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PROGRESS AND FEASIBILITY  
OF TOLL ROADS AND THEIR RELATION  
TO THE FEDERAL-AID PROGRAM

LETTER

FROM

SECRETARY OF COMMERCE

TRANSMITTING

A REPORT OF THE PROGRESS AND FEASIBILITY OF  
TOLL ROADS, WITH PARTICULAR ATTENTION TO THE  
POSSIBLE EFFECTS OF SUCH TOLL ROADS UPON  
THE FEDERAL AID HIGHWAY PROGRAMS, INCLUDING  
RECOMMENDATIONS WITH RESPECT TO FEDERAL  
PARTICIPATION IN TOLL ROADS



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## LETTER OF TRANSMITTAL

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THE SECRETARY OF COMMERCE,  
*Washington 25, April 14, 1955.*

Hon. SAM RAYBURN,  
*Speaker of the House of Representatives,*  
*Washington 25, D. C.*

MY DEAR MR. SPEAKER: I transmit herewith a report of the progress and feasibility of toll roads, with particular attention to the possible effects of such toll roads upon the Federal-aid highway programs, including recommendations with respect to Federal participation in toll roads.

The report was prepared by the Commissioner of Public Roads with the aid of information supplied by the State highway departments, pursuant to section 13 of the Federal-Aid Highway Act of 1954. This report completes the directive contained in section 13, since a report on the costs of completing the several systems of highways in the several States, and the financing thereof, was submitted to the Congress on March 25, 1955.

The report describes the progress of recent toll-road development in the United States and gives consideration to the additional mileage that might be feasibly constructed through toll financing. It also discusses the effect of toll roads on the Federal-aid program, and makes recommendations with respect to Federal participation in toll roads.

Sincerely yours,

SINCLAIR WEEKS,  
*Secretary of Commerce.*

III



# PROGRESS AND FEASIBILITY OF TOLL ROADS

## STEPS TOWARD DEVELOPMENT OF MAIN HIGHWAYS SINCE 1939

With few exceptions, the toll highways now in use and under construction follow closely the general lines of the National System of Interstate Highways. The exceptions are principally roads of local rather than national significance and include roads leading to resort areas and a number of parkways, some of which were built as free roads but on which tolls are now levied, not with the expectation of liquidating the cost of the particular roads, but rather to provide revenue to help finance other routes.

The study of the feasibility of additional toll roads made for the purposes of this report shows that nearly all the additional mileage estimated to be feasible of toll financing also lies along the general lines of the Interstate System.

It is of interest, therefore, to trace the origin and development of this system, on which lie the greatest part of the toll-road mileage either existing or under construction, and additional mileage found to be most feasible of toll financing.

### *Toll roads and free roads report*

The Federal-Aid Highway Act of 1938 directed the Chief of the Bureau of Public Roads to investigate—

\* \* \* the feasibility of building, and cost of, superhighways not exceeding three in number, running in a general direction from the eastern to the western portion of the United States, and not exceeding three in number, running in a general direction from the northern to the southern portion of the United States, including the feasibility of a toll system of such roads.

The report on the Bureau's investigation, transmitted by the President to the Congress on April 27, 1939,<sup>1</sup> after defining the most suitable locations of the six routes, found that their construction would be feasible. The Bureau concluded, however, as stated in the report (p. 3), that—

\* \* \* a sound Federal policy for the construction of a system of transcontinental superhighways, traversing the entire extent of the United States from east to west and from north to south, cannot rest upon the expectation that the costs of construction and operating such a system as a whole would be recoverable, in their entirety or in any large part from direct tolls collected from the users.

The report stated that at that time the construction and operation of limited sections might be financed through the collection of tolls, and listed the various sections of the routes studied in the order in which their costs might be recoverable through tolls.

Information assembled in the preparation of the 1939 report, the first ever made on a national basis to show usage and importance of our highways, strongly emphasized the essentiality of a national system of interregional highways. The findings of the study led the

<sup>1</sup> Toll Roads and Free Roads, 76th Cong., 1st sess., H. Doc. No. 272.

Bureau to state that the Federal Government could contribute to the important improvements required by authorizing the designation of such a system by joint action of the Federal Government and the States, the system to be limited to 1 percent of the country's rural road mileage, with appropriate urban connections. The Bureau further proposed, in the report (p. 122), that—

In view of the predominant national importance of such a system, the Federal Government could reasonably contribute to its construction in a proportion materially larger than that in which it contributes under the Federal Highway Act \* \* \*.

#### *Interregional highways report*

For a further study of the recommendations of the Bureau, the President on April 14, 1941, appointed a committee, known as the National Interregional Highway Committee, headed by the Commissioner of Public Roads, to investigate the need for a limited system of highways to improve the facilities then available for interregional transportation. Under the general direction of this committee the Bureau of Public Roads continued its investigations that led to the recommendations of the 1939 report and prepared the report *Interregional Highways*<sup>2</sup> which the President transmitted to the Congress on January 12, 1944.

Since the Commissioner of Public Roads served as Chairman of the Committee, the report also satisfied the requirement of the 78th Congress which, by Public Law 146 (57 Stat. 560), authorized and directed the Commissioner to survey the need for a system of express highways throughout the United States, the number of such highways needed, the approximate routes which they should follow, and the approximate cost of construction.

This report (p. 133) reiterated the importance of an interregional system of highways and again recommended that its immediate designation be authorized by the Congress. The committee strongly recommended—

\* \* \* prompt beginning of construction on the system at the end of the war and prosecution of such construction at the rate indicated by an annual expenditure of \$750 million.

