371	405	1,110	620	1,169	164	1,025	1,189	3,270	1,920		
	P 80	283	35	247	322	890	430	1,169	98	720	808	2,010	1,300		
	P 80	284	65	773	838	2,300	1,270	1,170	122	1,042	1,206	3,240	1,920		
	P 80	1,124	67	548	615	1,600	930	1,171	122	1,042	1,184	3,240	1,920		
	P 80	1,125	61	500	581	1,540	850	1,172	122	1,042	1,184	3,240	1,920		
Snyder -----	P 122	285	28	347	373	1,070	570	S 250	1,171	56	515	871	1,370	870	
	P 195	286	44	1,073	1,117	3,070	1,900	P 25	71	132	1,572	1,704	5,380	2,710	
	P 195	1,126	46	1,141	1,187	3,260	2,030	264	43	441	484	1,320	770		
	P 195	1,127	80	967	966	2,740	1,690	1,172	122	1,456	1,578	4,570	2,510		
	P 195	1,128	23	378	401	1,650	1,030	1,173	64	658	722	2,710	1,150		
	P 195	1,129	22	537	550	1,540	950	1,174	43	438	481	1,800	770		
	P 195	1,130	22	549	571	1,570	970	1,175	15	151	166	620	260		

	(Detour)	1,176	42	404	446	1,070	710		S 103	807	48	255	298	1,120	420
	N 194	1,177	80	288	818	1,190	610			1,230	34	530	804	1,800	520
	(Detour)	1,178	82	979	1,061	8,980	1,600			1,231	19	185	204	1,700	210
	N 195	1,179	74	888	957	8,580	1,500		S 106	1,232	47	452	499	1,870	210
	P 229	1,180	22	818	840	2,270	1,400			1,233	15	149	164	820	210
Somerset	P 50	295	22	782	840	2,270	1,400			1,234	10	82	102	880	100
	P 51	1,180	71	711	782	2,150	1,850		P 196	1,235	6	62	68	280	100
		296	37	496	478	1,230	320			808	88	1,192	1,275	4,780	2,190
		297	58	906	964	2,000	1,500			1,236	25	581	606	2,270	1,030
		1,181	41	647	688	1,800	1,070			1,237	48	1,104	1,152	4,320	1,950
		1,182	52	818	885	1,800	1,100			1,238	16	158	174	650	880
		1,183	56	911	969	2,390	1,600		P 212	1,239	9	86	96	860	310
		1,184	84	534	568	1,600	900		S 292	1,240	5	53	58	220	80
		1,185	42	651	692	1,910	1,200			1,241	19	181	200	750	290
		1,186	42	623	676	1,910	1,170	Union	S 803	1,242	29	283	312	1,170	410
		1,187	62	730	792	2,180	1,870		S 26	809	120	1,108	1,228	4,800	1,910
	P 51	1,188	44	533	567	1,500	980		S 27	1,243	138	1,268	1,407	5,200	2,180
	S 52	1,189	34	896	432	1,190	750		S 28	1,244	64	521	575	2,160	800
		298	114	624	738	1,900	1,880	Venango	S 29	1,245	5	48	53	200	80
		1,190	35	846	881	1,050	660		S 30	1,246	69	869	908	8,800	1,570
		1,191	68	833	690	1,910	1,200		S 31	310	58	904	962	8,600	1,660
		1,192	70	862	452	1,240	780		S 32	1,247	48	749	797	2,960	1,200
		1,193	118	648	706	2,110	1,630		S 33	1,248	24	872	896	1,400	2,540
	P 119	299	52	922	974	2,030	1,690		S 34	1,249	80	387	417	1,540	600
		1,194	49	878	927	2,570	1,610		S 35	P 74	68	842	910	8,370	1,400
		1,195	37	659	693	1,910	1,200		S 36	P 1,250	25	321	346	1,200	500
		1,196	43	775	818	2,250	1,420		S 37	P 1,251	99	1,298	1,399	5,170	2,270
		1,197	57	856	1,071	2,940	1,800		S 38	811	62	379	441	1,630	720
		1,198	54	950	1,010	2,780	1,750		S 39	812	114	1,687	1,801	6,860	2,900
	S 186	1,199	33	823	861	960	620		S 40	1,252	114	1,692	1,806	6,800	2,930
	S 223	1,200	23	264	290	800	600		S 41	1,253	94	499	538	1,970	790
	P 206	1,201	47	575	622	1,710	1,080		S 42	1,254	28	413	441	1,630	720
		1,202	80	1,117	1,197	2,640	1,690		S 43	1,255	75	1,203	1,331	4,920	2,160
	P 317	1,203	64	895	949	2,610	1,640		P 207	1,256	179	1,160	1,339	4,950	2,170
		801	72	1,118	1,431	3,800	2,480		P 218 & 228	1,257	49	600	649	2,400	1,050
		1,204	105	1,222	1,327	8,650	2,800		P 233	513	30	870	900	8,300	1,470
		1,205	161	1,877	2,038	5,000	3,530			814	32	908	1,001	8,700	1,620
Sullivan	P 17	1,206	19	98	108	390	140			1,258	27	808	838	8,080	1,360
		1,207	29	277	306	780	280			1,259	24	606	720	2,800	1,170
	S 217	1,208	7	71	80	330	110	Warren		1,260	37	780	807	2,600	1,310
	P 321	1,210	22	216	238	890	330		P 88	1,261	44	1,287	1,331	4,920	2,160
	P 9	1,211	81	790	871	8,270	1,480			1,262	17	166	212	780	870
Susquehanna		1,212	88	868	406	1,520	640		P 94	1,263	79	894	973	8,800	1,540
		1,213	27	487	514	1,930	870		P 95	816	132	1,754	1,866	6,980	2,980
		1,214	17	309	326	1,220	610		P 200	1,264	31	400	491	1,800	780
		1,215	22	408	425	1,560	870		P 209	1,265	21	280	301	1,110	480
	P 14	302	16	144	160	600	250		P 279	817	28	408	436	1,610	600
		1,216	30	176	196	740	270			1,266	45	593	638	2,800	1,010
		1,217	68	661	729	2,780	1,150	Washington	P 108	1,267	21	274	296	1,090	470
		1,218	60	1,092	1,152	4,320	1,900		P 109	818	79	980	1,068	2,800	1,090
		1,219	54	960	1,044	8,920	1,770		P 113	1,268	66	664	730	1,970	1,300
		303	13	46	50	230	90			76	94	1,214	1,264	8,470	2,200
	S 216	304	49	510	558	2,660	790			819	70	1,406	1,540	4,270	2,800
	P 21 & 22	305	68	962	1,030	8,860	1,740		P 114	1,269	80	1,378	1,458	8,940	2,600
	P 21 & 196	306	68	962	1,030	8,860	1,740			77	50	1,558	1,648	4,450	2,940
		1,220	36	574	560	2,060	780		S 115	1,270	60	1,090	1,058	2,970	1,090
		1,221	33	465	498	1,870	840		S 118	1,271	66	861	847	2,500	1,690
		1,222	47	658	705	2,640	1,200			820	191	1,037	1,208	8,200	2,160
		1,223	40	561	601	2,250	1,070			1,272	248	1,407	1,656	4,470	2,850
	S 1,224	5	74	800	70	110	110		S 181	821	38	538	568	1,540	1,020
	P 22	306	28	685	693	2,490	1,180		S 242	822	50	696	716	1,990	1,280
		1,225	24	250	274	1,080	390			1,273	34	452	486	1,510	870
		1,226	26	279	274	1,140	430		S 247	823	121	990	1,051	2,840	1,890
		1,227	38	746	779	800	305			1,274	102	1,024	1,126	8,040	2,010
		1,228	32	610	532	2,000	780		P 208	1,275	80	890	978	2,610	1,740
	P 102	1,229	10	106	115	430	160	Wayne	P 225	1,276	26	528	554	1,800	990
									P 6	1,277	106	781	886	8,820	1,840