#### *The interstate system*

Influenced by the recommendations of the committee report, the Congress in section 7 of the Federal-aid Highway Act of 1944 (58 Stat. 838), authorized the designation of a National System of Interstate Highways. The act stated:

SEC. 7. There shall be designated within the continental United States a National System of Interstate Highways not exceeding forty thousand miles in total extent so located as to connect by routes, as direct as practicable, the principal metropolitan areas, cities, and industrial centers, to serve the national defense, and to connect at suitable border points with routes of continental importance in the Dominion of Canada and the Republic of Mexico. The routes of the National System of Interstate Highways shall be selected by joint action of the State highway departments of each State and the adjoining States, as provided by the Federal Highway Act of November 9, 1921, for the selection of the Federal-aid system. All highways or routes included in the National System of Interstate Highways as finally approved, if not already included in the Federal-aid highway system, shall be added to said system without regard to any mileage limitation.

No funds were earmarked for the acceleration of the improvement of the system nor did the Federal Government then accept responsi-

<sup>2</sup> *Interregional Highways*, 78th Cong., 2d sess., H. Doc. No. 379.

bility for the financing of projects on the system in a ratio larger than the customary 50-50 ratio applicable to other Federal-aid projects. Since the routes of the system, under the terms of the act, were to become a part of the Federal-aid system, financing of their improvement was expected to be from funds available for that system.

It was not until 1952 that funds were authorized specifically for expenditures on the Interstate System only, and then in the token amount of \$25 million annually. It remained for the Federal-aid Highway Act of 1954 to increase this authorization to a more substantial sum, \$175 million annually, and to increase the Federal contribution to the cost of projects on the system from 50 to 60 percent.

#### *Increasing inadequacy of highways*

The early study of the feasibility of toll roads, reported in 1939, was made toward the end of nearly a decade of economic depression. Traffic volumes had recovered but slowly from their decline in 1932 and 1933, and in 1938 had barely held even at the level reached in 1937.

With World War II came the restrictions to travel that reduced traffic volumes to less than two-thirds of their prewar level. At the same time highway construction was curtailed. Highways were regarded as expendable, and were expended. Then, with the return of peace, came an economic upsurge unexpected in its proportions, and with it a parallel and equally unexpected upsurge in traffic.

By 1947 traffic volumes exceeded their prewar level, and in 1950 the curve of traffic volume passed through the projection of the prewar trend of increase. In 1954 traffic volume was nearly double that of 1940, nearly triple that of the low of 1933, and the increase still continues.

Thus, emerging from a war period, the highway systems, abnormally depreciated as a result of the heavy wartime usage and the stoppage of normal replacement, were in no case prepared to meet the unforeseen and increasingly insistent demands of a growing traffic. And it was on the Interstate System, particularly in and near cities where travel was already heaviest, that the inadequacies were greatest.

#### *Insufficiency of current revenues*

It has become increasingly apparent that public funds applicable to highway construction, especially on the more important routes, have not been sufficient to prevent their increasing obsolescence. On the contrary, the conclusion is clear that the condition of the more important highways is falling steadily further behind the needs of traffic. It has likewise become more apparent that the gap will not be closed by the use of current revenues on a pay-as-you-go basis at the present rates of taxation. Although tax rates and other fees have been raised to some extent, the increases have not even offset the higher road costs resulting from wartime and postwar inflation.

A further deterrent to accelerating construction on the more important routes is the general practice of earmarking funds specifically for expenditure on particular systems. Moreover, as a matter of policy or legislative requirement, it is usually not practicable to concentrate funds for a particular system on a limited mileage of that system. More often, funds are spread as uniformly as practicable over the entire system.

Efforts by the States to obtain funds in sufficient amount for desirable Interstate System improvements through increased taxes or the authorization of general-obligation bonds have generally failed or have been inadequate. Proposals to borrow funds for improvements which may be thought to benefit principally motorists from other States can hardly be expected to find favor with the voters of any State.

The Congress has recognized the importance of encouraging the capitalization of future revenues, and section 5 of the Federal-Aid Highway Act of 1950 (64 Stat. 785) provided as follows:

SEC. 5. Any State, county, city, or other political subdivision that shall issue bonds and use the proceeds of such bonds for the construction of toll-free facilities in order to accelerate the improvement of the National System of Interstate Highways, the Federal-aid primary highway system, or the Federal-aid highway system in urban areas, may apply any portion of the funds herein, or hereafter, authorized for expenditure on said systems of highways and apportioned to such State under the provisions of section 1 to aid in retirement of annual maturities of the principal indebtedness of such bonds to the extent that the proceeds of such bonds are actually expended in the construction of said systems of highways: \* \* \*.

Four States have availed themselves of this means of accelerating improvement of their highway systems up to March 1, 1955. A total of 180 projects having an estimated total cost of \$116,006,860, of which \$66,108,358 may eventually be paid from Federal-aid funds, had been programed in the 4 States for the improvement of 656.8 miles of highway under the bond program.

Since the end of World War II the demand for solution of traffic problems on main highways has become increasingly urgent. At the same time there has been no provision of public funds, or steps toward financing, that offered relief within a reasonable period of years. In this situation some of the States have resorted, in increasing degree, to toll financing of highways, in order to effect a solution when it was felt delay could not longer be tolerated.

#### PRESENT TOLL ROAD DEVELOPMENT

##### *Pennsylvania Turnpike*

The first of the modern toll roads was the Pennsylvania Turnpike. The possibility of using the right-of-way of the never-completed South Penn Railroad, on which tunnels already penetrated several of the parallel mountain ranges, had long been envisioned. In contrast to driving over the winding road that crossed the mountains on steep grades, the prospect of traveling rapidly and easily through these barriers was most inviting. After much official and unofficial discussion in the State, the Pennsylvania Legislature created the Pennsylvania Turnpike Commission in 1937, with authority to finance, construct, and operate a turnpike from Middlesex to Irwin (roughly, Harrisburg to Pittsburgh).

Despite the topographic conditions that gave the low-gradient route an unusual advantage, and despite the large volume of truck traffic moving between the population and industrial centers at the ends of the proposed turnpike, all efforts to sell bonds to private banking interests were unsuccessful.



Turning then to Federal sources, the Commission succeeded in obtaining grants totaling \$29.5 million from the Public Works Administration and, with over 40 percent of the needed capital then at hand, sold \$40.8 million of Turnpike bonds to the Federal Reconstruction Finance Corporation. These bonds, bearing 3¼ percent interest, were sold at a discount sufficient to make them yield 4.01 percent.

Two other issues of \$1.5 million each were subsequently sold: One in 1943, to cover final construction costs, and one in 1946, in connection with a refinancing to take advantage of a lower interest rate. In 1948 the financing of the original turnpike was merged with that of the eastern extension which had earlier been authorized by the legislature. Bonds were issued in that year, in part to redeem the outstanding indebtedness on the original section and partly to finance the 101-mile extension. These bonds were sold to private interests at a net interest rate of 3.08 percent.

This brief tracing of the financing of the Pennsylvania Turnpike is of interest to show the change in public attitude toward toll highway revenue bonds during the period 1937-48. In 1937, with recollections of the long economic depression fresh in the minds of investors, and with road systems then not generally regarded as seriously inadequate, the Pennsylvania Turnpike was not expected to be fully self-liquidating. Despite its favorable position geographically and topographically, and the fact that only 60 percent of the cost needed to be liquidated through tolls, the Reconstruction Finance Corporation, in accepting the bonds, required a net interest rate of 4.01 percent. Net interest rate or cost is the actual rate of return on the investment in the bonds, taking into consideration the discount or premium at which the bonds were sold.

Opened in October 1940, the turnpike had only 15 months of operation before wartime restrictions curtailed its traffic and forced it to operate at a loss during the war years. But with the return to peace and the advent of unprecedented economic prosperity, traffic volumes increased everywhere, and the turnpike received more than its proportionate share of the general growth.

Gradually the obsolescence of other routes became increasingly apparent, and the speed, comfort, and convenience available over long distances on this road of modern design standards became more widely known. Increasing toll revenues not only assured the liquidation of the loan on the original section, but also showed prospects of being sufficient to have liquidated the entire cost of the facility including the amount of the PWA grant. By 1948 there was wide public acceptance of this first modern toll road. Far more optimistic views of the economic future existed than prevailed in 1938. Bonds offered by the Pennsylvania Turnpike Commission in 1948 were readily sold, and at an interest rate of but three-fourths of the rate found necessary 10 years earlier. By the end of 1954 the original 159-mile section had been extended to the Ohio border on the west and to the Delaware River on the east, a total of 360 miles. A summary of some of the features of this and the five other major toll roads in operation at the end of 1953 is shown in table 1.

TABLE 1.—Operations of 6 major toll roads, 1953

	Colorado Turnpike	Maine Turnpike	New Hampshire Turnpike	New Jersey Turnpike	Oklahoma Turnpike <sup>1</sup>	Pennsylvania Turnpike <sup>2</sup>
<b>Operating revenues:</b>						
Tolls.....	\$431, 576	\$1, 604, 820	\$585, 410	\$19, 192, 647	\$1, 339, 877	\$20, 932, 161
Rentals and concessions.....		40, 629		1, 853, 880	45, 569	1, 287, 954
Investment income.....	8, 338			396, 948		35, 271
Highway department funds.....	83, 915					
Other.....				67, 154		154, 835
<b>Total.....</b>	<b>523, 829</b>	<b>1, 645, 449</b>	<b>585, 410</b>	<b>21, 510, 629</b>	<b>1, 385, 446</b>	<b>22, 410, 221</b>
<b>Operating expenses:</b>						
Fare collection.....	52, 150	139, 461	64, 393	825, 802	96, 314	1, 065, 385
Maintenance.....	18, 662	122, 965	48, 504	1, 258, 365	136, 424	4, 733, 342
Traffic control.....		3, 066	51, 074	543, 195	54, 643	667, 334
Administration and miscellaneous.....	13, 103	74, 276	19, 555	630, 832	46, 445	757, 185
<b>Total.....</b>	<b>83, 915</b>	<b>339, 768</b>	<b>183, 526</b>	<b>3, 258, 194</b>	<b>333, 826</b>	<b>7, 223, 246</b>
<b>Net operating revenue..</b>	<b>439, 914</b>	<b>1, 305, 681</b>	<b>401, 884</b>	<b>18, 252, 435</b>	<b>1, 051, 620</b>	<b>15, 186, 975</b>
<b>Operating ratio.....</b>						
Cost of collection per dollar of tolls.....cents..	6.2	4.8	3.2	6.6	4.2	3.1
	12.1	8.7	11.0	4.3	7.2	5.1
<b>1953 traffic:<sup>4</sup></b>						
Automobiles.....	1, 940, 612	2, 162, 578	2, 699, 627	19, 434, 968	1, 102, 560	9, 246, 453
Trucks.....	51, 018	222, 194	248, 362	2, 153, 487	89, 439	2, 289, 543
Busses.....	( <sup>5</sup> )	4, 959	3, 990	416, 623	8, 393	62, 076
<b>Total.....</b>	<b>1, 991, 630</b>	<b>2, 389, 731</b>	<b>2, 951, 979</b>	<b>22, 005, 078</b>	<b>1, 200, 392</b>	<b>11, 598, 072</b>
<b>Percentage distribution, 1953 traffic:</b>						
Automobiles.....	97.4	90.5	91.5	88.3	91.8	79.7
Trucks.....	2.6	9.3	8.4	9.8	7.5	19.8
Busses.....	( <sup>5</sup> )	.2	.1	1.9	.7	.5
<b>Total.....</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Percentage distribution, 1953 toll revenues:</b>						
Automobiles.....	94.4	88.8	80.7	78.0	82.9	42.2
Trucks.....	5.6	15.7	19.1	19.6	15.4	56.8
Busses.....	( <sup>5</sup> )	.5	.2	2.4	1.7	1.0
<b>Total.....</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Average trip fee per vehicle:</b>						
Automobiles.....	\$0.21	\$0.62	\$0.17	\$0.77	\$1.01	\$0.96
Trucks.....	.47	1.13	.45	1.75	2.31	5.19
Busses.....	( <sup>5</sup> )	1.62	.29	1.11	2.71	3.37
<b>Cost of toll collection per vehicle.....cents..</b>						
Length of project (miles).....	2.6	5.8	2.2	3.8	8.0	9.2
Number of toll collection points.....	17.3	47.2	14.7	117.6	88.0	327.2
	1	6	1	17	6	24