MOTOR VEHICLE TRAFFIC AT TRANSPORT SURVEY STATIONS—Continued

County	Route no.	(New) Station No.	Average daily number of motor vehicles—1924				Forecast of average daily traffic 1930	County	Route no.	(New) Station No.	Average daily number of motor vehicles—1924				Forecast of average daily traffic 1930
			Trucks	Passen- gers	Total	Maxi- mum					Trucks	Passen- gers	Total	Maxi- mum	
Westmoreland	P 7 & 335	325	72	756	827	3,100	1,250	S 124	1,310	80	732	812	2,230	1,320	
	P 7	1,278	74	778	862	3,200	1,290		1,311	129	1,117	1,240	3,410	2,020	
	S 171	326	10	79	89	330	130		1,312	115	1,044	1,159	3,150	1,880	
		1,279	8	88	91	340	140		1,313	189	1,722	1,911	5,260	3,110	
	S 172 & 335	327	35	268	303	1,140	460		1,314	21	190	211	540	340	
	S 178	328	44	325	369	1,380	560		1,315	186	2,335	2,521	6,930	4,100	
		1,280	36	268	304	1,140	460		1,316	137	1,712	1,849	5,090	3,010	
	S 254	1,281	30	291	321	1,200	480		1,316	219	2,698	2,914	8,010	4,740	
	P 335	329	12	58	70	260	110		1,317	341	1,108	1,269	3,490	2,080	
		1,282	53	319	362	1,320	530		1,317	342	56	608	564	1,550	920
	P 69	78	144	1,136	1,280	3,460	2,200		1,317	293	2,664	2,957	8,130	4,910	
		330	28	614	642	1,730	1,100		1,318	144	1,310	1,454	4,000	2,380	
		1,283	23	490	513	1,880	880		1,319	73	661	734	2,020	1,190	
		1,284	95	756	851	2,300	1,460		1,319	79	1,961	2,117	5,370	3,440	
	S 69	331	61	833	894	2,410	1,530		1,320	244	3,053	3,297	9,070	5,360	
		332	68	1,096	1,149	3,100	1,970		1,321	159	1,983	2,142	5,360	3,450	
		1,285	68	1,167	1,235	3,330	2,120		1,322	123	1,642	1,665	4,590	2,710	
		1,286	48	818	866	2,340	1,490		1,323	843	65	415	480	1,320	790
		1,287	53	903	956	2,580	1,640		1,323	12	113	125	340	200	
		1,288	61	832	893	2,410	1,530		1,324	8	77	85	230	140	
	P 117	333	92	896	968	2,670	1,700		1,325	140	899	1,039	2,360	1,600	
		1,289	122	1,195	1,317	3,560	2,260		1,326	95	610	705	1,940	1,160	
	S 118	334	40	545	585	1,580	1,000		1,327	41	262	303	830	490	
		335	44	656	700	1,880	1,200		1,327	344	246	1,169	1,414	3,390	2,300
		1,290	53	732	785	2,120	1,350		1,328	345	25	91	116	320	
	S 118	1,291	42	580	622	1,680	1,070		1,328	379	1,797	2,176	5,960	3,540	
		1,292	36	491	527	1,420	900		1,329	243	1,175	1,423	3,910	2,310	
	P 119	336	136	2,036	2,222	6,000	3,810		1,330	309	1,467	1,776	4,860	2,800	
		1,293	65	1,004	1,069	2,880	1,830		1,331	61	569	630	1,730	1,020	
		1,294	99	1,517	1,616	4,360	2,770		1,332	16	151	167	460	270	
		1,295	82	1,268	1,350	3,640	2,320		1,333	71	659	730	2,010	1,190	
		1,296	126	1,943	2,069	5,590	3,550		1,334	77	711	789	2,170	1,230	
P 120	337	132	2,029	2,158	5,330	3,700	1,335	97	617	684	1,860	1,110			
	1,297	127	1,962	2,089	5,640	3,590	1,336	119	1,009	1,219	3,350	1,960			
	1,298	255	2,491	2,746	7,410	4,710	1,337	97	617	684	1,860	1,110			
S 186	338	69	694	763	2,060	1,310	1,338	64	745	809	2,220	1,320			
P 187	1,299	70	548	618	1,670	1,060	1,338	126	1,258	1,394	3,810	2,250			
S 188	1,300	84	638	622	2,490	1,580	1,339	213	2,128	2,341	6,440	3,810			
S 238	1,301	9	90	99	270	170	1,339	105	1,053	1,158	3,180	1,840			
P 9	1,302	132	1,288	1,420	5,370	2,410	1,340	50	501	551	1,520	900			
S 11	1,303	17	166	183	690	270	1,341	52	520	572	1,570	930			
S 13	1,304	12	116	128	480	190	1,342	10	97	107	290	170			
P 232	1,305	10	93	103	390	960	1,343	80	743	823	2,260	1,340			
P 241	1,306	11	100	111	420	160	1,344	38	442	480	1,320	790			
York	1,307	50	1,195	1,245	3,470	2,020	1,345	59	544	608	1,660	960			
	1,308	36	875	911	2,560	1,480	1,346	53	304	337	890	550			
	339	109	938	1,097	3,020	1,780	1,347	15	143	158	430	260			
	1,309	72	656	728	2,000	1,180									