<sup>1</sup> Opened to traffic May 16, 1953.<sup>2</sup> For year ending Nov. 30, 1953.<sup>3</sup> Includes \$2,332,080 replacement reserves.<sup>4</sup> Number of vehicles.<sup>5</sup> Not segregated.

### Maine Turnpike

The second major toll road of modern times was the Maine Turnpike, the first section of which was opened to traffic in December 1947. The State legislature in 1941 authorized the construction of a toll road from Kittery to Fort Kent, a distance of about 400 miles, but because of wartime restrictions and uncertainty as to financial feasibility no action was taken until 1945, when it was concluded that the section between Kittery and South Portland was feasible.

Bonds amounting to \$15 million were sold in 1946, at a net interest rate of 2.64 percent, to cover the estimated construction cost. Caught in a period of rising prices, however, the costs exceeded the estimates by a considerable amount and additional issues, one of \$5 million and a second of \$600,000, were sold to provide funds to complete the section.

When the road was opened, traffic volumes exceeded somewhat those estimated, but revenues at the toll rates originally scheduled proved to be inadequate to meet the higher costs. Eventually the tolls for passenger cars for the 47-mile trip were raised from 50 cents to 60 and later to 75 cents. Interestingly, the increase in the toll rates had no apparent effect on rate of traffic growth. Revenues have been ample to provide for all operating costs, necessary reserves, and interest charges. By the end of 1953, \$806,000 of the \$20,600,000 bond issues had been retired, an amount considerably less, however, than that provided by the sinking-fund schedule.

Nevertheless, prospects seemed to justify undertaking a 63-mile extension. The outstanding obligations of the original section were refinanced and combined with the financing of the second section. The bonds of the new issue sold at a net interest rate of 4.17 percent. Possibly significant in considering the prospects for future traffic on the original section is the fact that traffic volumes on U. S. 1 have already regained the level at which they stood at the time the turnpike was opened. It is reasonable to expect that as traffic in the area increases an increasing proportion of the new traffic will be attracted to the turnpike.

The Maine Turnpike is unique in several respects. It was the first modern turnpike to be financed without Federal assistance, and the first to be financed wholly with bonds secured only by the future earnings of the facility. As in the case of the Pennsylvania Turnpike, it possesses certain special features, although they are quite different from those that take the Pennsylvania Turnpike out of the "average" category.

The Maine Turnpike parallels U. S. 1, at a distance several miles inland. Both routes traverse and lead into areas of great attraction to summer vacationists. Consequently, turnpike traffic is predominantly a summer traffic, and is largely composed of vehicles carrying people who, because they are vacationing, were expected by many to be more willing to pay toll than those who drive for business or similar purposes.

Studies conducted by the Bureau of Public Roads in cooperation with the Maine Turnpike Commission and the Maine State Highway Commission reveal that drivers on vacation trips do use the turnpike in greater proportion than do those on business or similar trips. The studies also show, however, that drivers on long trips use the turnpike in greater proportion than those on shorter trips and that the proportion of those using it increases as the frequency of trips decreases.

Since vacation trips are usually long and infrequent, it is not possible to determine whether it is the purpose, the length, or the frequency of the trip that influences the driver most as to whether he will or will not use the toll road. Studies on other roads, however, lead to the belief that the length is probably a more important factor in the decision than the purpose. In any event, the fact that the Maine Turnpike is used to such a great extent for summer recreational

travel is a reason for the exercise of considerable caution in applying its experience to routes in other areas.

One element that works to the disadvantage of the Maine Turnpike is that substantially all of the population of the area is to the east along U. S. 1, so local travelers must always travel added distance if they wish to use the turnpike in preference to the more congested U. S. 1.

Both the turnpike and U. S. 1 lie in relatively flat country and neither route has appreciable advantage over the other with respect to gradient or length. The principal disadvantage of U. S. 1 is that its width is inadequate for peak volumes and it traverses a populous area and passes through several towns and villages.