### APPENDIX III

Average Daily Density of Loaded and Empty Truck Traffic by Capacity Groups

Station	Average daily trucks			Average daily trucks by capacity groups									
				1-1½ tons		2-2½ tons		3-4 tons		5-5½ tons		6-7½ tons	
	Total	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty
1	457	301	156	181	100	64	24	30	19	25	14	1	
2	166	103	63	61	34	16	19	15	10	11	7		
3	368	223	140	134	90	56	24	24	19	14	7		
4	275	163	112	101	63	35	24	16	14	11	7		
5	234	136	99	67	46	37	23	11	9	20	10		
6	130	86	44	57	29	16	7	7	5	6	3		
7	320	190	130	108	78	43	24	19	13	19	14	1	1
8	70	46	24	26	16	13	4	5	3	3	1		
9	32	19	13	13	8	3	2	3	1	1	1		
10	40	21	19	9	7	3	2	5	6	4	4		
11	372	240	132	143	82	46	26	30	16	16	8		
12	84	54	30	40	18	9	6	4	5	1	1		
13	133	127	69	79	35	19	10	16	7	12	4	1	1
14	102	78	29	47	18	10	5	7	4	6	2	1	1
15	368	171	97	119	62	21	11	17	12	14	12		
16	98	64	34	49	26	7	3	7	4	1	1		
17	126	82	44	66	36	11	5	5	3	1	1		
18	70	39	31	29	25	6	4	3	1	1	1		
19	134	91	43	59	29	14	7	9	4	9	3		
20	65	43	22	29	15	7	4	4	2	3	1		
21	639	537	351	227	142	80	49	80	56	143	99	7	5
22	144	93	61	51	33	14	12	9	8	9	8		
23	46	31	15	18	9	6	3	6	3	1	1		
24	343	234	109	108	56	48	13	31	19	45	21	2	1
25	69	43	26	30	17	7	3	4	3	2	1		
26	154	91	63	58	36	23	23	5	4	4	1		
27	138	97	61	69	40	18	8	5	3	3	1		
28	94	57	37	46	29	9	7	2	1	1	1		
29	147	97	50	78	38	13	5	3	3	4	3		
30	908	600	318	402	224	131	66	47	33	4	4	1	1
31	352	213	139	118	69	26	13	67	48	13	11		
32	232	157	76	103	49	27	12	19	9	9	5		
33	135	92	43	64	31	15	5	9	5	3	2	1	1
34	762	474	288	283	173	82	49	68	29	55	26	1	1
35	534	356	178	199	96	53	23	42	21	61	30	1	1
36	538	353	203	217	120	57	33	23	21	30	28	1	1
37	97	69	28	57	25	10	2	2	1	1	1		
38	129	85	44	65	33	13	7	4	2	4	2		
39	180	123	57	106	48	11	5	4	3	2	1		
40	171	94	77	57	44	11	13	22	14	3	1		
41	106	69	37	50	28	12	7	5	3	3	1		
42	168	98	72	62	44	22	15	11	11	1	2		
43	106	61	45	41	29	13	10	6	5	1	1		
44	90	57	33	40	21	7	4	4	3	5	4	1	1
45	118	65	53	33	24	13	11	10	9	9	9		
46	98	68	30	53	19	7	5	7	5	1	1		
47	94	58	41	40	31	11	8	2	3	1	1		
48	364	260	104	204	81	29	11	23	10	5	2		
49	313	213	100	164	73	23	17	15	8	6	2		
50	140	98	47	66	33	10	6	12	7	5	2		
51	198	133	73	65	39	23	11	19	13	15	10	1	1
52	65	55	30	36	19	9	4	7	5	3	2		
53	106	73	33	58	26	12	4	5	2	3	1		
54	70	45	25	38	19	5	3	2	3	3	1		
55	133	119	64	77	44	17	9	10	4	14	7	1	
56	330	257	133	133	76	33	21	30	27	11	9		
57	96	62	34	42	21	10	7	7	5	3	1		
58	373	242	136	177	101	33	20	21	10	3	4	1	1
59	208	133	76	107	60	20	11	5	3	1	1		
60	76	48	28	37	23	6	3	4	3	1	1		
61	164	109	55	91	43	11	8	5	3	3	1		
62	124	87	37	47	21	20	9	3	3	13	4		
63	329	226	104	140	68	39	17	23	10	22	11	1	
64	123	86	39	51	18	14	8	3	4	13	6		
65	143	97	45	63	39	16	7	7	4	10	5	1	1
66	360	189	78	114	48	38	14	19	13	13	9	1	1
67	356	218	138	181	102	24	13	11	15	2	2		1
68	60	37	23	30	19	5	3	1	1	1	1		
69	296	203	96	153	66	26	16	13	11	5	3		

HIGHWAY TRANSPORTATION SURVEY

Average Daily Density of Loaded and Empty Truck Traffic by Capacity Groups—Continued