#### *New Hampshire Turnpike*

The next toll road to be opened was the New Hampshire Turnpike, in 1950. This, too, has special features that make it important to use caution in translating its experience to other roads.

This road, but 15 miles in length, crosses the edge of the State and connects directly with the Maine Turnpike at one end and with a free express highway in Massachusetts at the other. Figuratively, it bridges the State, for its traffic includes relatively few New Hampshire vehicles or vehicles bound for points in the State.

After repeated unsuccessful attempts to obtain an increase in the gas tax to finance improvements on the winding and narrow U. S. 1, authorization was obtained from the New Hampshire Legislature for the construction of a toll road. This authorization differed from those of the two toll roads previously discussed in that it pledged the faith and credit of the State to the retirement of the bonds, and authorized the State highway commission, rather than a separate toll authority, to construct and operate the facility.

It has but a single toll-collection point. Its bonds sold at a net interest rate of 1.58 percent. Its successful operation has led to a decision to build two more toll routes in New Hampshire.

#### *New Jersey Turnpike*

The New Jersey Turnpike, successive sections of which were opened between November 1951 and January 1952, became the fourth of the major modern toll roads. This is probably the best known of the turnpikes—at least it was used by more vehicles (22 million) in 1953 than all the other 5 major turnpikes combined. Its traffic attraction has been the most striking, with the volume in 1953 reaching that estimated by the consultants for 1975, and with 1953 toll revenues more than double the amount estimated for that year.

The route is in a sense a trans-State "bridge," with much traffic using it en route between New York or New England and points to the south and west. Possibly recognition of the importance of this trans-State traffic and the feeling that it should pay its own way was a factor in the decision to construct this route as a toll facility.

Heavy through traffic with out-of-State registrations is prominent on the turnpike, especially on the more lightly traveled southern end. Significantly, however, use of the northern end, where there is more local traffic, is increasing faster than use of the southern end, so that New Jersey drivers are evidently bearing an increasing share of the cost.

While the turnpike has solved the traffic problem in New Jersey for trans-State drivers, at least for those willing to pay the 1½-cents-per-mile toll, it has done little for the average New Jersey driver. Traffic even on parallel routes now exceeds the volumes carried at the time the turnpike was opened, although were it not for the turnpike the increases would certainly have been greater. It is estimated that vehicle mileage on the turnpike was less than 6 percent of the total vehicle mileage in the State in 1953.

Aside from its striking traffic volume and revenue, the New Jersey Turnpike has other unique features. It was financed by revenue bonds, not sold through competitive bidding, but by negotiation with a group of insurance companies. A feature of the agreement was that funds were to be made available as needed, on a "forward commitment" basis. The original issue amounted to \$220 million and carried an interest rate of 3¼ percent, which applied only to the funds actually taken. The agreement also provided for interest to be paid at the rate of one-half of 1 percent on the amount not taken.

With the original section completed and its attraction to traffic known, additional sections are under construction or proposed and are being financed also by revenue bonds but sold through competitive bidding. Connections with the Holland Tunnel and the Pennsylvania Turnpike will soon be completed and will produce additional traffic, for which provision by widening the original section is being made.

#### *Denver-Boulder Turnpike*

In January 1952 the Denver-Boulder Turnpike in Colorado became the fifth of the modern toll roads. It, too, had its unique features. Studies indicated that toll revenues would not be sufficient to operate this road and amortize its estimated \$5.3 million cost. A plan was devised that authorized the State highway department to construct the road with the proceeds of revenue bonds, and further provided that up to 30 percent of the interest and principal in any year, and up to 30 percent of an amount necessary to create an adequate reserve, might be paid from regular highway funds. Total principal payments by the State could not exceed 30 percent of \$5.3 million, the original estimated cost. Costs of maintenance and operation were to be paid from State funds.

Subsequently, the cost estimate was revised to \$6.3 million. With the combination of prospective toll revenues and the guaranty of part of the costs of amortization, bonds in that amount sold at a net interest cost of 2.97 percent. Since the opening of the turnpike, costs of operation have been borne by highway funds, but the revenues from tolls have been more than adequate to meet the requirements for debt service and creation of a reserve, and it has not been necessary to call on the highway funds for that purpose.

#### *Turner Turnpike*

The year 1953 saw the opening of the Turner Turnpike in Oklahoma, on the route connecting Tulsa and Oklahoma City. The toll section includes 88 miles of the 106-mile distance between the cities. The State highway department constructed the connections to the cities at each end, without charge to the toll section.

This road probably has fewer unusual features of operation or environment than any of its predecessors, and more nearly represents

operation under "normal" or "average" conditions. It is in an area of about average traffic volumes. Other conditions, such as purposes of trips, amount of truck traffic, terrain, population density, and similar factors, that might be thought to influence the use of the earlier toll roads, are not unusual here.

The turnpike has not been in operation long enough to give conclusive evidence as to its financial prospects, but early results show that its net operating revenue is very close to that estimated by the consultants prior to its construction. In 1954, although operating costs exceeded the estimates, traffic volumes also were higher than predicted, and the net operating revenue was within 3.5 percent of the estimate for that year.

The first \$31 million of bonds for the original section were sold at a net interest cost of 3.4 percent, and an additional \$7 million were sold at a net interest cost of 3.84 percent. In December 1954 a syndicate agreed to purchase an issue of \$68 million for extension of the original section from Tulsa to the State line near Joplin, Mo., at an interest rate of 3.81 percent. It declined, however, to bid on bonds to finance a proposed extension of the turnpike system across the State to the north and south through Oklahoma City on the basis that the bond market would not then absorb further turnpike issues, and that further financing, while believed to be feasible, would "have to take time."