Station	Average daily trucks			Average daily trucks by capacity groups									
	Total	Loaded	Empty	1-1½ tons		2-2½ tons		3-4 tons		5-6½ tons		6-7½ tons	
				Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty
70	146	101	45	78	84	13	6	7	3	3	2		
71	133	90	43	73	34	9	4	5	3	3	1		
72	113	73	40	49	26	10	10	6	4	2			
73	80	40	20	31	16	5	2	3	2	1			
74	68	44	24	38	22	4	1	1		1			
75	178	104	74	90	59	13	13	1	3	1			
76	70	49	29	25	16	9	7	5	3	3			
77	90	57	33	38	22	11	6	5	3	3			
78	144	88	61	67	49	9	8	5	3	2			
79	150	109	48	65	31	19	6	14	7	10			
80	85	23	12	16	8	4	2	3	2				
81	78	45	33	26	15	7	6	8	9	4			
82	53	37	15	23	10	6	3	2	1	1			
83	37	23	15	12	7	3	2	2	1	5			
84	33	24	9	16	7	5	1	2	1	1			
85	60	39	21	25	14	8	3	4	3	2			
86	35	21	14	16	10	3	3	2	1				
87	67	43	24	24	11	7	3	4	3	8			
88	417	231	186	131	109	56	47	23	18	20			
89	83	48	36	25	16	9	6	4	4	11			
90	75	41	34	18	16	11	9	7	6	5			
91	52	30	22	21	16	7	4	2	2				
92	108	55	47	31	27	13	11	5	4	6			
93	83	47	36	23	23	9	6	4	3	6			
94	18	9	9	4	4	2	3	3	2				
95	30	20	10	16	8	2	1	1		1			
96	20	11	9	8	7	2	2	1					
97	60	38	22	25	11	6	6	5	4	2			
98	131	105	76	69	49	19	9	10	9	12			
99	276	147	129	94	89	39	24	17	13	7			
100	270	157	113	105	77	26	16	17	15	8			
101	135	75	60	44	39	17	9	11	10	3			
102	42	29	20	17	16	3	1	2	2				
103	46	25	21	19	17	4	2	1	1	1			
104	144	84	60	68	44	11	8	6	5	3			
105	235	133	119	121	76	30	13	23	13	9			
106	54	36	18	23	13	2	3	4	2	2			
107	208	109	99	61	56	28	26	16	14	4			
108	68	58	30	42	25	7	3	9	2				
109	28	20	8	13	7	2	1						
110	64	40	24	36	20	2	2	2	2				
111	35	20	9	20	7	2	1	4	1				
112	26	16	10	14	9	2	1						
113	24	19	5	16	4	2	1						
114	20	16	4	12	3	2		2	1				
115	78	48	26	42	22	4	1	2	2				
116	40	23	12	20	10	7	1	1	1				
117	198	130	68	97	43	22	11	13	5	8			
118	134	89	45	56	30	14	6	8	5	10			
119	48	32	16	23	10	5	2	3	4	1			
120	134	88	46	47	21	14	7	13	10	14			
121	40	23	12	17	7	4	2	2	1	5			
122	59	40	19	29	13	5	3	3	3	3			
123	180	100	60	73	47	9	5	10	5	7			
124	336	225	111	91	49	37	18	31	16	60			
125	77	48	31	28	19	8	7	4	2	6			
126	79	49	30	37	21	6	6	3	2	2			
127	35	19	17	13	19	3	2	1	1	1			
128	50	29	21	23	16	4	4	2	1	1			
129	30	55	35	40	23	9	8	5	4	4			
130	129	70	52	54	39	10	9	4	4	2			
131	59	39	20	33	15	5	9	1	2				
132	33	20	13	17	10	2	2	1	1				
133	51	51	30	40	22	6	6	3	2				
134	13	5	7	2	5	3	2						
135	119	68	51	50	41	14	10	4	4				
136	104	66	66	33	56	10	7	4	2	1			
137	40	23	18	15	12	3	2	3	3	1			
138	34	23	30	46	28	10	6	1	1	1			
139	46	32	14	29	10	5	4						
140	34	19	15	17	15	2	2						
141	56	32	24	23	15	9	9	1					
142	15	10	5	8	4	1							
143	199	129	70	89	58	21	9	11	5	8			
144	70	50	29	27	13	7	3	5	1	10			
145	193	129	69	61	36	25	11	19	9	22			
146	133	80	46	43	28	14	7	9	5	14			

Average Daily Density of Loaded and Empty Truck Traffic by Capacity Groups—Continued