This turnpike, because of the "average" conditions surrounding it, will be observed with much interest by highway and investment interests.

#### *Other toll roads*

Not included in table 1 are a number of toll roads opened in part or in whole in 1954, but too late for their experience to be significant. These roads, and those already discussed, are listed in table 2, which shows the status of all arterial toll roads as of January 1, 1955.

TABLE 2.—Status of arterial toll roads as of Jan. 1, 1955

Name of road or location <sup>1</sup>	Year built or estimated completion date	Mileage				Actual or estimated cost (1,000 dollars) <sup>2</sup>
		Completed	Under construction	Authorized <sup>3</sup>	Proposed <sup>3</sup>	
Colorado: Denver-Boulder Turnpike <sup>1</sup> .....	1952	17.3				6,237
Connecticut: Greenwich-Killingly Expressway <sup>1</sup> .....	1957	129.0				398,000
Delaware: Maryland line-Delaware Memorial Bridge.....					16.0	16,000
Florida: Sunshine State Parkway (Hollywood-Fort Pierce).....				110.0		78,000
Fort Pierce-Jacksonville.....					238.0	150,000
Cross-State spur to Tampa.....					128.0	80,000
<i>Subtotal, Florida</i> .....				110.0	368.0	308,000
Georgia: Cartersville-Valdosta.....				290.0		225,000
Illinois: Chicago-Rockford-Beloit.....					88.4	141,602
Chicago Belt Line (Hammond, Ind.-Wisconsin line).....					80.2	208,944
Maywood-Aurora.....					24.7	39,454
<i>Subtotal, Illinois</i> .....					193.3	390,000
Indiana: Turnpike (Ohio line-Illinois line).....	1956		156.0			280,000
Gary area-Indianapolis area.....				131.0		178,000
Vincennes-Cincinnati area.....					160.0	200,000
Indianapolis-Cincinnati.....					110.0	100,000
<i>Subtotal, Indiana</i> .....			156.0	131.0	270.0	758,000
Iowa: Davenport-Council Bluffs.....					297.7	180,000
Kansas: Turnpike (Kansas City via Topeka and Wichita to Oklahoma line).....	1957		236.0			160,000
Turnpike extensions: Bonner Springs-Missouri line.....					56.0	33,220
Wichita-Hays.....					155.0	79,140
<i>Subtotal, Kansas</i> .....			236.0		211.0	272,360
Kentucky: Turnpike (Louisville-Elizabethtown).....	1956		40.0			38,500
Louisville-Cincinnati.....					100.0	80,000
<i>Subtotal, Kentucky</i> .....			40.0		100.0	118,500

See footnotes at end of table, p. 14.

TABLE 2.—Status of arterial toll roads as of Jan. 1, 1955—Continued

Name of road or location <sup>1</sup>	Year built or estimated completion date	Completed	Under construction	Mileage			Actual or estimated cost (1,000 dollars) <sup>4</sup>
				Authorized <sup>2</sup>	Proposed <sup>3</sup>	Total	
Louisiana: Lafayette-Lutcher.....				86.0		86.0	100,000
Maine:							
Turnpike (Portland-Portland).....	1947	47.2				47.2	20,600
Portland-Augusta extension.....	1955		66.0			66.0	55,000
• Augusta-Fort Kent extension.....				279.0		279.0	195,000
<i>Subtotal, Maine</i> .....		47.2	66.0	279.0		392.2	370,600
Maryland: Northeastern Expressway (Baltimore-Elkton area).....					48.0	48.0	29,525
Massachusetts: Turnpike (New York line-Boston area).....	1956		123.0			123.0	239,000
Michigan:							
Rockwood-Saginaw.....				114.6		114.6	187,000
Ypsilanti-Gary area.....				176.0		176.0	215,000
<i>Subtotal, Michigan</i> .....				290.6		290.6	402,000
Nebraska: Omaha-Lincoln.....					65.0	65.0	40,000
New Hampshire:							
Turnpike (Seabrook-Portsmouth).....	1950	14.7				14.7	6,770
Portsmouth-Rochester extension (Spaulding Turnpike).....	1957		22.8			22.8	14,300
Central Turnpike (Erewhitt).....	1957		37.6			37.6	23,400
<i>Subtotal, New Hampshire</i> .....		14.7	60.4			75.1	43,470
New Jersey:							
Garden State Parkway <sup>4</sup> .....	1954	90.0				90.0	80,000
Extension to New York Thruway.....				8.0		8.0	95,000
Turnpike (Delaware River to George Washington Bridge interchange).....	1952	117.6				117.6	284,952
Turnpike extensions.....							
Newark Airport interchange-Holland Tunnel.....	1955		8.1			8.1	190,048
Bordenown interchange-Pennsylvania Turnpike extension.....	1956		6.0			6.0	7,27,200
Newark-Columbia.....				59.0		59.0	307,000
<i>Subtotal, New Jersey</i> .....		207.6	14.1	67.0		288.7	837,200
New York:							
New York Thruway system:	1954	396.0	31.0			427.0	675,428
Buffalo-New York City section.....			20.0			20.0	
Niagara section.....			70.0			70.0	
Eric section.....							
New England section.....			18.0			18.0	