Station	Average daily trucks			Average daily trucks by capacity groups									
				1-1½ tons		2-2½ tons		3-4 tons		5-6½ tons		6-7½ tons	
	Total	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty
147	269	180	82	88	42	31	18	24	11	41	16	1	
148	100	68	34	42	21	10	4	8	4	6	5		
149	32	18	14	14	9	3	3	1	1				
150	44	24	20	19	14	4	4	1	2				
151	40	20	20	14	15	5	4	1	1				
152	15	8	7	8	6		1						
153	94	60	34	46	27	13	6	2	1				
154	78	49	34	35	28	6	5	1	1				
155	10	6	4	5	3	1	1						
156	83	23	10	18	10	6							
157	89	51	37	43	31	7	5	1	1				
158	102	62	40	61	31	9	8	1	1	1			
159	94	61	33	49	27	9	4	2	1	1	1		
160	178	103	76	76	57	17	11	8	7	1	1		
161	53	36	17	81	15	3	2	3					
162	27	14	13	12	10	1	2	1	1				
163	51	27	24	18	15	4	3	4	5	1	1		
164	44	27	17	22	13	3	3	1	1	1	1		
165	31	22	9	20	9	3	2						
166	26	14	12	12	8	3	2	2	1	1	1		
167	262	157	105	110	72	33	23	13	9	2	2		
168	168	121	45	77	38	32	4	10	3	2			
169	61	42	19	30	15	6	2	3	2	1			
170	16	8	8	7	7	1	1						
171	56	35	21	29	15	4	2	3	1	3	3		
172	96	59	37	48	31	9	4	1	1	1	1		
173	91	52	39	47	37	4	1	1					
174	301	198	103	111	55	39	19	23	17	19	12	1	
175	179	110	66	67	45	14	8	19	9	10	5		
176	84	53	31	34	21	9	5	9	4	1	1		
177	606	422	183	237	102	77	36	59	29	53	22	2	1
178	900	417	188	309	93	76	32	51	24	73	33	3	1
179	65	42	23	31	17	4	2	4	2	3	1		
180	28	16	12	13	10	2	2	1					
181	40	24	16	22	13	2	3						
182	40	25	15	22	12	3	3	1	1				
183	69	39	30	29	23	7	5	3	1	2	1		
184	86	43	43	31	35	9	6	2	1	3	1		
185	91	59	32	51	26	3	2	1		4	4		
186	5	2	3	2	3		1						
187	50	28	22	24	19	4	3						
188	257	163	94	108	61	38	23	14	9	3	2		
189	152	88	64	62	44	18	12	7	6	1	1		
190	118	77	41	56	30	14	7	6	4	1	1		
191	78	55	23	41	16	10	5	2	1	2	1		
192	74	51	23	36	15	11	5	2	2	2	1		
193	51	55	26	44	17	7	6	2	1	3	2		
194	22	14	8	12	7	2	1						
195	4	3	1	3	3								
196	106	59	47	20	8	7	6	24	23	8	5		
197	31	18	13	6	3	3	2	6	5	3	2	1	1
198	18	11	7	7	3	1	1	3	3				
199	24	15	9	5	2	7	4	2	2	1	1		
200	32	16	16	5	4	4	3	4	5	3	4		
201	49	24	24	12	11	4	4	5	6	3	3		
202	12	7	5	5	4	1		1	1				
203	108	68	40	52	32	5	2	10	5	1	1		
204	62	41	21	32	16	4		4	3	1			
205	39	19	20	7	6	9	13	1	1	1	1		
206	68	42	26	33	19	7	5	2	2				
207	30	18	12	15	9	3	3						
208	48	31	17	25	13	5	3	1	1				
209	26	16	10	15	9	1	1						
210	32	20	12	15	8	2	3	1	1	2	1		
211	46	33	16	24	11	5	9	2	2	1	1		
212	626	409	217	289	165	70	39	29	16	12	6	1	
213	121	80	41	64	34	7	3	7	3	3	1		
214	376	221	155	166	119	28	19	13	15	9	3		
215	114	77	37	61	27	7	4	7	5	2	1		
216	120	75	45	45	27	13	5	11	8	5	4	1	1
217	13	8	5	6	4	2	1						
218	102	60	42	41	32	10	6	7	3	2	2		
219	23	16	13	11	9	4	1	1	1		1		
220	51	47	34	30	27	10	6	5	1	2			
221	83	50	33	24	17	9	6	8	4	9	6		
222	66	40	26	26	16	4	3	7	6	3	2		
223	82	50	32	29	20	10	7	4	2	6	2	1	

HIGHWAY TRANSPORTATION SURVEY

Average Daily Density of Loaded and Empty Truck Traffic by Capacity Groups—Continued

Station	Average daily trucks			Average daily trucks by capacity groups									
	Total	Loaded	Empty	1-1½ tons		2-2½ tons		3-4 tons		5-6½ tons		6-7½ tons	
				Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty
224	130	74	62	58	49	9	8	4	3	3	2		
225	129	61	62	44	46	4	4	3	4	4	1		
226	77	47	30	38	21	10	4	3	3	3	4		
227	203	151	79	89	52	19	3	12	8	8	0	5	1
228	51	30	21	29	15	3	2	3	3	2	2		
229	183	111	73	77	55	12	7	10	7	7	1	5	
230	36	20	15	15	12	3	3	1	1	1	1		
231	129	77	49	51	58	17	3	6	4	4	2	1	
232	188	106	88	74	57	17	13	10	7	9	2		
233	188	109	89	61	66	19	15	7	6	3	2		
234	104	61	48	48	32	11	7	5	3	2	1		
235	49	22	22	14	12	2	1	5	6	4	1		
236	91	57	34	41	26	9	4	3	2	1	2		
237	545	373	173	238	100	76	35	44	21	18	16	1	1
238	430	269	161	199	119	39	20	22	15	10	7		
239	28	15	11	11	9	3	2						
240	159	87	37	35	23	13	9	7	5	1			
241	128	80	48	64	38	11	7	5	3				
242	85	58	33	44	30	9	4	3	2	1	1		
243	90	55	35	48	28	9	6	3	2	1	1		
244	108	61	42	47	33	10	5	3	3	1	1		
245	30	19	11	16	9	2	2	1	1				
246	38	24	14	18	10	3	2	2	2				
247	70	41	29	32	22	6	6	3	2				
248	76	39	33	35	22	2	2	1	1				
249	20	18	7	11	5	1	1	1	1				
250	58	31	25	22	17	6	5	2	2	1			
251	58	31	27	23	23	6	3	1	1	1			
252	30	19	12	11	7	4	3	1	1	2			
253	22	11	12	6	8	4	4	1	1				
254	60	31	29	25	25	4	4	1	1				
255	111	73	38	60	29	9	6	3	3	1			
256	115	71	44	54	34	9	6	3	3	3	1		
257	81	17	14	10	6	2	2	2	2	3	3		
258	229	181	98	85	58	27	21	8	7	11	12		
259	50	31	19	23	13	6	3	2	2	2	1		
260	59	36	23	29	19	3	1	1	1	2	3		
261	68	47	16	26	11	16	2	1	1	4	3		
262	96	64	32	53	27	5	3	1	2				
263	136	85	51	66	39	14	7	3	3	1	2		
264	130	75	55	64	49	8	6	4	5		1		
265	37	23	14	19	11	3	1	1	1			1	1
266	67	48	24	31	15	7	4	4	4	1	1		
267	171	104	67	82	51	15	10	5	3	2	3		
268	140	86	54	61	38	8	6	11	8	6	2		
269	125	87	38	56	25	14	5	9	5	8	3		
270	253	159	97	106	65	22	15	15	7	13	10		
271	219	137	75	103	52	18	12	11	7	5	4		
272	48	30	18	18	11	6	3	3	3	3	1		
273	69	43	24	24	15	6	3	5	2	6	3	1	1
274	110	72	38	50	24	15	7	4	4	3	3		
275	100	62	38	41	27	7	4	5	3	7	3	2	1
276	104	66	39	49	23	5	2	10	8	1	1		
277	189	100	86	71	60	15	14	10	9	3	3	1	
278	61	32	19	26	14	5	3	1	1		1		
279	118	79	42	59	34	11	5	4	2	3	1		
280	68	42	26	31	20	5	4	3	2	3			
281	130	80	50	62	39	11	6	6	4	1	1		
282	32	20	6	20	5	4	1	1	1				
283	35	23	13	18	10	3	2	1	1	1			
284	65	45	20	31	10	7	4	6	5	1	1		
285	26	19	7	15	6	3	1	1	1				
286	44	26	18	20	13	4	3	1	2	1			
287	36	21	15	20	14	1	1	1	1				
288	26	17	9	14	7	2	1	1	1				
289	26	18	8	16	7	1	1	1	1				
290	16	11	5	9	4								
291	93	57	35	39	23	12	8	5	3	1	1		
292	133	74	58	53	39	12	9	6	3	3	4	1	1
293	196	108	92	81	73	17	13	7	6	1	1		
294	43	23	15	22	11	3	2	2	2	1			
295	23	14	8	10	5	3	3	1	1				
296	37	20	17	11	9	3	3	5	4				
297	58	33	25	25	21	6	4	1	4				
298	114	73	41	58	23	10	10	4	2	1			
299	69	29	24	19	13	5	6	4	4	1	1		
300	68	41	25	29	18	9	5	3	2				