PROGRESS AND FEASIBILITY OF TOLL ROADS

Berkshire section.....					20.0	20.0	62,332
Garden State Parkway connection.....					2.0	2.0	
New Jersey Turnpike connection.....					5.0	5.0	
Albany-Rouses Point section.....					160.0	160.0	248,000
Binghamton-Clayton section.....					185.0	185.0	110,000
Hartiman-Binghamton section.....					110.0	110.0	80,000
Long Island Expressway (New York City-Riverhead).....					64.0	64.0	1,667,698
<i>Subtotal, New York.....</i>					<i>596.0</i>	<i>182.0</i>	<i>1,081.0</i>
North Carolina: Gastonia-Mount Airy Turnpike.....					125.0	125.0	200,000
Ohio:							
Turnpike (Pennsylvania line-Indiana line).....	1955	21.4	220.0		300.0	300.0	326,000
Cincinnati-Connecticut.....					100.0	100.0	400,000
Columbus-Toledo spur.....		21.4	220.0		400.0	400.0	123,000
<i>Subtotal, Ohio.....</i>							<i>861,000</i>
Oklahoma:							
Turner Turnpike (Oklahoma City-Tulsa).....	1953	88.0	88.5		97.6	97.6	68,000
Turnpike extensions:							
Tulsa-Missouri line.....	1957				127.6	127.6	61,800
Oklahoma City-Kansas line.....					97.6	97.6	94,800
Oklahoma City-Texas line.....					225.2	225.2	862,346
<i>Subtotal, Oklahoma.....</i>							<i>401.7</i>
Pennsylvania:							
Turnpike (Irwin-Carlisle).....	1940	158.9	158.9		158.9	158.9	77,164
Eastern extension (Carlisle-Valley Forge).....	1950	100.9	100.9		100.9	100.9	87,000
Western extension (Irwin-Ohio line).....	1951	67.4	67.4		67.4	67.4	77,500
Delaware River extension (Valley Forge-Delaware River).....	1954	32.3	32.3		32.3	32.3	65,000
Northeastern extension (Philadelphia-Scranton).....	1956		110.0		40.0	110.0	233,000
Northeastern extension (Scranton-Sayre).....					100.0	100.0	40,000
Gettysburg extension (lateral spur).....					33.0	33.0	170,000
Northwestern extension (New York line-Ohio line via Erie with connection to Pittsburgh).....			110.0		150.0	150.0	250,000
<i>Subtotal, Pennsylvania.....</i>					<i>569.5</i>	<i>792.5</i>	<i>1,032,864</i>
Rhode Island: Connecticut line-Massachusetts line.....					40.0	40.0	35,000
Texas:							
Dallas-Fort Worth Turnpike.....					30.5	30.5	58,500
Dallas-Fort Worth area-San Antonio.....					250.0	250.0	139,000
Galvestone-Corpus Christi via Houston.....					400.0	400.0	200,000
<i>Subtotal, Texas.....</i>					<i>680.5</i>	<i>680.5</i>	<i>397,500</i>

See footnotes at end of table, P. 14.

TABLE 2.—Status of arterial toll roads as of Jan. 1, 1955—Continued

Name of road or location <sup>1</sup>	Year built or estimated completion date	Mileage				Actual or estimated cost (1,000 dollars) <sup>2</sup>
		Completed	Under construction	Authorized <sup>3</sup>	Proposed <sup>4</sup>	
Virginia: Richmond-Petersburg.....				36.0		57,000
West Virginia line-North Carolina line.....				75.0		75,000
Subtotal, Virginia.....				111.0		132,000
Washington: Tacoma-Everett.....				65.0		175,000
West Virginia: Turnpike (Charleston-Princeton).....	1954	87.6				133,000
Turnpike extensions: Charleston to Pennsylvania and Ohio lines via Fairplain.....					225.0	338,000
Princeton-Virginia line.....					6.0	9,000
Subtotal, West Virginia.....		87.6			231.0	480,000
Total mileage.....		1,239.3	1,382.0	3,314.3	2,253.0	8,188.6
Total actual or estimated cost.....		\$1,552,226	\$2,303,386	\$3,758,592	\$2,242,886	\$9,857,100

<sup>1</sup> Omitted from this tabulation are the Jacksonville, Fla., toll expressway system, the Calumet Skyway in Chicago, Ill., and the proposed Loveland Pass Tunnel in Colorado which are not classified as toll roads.  
<sup>2</sup> Legislation has been enacted authorizing construction of these toll roads or enabling projects to be constructed if found feasible. Financing arrangements have not been completed.

<sup>3</sup> Includes toll roads authorized or recommended for study as to feasibility by State governors, highway departments, turnpike officials, or legislative committees. As of current date, plans and locations have not been firmly established. Cost and mileage data are therefore only approximated. Omitted are (a) projects discussed informally, (b) those proposed at a previous time, but apparently not now receiving serious consideration, (c) projects studied and found presently infeasible, including those for which enabling legislation has been introduced but failed of enactment.

<sup>4</sup> "Actual" costs refer in most instances to proceeds of bond issues and hence include interest during construction.

<sup>5</sup> The State is required to pay maintenance and collection costs in addition to debt service to the extent that revenues from toll receipts are inadequate to meet the full debt requirements.

<sup>6</sup> Section of the parkway south of Lakewood on which trucks are permitted. The proceeds of these bond issues include the prorata share borne by the Pennsylvania Turnpike Commission and the New Jersey Turnpike Authority of the bridge across the Delaware linking these toll roads.

<sup>7</sup> Includes \$29,250,000 Federal grant from the Public Works Administration. Cost of mileage under construction includes 31 miles of New York Thruway. Cost of mileage under construction includes 21.4 miles of the Ohio Turnpike opened to traffic December 1954. In neither case is the segregation available.