## Average Daily Density of Loaded and Empty Truck Traffic by Capacity Groups—Continued

Station	Average daily trucks			Average daily trucks by capacity groups									
				1-1½ tons		2-2½ tons		3-4 tons		5-5½ tons		6-7½ tons	
	Total	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty	Loaded	Empty
301	74	50	24	29	16	15	7	5	1	1			
302	16	12	4	11	8	1	1						
303	13	12	1	7									
304	46	32	16	15	7	12	2	5	7				
305	68	41	27	29	17	7	5	4	4	1	1		
306	28	19	9	15	7	1	1	2	1	1			
307	43	27	16	15	18	8	8	4					
308	83	59	24	35	16	12	4	12	4				
309	120	77	43	60	34	5	3	7	4	5	2		
310	56	30	26	24	24	5	3	1			1		
311	62	34	28	24	18	6	7	4	5				
312	114	64	50	49	39	10	6	3	3	2	2		
313	30	16	14	11	9	2	3	1	1	1	1	1	
314	32	15	17	11	13	8	3			1	1		
315	79	49	31	40	24	5	4	3	3	1			
316	132	83	49	59	34	14	8	10	6		1		
317	28	17	11	13	8	3	2	1	1				
318	79	43	36	27	22	10	9	4	3	2	2		
319	94	55	39	37	24	11	8	8	2	2	5		
320	181	104	77	61	34	29	27	9	12	5	4		
321	83	18	15	13	9	2	2	2	2	1	1		
322	50	29	21	24	16	2	2	2	1		1		
323	121	61	60	34	36	15	12	7	6	5	4		
324	166	105	61	89	54	11	4	5	3				
325	72	49	24	39	19	6	3	2	2	1			
326	10	7	3	7	3								
327	85	21	14	16	10	2	1	2	2	1	1		
328	44	27	17	18	12	9	1	7	4				
329	12	10	2	10	3								
330	28	16	12	10	9	3	2	2	1	1			
331	61	35	26	23	17	7	5	4	2	2	1		
332	63	37	26	23	15	10	7	3	2	1	2		
333	92	57	35	45	28	8	4	3	2	1	1		
334	40	23	17	16	10	4	3	2	2	1	1		
335	44	25	19	15	12	7	5	2	2	1			
336	136	79	57	49	35	15	11	3	3	6	2	2	1
337	132	73	59	43	34	13	12	7	3	3	5		
338	69	42	27	29	17	7	6	4	3	2	2		
339	109	71	38	52	23	6	6	9	6	4	4		
340	136	124	69	73	39	29	9	15	12	7	6		
341	161	99	62	75	47	13	9	9	4	2	2		
342	59	39	20	24	13	6	4	4	2	2	1		
343	65	45	20	33	16	8	2	3	2	1			
344	246	149	99	94	57	24	13	13	13	12	10		
345	25	13	12	4	5	1		6	5	2			
346	64	39	25	21	21	3		5	5	3	4		
347	126	79	50	53	31	9	4	11	11	4	4		
1348	274	180	94	96	49	40	20	24	17	20	9		
1349	154	85	69	47	40	21	15	11	8	6	6		
1350	274	189	85	100	50	37	16	23	11	23	9	2	2
1351	373	254	119	145	68	50	28	22	14	26	12	1	



## APPENDIX IV

Sections of the primary highway system on which the density of motor truck traffic in 1924 was more than 200 per day

Highway section	Route No.	Miles	Daily truck traffic
Harrisburg—Lemoyne .....	94	1	908
Philadelphia—Chester—Delaware Line .....	132-180	10	681
Philadelphia—Media .....	130	7	637
Scranton—Wilkes-Barre .....	5	17	568
Philadelphia—Willow Grove .....	151	6	473
Pittsburgh—Springdale .....	70	15	468
Scranton—Carbondale .....	6	14	466
Philadelphia—Morrisville .....	281	13	446
Pittsburgh—Bridgeville .....	108	5	429
Philadelphia—Coatesville .....	142	85	411
Wilkes-Barre—Pittston .....	4-368	7	396
Pittsburgh—East Pittsburgh .....	120	6	346
Sunbury—Shamokin .....	161	15	329
Easton—Bethlehem .....	159	6	297
Scranton—Factoryville .....	9	11	294
Jct. 4 & 969—Shickshinny .....	4	18	284
Reading—Womelsdorf .....	149	13	276
Harrisburg—Clarks Ferry .....	1	13	271
Altoona—Hollidaysburg .....	56	4	268
Harrisburg—Elizabethtown .....	129	16	264
Lock Haven—Mill Hall .....	59	3	259
Springdale—Butler County Line .....	70	11	242
Philadelphia—Spring House .....	153	8	241
Pottsville—Middleport .....	162	6	238
Reading—Allentown .....	157	33	233
Hamburg—Pottsville .....	140-141	21	226
Bridgeville—Washington County Line .....	106	4	219
Uniontown—Fairchance .....	116	5	217
Lewistown—Jct. 29 & 192 .....	29	6	212
Reading—Adamstown .....	143	11	212
Pottsville—Tower City .....	199	20	206
Reading—Hamburg .....	160	14	206
<b>Total miles</b> .....		<b>374</b>	

## APPENDIX V

Sections of the primary highway system on which the density of loaded 5 to 7½-ton truck traffic in 1924 was 5 or more per day

Highway section	Route No.	Miles	Daily 5-7½ ton Loaded Trucks
Philadelphia—Chester	180	7	81
Philadelphia—Morrisville	281	13	79
Chester—Delaware Line	139	3	62
Philadelphia—Lansdowne	130	1	56
Philadelphia—Paoli	142	16	51
Paoli—Downingtown	142	12	42
Pittsburgh—Tarentum	70	19	26
Downingtown—Coatesville	142	7	24
Philadelphia—Willow Grove	151	6	23
Pittsburgh—East Pittsburgh	120	6	21
Lansdowne—Media	130	6	17
Beaver—Beaver Falls	77	5	16
Scranton—Wilkes-Barre	5	17	16
Easton—Bethlehem	150	6	14
Philadelphia—Allentown	153	41	14
Pittsburgh—Bridgeville	108	5	14
Reading—Temple	157	4	14
Norristown—Collegeville	140	8	13
Reading—Pottstown	148	16	13
Harrisburg—Clarks Ferry	1	13	12
Lancaster—Coatesville	142-215	27	12
Philadelphia—Norristown	145	8	12
Easton—Riegelsville	156	7	11
East Pittsburgh—Irwin	120	8	11
Etna—Bakerstown	72	12	11
Lewistown—junction with road to Shraders	29	6	11
Myerstown—Hershey	139-149	18	11
Wilkes-Barre—West Nanticoke	4	9	11
Willow Grove—Doylestown	151	13	11
Altoona—Hollidaysburg	56	4	10
Harrisburg—Lemoync	34	1	10
Lancaster—York	128	20	10
Scranton—Blakely	6	6	10 <sup>1</sup>
Tarentum—Freeport	70	8	10 <sup>1</sup>
Reading—Myerstown	149	20	9
Scranton—Dalton	9	7	9
Collegeville—Pottstown	146	13	8
Doylestown—Riegelsville	156	23	8
Lancaster—Harrisburg	129	34	8
Philadelphia—Morrisville	150	17	8
West Chester—junction with Rt. 142	143	7	8
West Nanticoke—Shickshinny	4	10	8
Reading—Shillington	148	2	7
Bakerstown—Butler	72	16	6
Beaver—Ohio Line	204	14	6
Beaver Falls—New Castle	77	19	6
Chambersburg—Caledonia Park	43	9	6
Chester—junction with Rt. 130	225	4	6
Irwin—Greensburg	120	9	6
Media—Kennett Square	131	19	6
Norristown—Bridgeport	143	1	6
Pittston—junction with Rt. 4	368	7	6
Carbondale—Blakely	6	8	5
Norristown—junction with Rt. 153	178	10	5
Pottsville—Orwigsburg	140-141	8	5
Reading—Tuckerton	160	3	5 <sup>1</sup>
Scranton—Moscow	168	10	5
Temple—Kutztown	157	10	5
West Chester—junction with Rt. 131	135	7	5
Total miles		644	

<sup>1</sup>Estimated.

## APPENDIX VI

### Average Gross Weight of Loaded Trucks By Capacity Groups, (81 Weight Stations)

Station	½-1½ tons		2-2½ tons		3-4 tons		5-7½ tons	
	Loaded trucks per day	Average gross weight	Loaded trucks per day	Average gross weight	Loaded trucks per day	Average gross weight	Loaded trucks per day	Average gross weight
		Pounds		Pounds		Pounds		Pounds
1	181	4,730	64	9,680	30	15,080	26	19,080
2	61	5,110	16	10,940	15	16,380	11	20,470
3	134	4,460	56	10,360	24	15,950	14	18,490
4	101	4,420	35	10,380	16	13,340	11	17,990
5	67	4,170	37	12,450	11	16,720	20	22,210
6	67	4,350	16	9,920	7	16,560	6	19,920
7	108	4,450	43	10,150	19	15,100	20	20,840
8	26	4,580	13	10,630	5	17,890	3	18,550
9	12	4,900	3	10,360	2	13,380	1	17,610
10		4,580	3	10,100	5	1	4	1
11	148	4,200	46	10,560	30	13,780	16	19,190
12	40	4,380	9	10,010	4	14,910	1	18,310
13	79	4,290	19	10,680	16	14,200	13	20,560
14	47	4,460	10	10,020	7	15,280	9	20,050
15	119	3,710	21	9,980	17	15,860	14	21,960
16	49	3,760	7	11,140	7	15,170	1	15,170
17	65	4,350	11	10,480	5	14,770	1	16,510
18	29	3,820	6	9,760	3	15,520	1	21,680
19	59	4,110	14	10,350	9	14,160	9	19,200
20	29	3,800	7	10,460	4	13,380	3	17,480
21	227	4,060	80	11,490	80	18,140	150	22,540
22	51	4,240	14	11,760	9	17,090	9	22,880
23	18	3,830	6	9,620	6	13,900	1	15,880
24	108	4,300	48	10,380	31	15,030	47	21,330
25	30	3,660	7	9,580	4	13,880	2	17,580
26	58	4,800	28	10,880	5	12,640		
27	69	4,400	13	10,010	5	12,550		
28	46	4,210	9	9,650	2	10,670		
29	78	4,180	12	8,670	3	16,700	4	22,240
30	402	4,240	131	10,460	47	14,740	10	20,060
31	118	4,020	26	10,070	57	19,300	12	20,500
32	108	4,120	27	10,360	18	15,150	9	20,240
33	64	4,210	15	9,890	9	14,440	4	20,420
34	263	3,840	69	9,380	53	14,820	56	20,150
35	199	4,160	63	9,620	42	14,610	62	18,740
36	217	3,710	57	9,270	28	14,580	31	20,380
37	57	4,380	10	9,760	2	15,230		
38	65	4,100	12	11,580	4	16,970	4	21,320
39	106	3,990	11	9,420	4	15,520	3	17,860
40	57	4,100	22	10,890	13	13,970	2	19,830
41	50	4,080	12	9,670	5	13,900	2	17,870
42	62	4,550	22	10,950	11	14,490	1	21,550
43	41	4,640	13	10,340	6	28,470	1	18,110
44	40	3,860	7	9,940	4	15,350	6	22,850
45	53	5,100	13	10,420	10	15,310	9	18,010
46	53	4,240	7	9,620	7	14,830	1	20,320
47	40	4,740	11	10,300	2	14,650		
48	204	3,900	29	9,710	22	14,070	5	17,720
49	164	4,630	28	10,140	15	15,150	6	19,500
50	65	4,100	10	10,450	12	16,680	5	19,890
51	65	3,920	23	10,210	19	15,700	16	20,160
52	36	4,060	9	9,800	7	15,280	3	17,950
53	53	4,340	12	9,530	5	13,400	3	17,210
54	38	4,420	5	11,680	2	11,940		
55	77	4,150	17	9,800	10	12,970	15	20,190
56	183	4,010	33	10,580	30	16,670	11	21,190
57	43	4,470	10	10,400	7	15,700	3	19,770
58	177	3,860	38	9,840	21	14,790	6	19,560
59	107	4,130	20	9,670	5	13,470	1	17,700
60	37	4,310	6	10,750	4	13,160	1	17,360
61	91	4,040	11	9,680	5	14,840	2	19,800
62	47	4,010	20	10,660	8	13,500	13	19,720
63	140	3,860	39	9,940	23	15,210	23	19,800
64	51	4,180	14	10,620	8	14,270	13	20,780
65	68	3,560	16	10,250	7	14,430	11	20,250
66	114	4,340	35	10,660	16	14,950	14	20,100
67	181	3,860	24	9,940	11	13,120	2	19,280
68	30	4,240	5	9,410	1	11,260	1	18,100
69	153	4,270	26	10,420	19	14,800	5	19,310
70	78	4,290	13	10,060	7	12,620	3	18,910
71	73	3,560	9	10,400	5	13,000	3	18,820
72	49	4,450	16	10,380	6	14,340	2	19,980
73	31	4,650	5	10,060	3	16,350	1	15,140
74	38	4,320	4	9,300	1	13,350	1	21,410
75	90	3,730	12	10,240	1	14,110	1	17,050
76	25	4,010	9	10,130	5	13,910	3	17,810
77	35	4,300	11	9,790	5	14,690	3	18,840
78	67	3,710	9	9,140	5	12,820	3	16,160
79	65	4,430	19	10,520	14	16,110	10	21,160
1348	96	4,400	40	9,540	24	15,380	20	18,700
1350	100	4,100	37	9,510	23	14,010	25	20,120

<sup>1</sup>Gross weight not available

## APPENDIX VII

Average Daily Density of Loaded Truck Traffic by Gross Weight Groups  
(81 Weight Stations)

Station	Daily loaded trucks by gross weight					
	Total	Under 6,000 Pounds	6,000-11,999 Pounds	12,000-17,999 Pounds	18,000-23,999 Pounds	24,000 pounds and over
1	301	146	99	34	18	4
2	103	43	31	14	12	3
3	228	111	70	31	14	2
4	163	85	49	21	7	1
5	135	63	23	20	16	7
6	86	50	21	8	0	1
7	190	89	57	23	15	0
8	46	20	15	6	5	
9	19	9	7	2	1	
10	21	13	7	1		
11	240	128	62	35	19	3
12	54	36	13	5	1	
13	127	66	32	10	10	3
14	73	37	19	9	0	2
15	171	108	31	15	11	0
16	64	45	10	7	2	
17	82	56	19	7	1	
18	39	27	7	4	1	
19	91	52	20	12	0	1
20	43	26	10	0	1	
21	537	200	93	76	94	79
22	83	43	16	11	10	3
23	31	16	8	6	1	
24	234	93	50	40	23	19
25	43	28	10	4	1	
26	91	45	35	11		
27	87	58	24	5		
28	57	40	14	3		
29	97	68	22	3	3	1
30	590	345	100	64	19	3
31	213	106	39	20	43	7
32	157	92	35	20	7	3
33	92	55	23	9	4	1
34	474	263	105	54	41	11
35	356	174	73	50	42	6
36	333	206	69	32	17	10
37	69	47	18	3	1	
38	85	57	10	7	3	2
39	123	94	22	5	2	
40	94	49	26	16	3	
41	69	45	17	0	1	
42	96	48	31	14	3	
43	61	33	20	7	1	
44	57	35	12	3	4	3
45	65	31	21	9	4	
46	68	45	16	5	2	
47	53	30	13	5		
48	260	132	53	19	6	1
49	213	132	50	18	0	1
50	93	56	20	10	0	1
51	123	59	23	19	15	2
52	55	31	13	7	4	
53	73	45	20	0	2	
54	45	31	10	3	1	
55	119	64	30	14	8	3
56	257	159	51	26	16	5
57	62	34	16	8	3	1
58	242	158	54	21	8	1
59	133	95	29	8	1	
60	49	32	10	5	1	
61	109	83	18	7	1	
62	87	41	23	15	5	3
63	225	128	48	23	15	0
64	86	43	20	13	6	4
65	97	58	19	12	0	2
66	182	96	48	25	10	3
67	218	161	43	11	3	
68	37	26	9	7	1	
69	202	126	50	19	0	1
70	101	66	26	7	2	
71	90	68	14	6	3	
72	73	41	21	8	3	
73	40	24	12	3	1	
74	44	31	9	2	1	1
75	104	81	13	5		
76	49	22	12	6	2	
77	57	31	10	7		
78	83	63	15	4	3	
79	108	54	27	14	9	4
1348	180	83	55	20	12	5
1350	186	91	48	20	10	5