TABLE 3.—*Status of toll parkways*<sup>1</sup> as of Jan. 1, 1955

Name of road or location	Year built or estimated completion date	Miles	Actual or estimated cost (1,000 dollars) <sup>2</sup>
<b>Connecticut:</b> <sup>3</sup>			
Merritt Parkway.....	1940	37.5	4 20,592
Wilbur Cross Parkway.....	1949	29.5	17,500
<i>Subtotal, Connecticut</i> .....		67.0	38,092
New Jersey: Garden State Parkway <sup>4</sup> .....	1955	75.0	250,000
<b>New York:</b>			
Westchester County parkways: <sup>5</sup>			
Saw Mill River Parkway (toll portion).....	1926	11.1	3,500
Hutchinson River Parkway (toll portion).....	1927	11.2	4,600
Cross County Parkway.....	1940	4.0	1,800
Southern State Parkway system <sup>6</sup> .....	1955	23.0	40,000
<i>Subtotal, New York</i> .....		49.3	49,900
<b>Grand total</b> .....		191.3	337,992

<sup>1</sup> These facilities permit free access between toll gates and, in general, heavy trucks are denied use of the parkways. Except as noted, all are in operation.

<sup>2</sup> "Actual" costs refer in most instances to proceeds of bond issues and hence include interest during construction and other initial financing costs.

<sup>3</sup> The Connecticut and Westchester County (N. Y.) parkways were not built as self-liquidating limited-access toll roads.

<sup>4</sup> Includes Federal grant of approximately \$400,000 from Public Works Administration.

<sup>5</sup> Section of the Parkway north of Lakewood on which trucks are prohibited. 65 miles in operation, 10 miles scheduled to be opened in 1955.

<sup>6</sup> Includes 5.5 miles under construction. 1953 legislature authorized a 10-cent toll on the existing Southern State Parkway to help finance a \$40 million parkway construction and improvement program. Toll collections began in July 1954.

TABLE 4.—*Status of resort toll roads*<sup>1</sup> as of Jan. 1, 1955

Name of road or location	Year built or estimated completion date	Miles	Cost (in thousands of dollars)
Florida: Buccaneer Trail.....	1950	17.5	4,600
Georgia: Brunswick-St. Simon Causeway.....	1924	11.1	650
<b>New York:</b>			
Long Island Parkways:			
Meadowbrook and Loop Causeways.....	1934	8.3	5,000
Wantagh Causeway.....	1934	5.1	2,000
Captree Parkway.....	1954	4.2	7,300
<i>Subtotal, New York</i> .....		17.6	14,300
Interstate: Nags Head, N. C.-Virginia Beach, Va. <sup>2</sup> .....		54.0	3,500
<b>Grand total</b> .....		100.2	23,050

<sup>1</sup> These facilities are principally publicly owned resort or seasonal roads, not serving through traffic.

<sup>2</sup> This road has not been financed.

### West Virginia Turnpike

The West Virginia Turnpike was completed late in 1954. Originally proposed to cross the State from north to south through Charleston, the 88-mile section south from Charleston to Princeton, near the Virginia border, was deemed feasible of self-liquidation. Revenue bonds in the amount of \$96 million were sold in April 1952, at a net interest rate of 3.95 percent. Subsequently, to cover unanticipated construction costs, an additional \$37 million issue was sold at a net interest cost of 4.25 percent. A portion of this section was opened in September 1954 and the remainder in the following month. The toll route saves considerable distance and eliminates much tortuous

mountain alignment, and so was expected to be especially attractive to truck traffic, the estimates anticipating that commercial vehicles would account for 40 percent of the total traffic.

Among the toll roads not yet in full operation are two that deserve special mention: the New York Thruway, and the Garden State Parkway in New Jersey. Both were financed in their early stages by bonds backed by the faith and credit of the respective States. Subsequently, additional funds were obtained in each case through the sale of revenue bonds.

#### *Garden State Parkway*

The Garden State Parkway, running 165 miles, generally along the New Jersey coast, from Patterson at the north to Cape May at the south, was begun in 1945. By 1951, only 22 miles had been completed through the use of current revenues. It became apparent that credit financing would be required to complete the route in a reasonable time, and in 1952 the New Jersey Legislature established an authority within the State highway department to construct and operate the parkway. The voters subsequently authorized the issuance of \$285 million in bonds, backed by the faith and credit of the State. This issue was sold in 2 installments, \$150 million at a net interest cost of 2.997 percent and \$135 million at a net interest cost of 2.77 percent. Subsequently, the legislature gave authority to sell bonds backed only by the revenues of the parkway. In November 1954, \$20 million of such bonds were sold at a net interest cost of 3.24 percent to provide for the extension and widening of certain sections.

Automobiles and buses may use the entire length, but trucks are prohibited from using approximately the northern two-fifths. For this reason, part of the parkway is shown in table 2 and part in table 3.

An unusual feature of this toll road is the manner of collecting tolls. Most arterial toll roads are of the "closed" type. A driver receives a card as he enters and surrenders it when leaving, and the toll paid is based on the distance traveled on the turnpike. On the Garden State Parkway, tolls of a fixed amount are collected at each of a series of toll gates, or "barriers," through which all traffic passes. Thus drivers who both enter and leave the parkway at interchanges between adjacent barriers pay no toll. Drivers passing a barrier pay the fixed fee regardless of where they enter, and drivers traversing a considerable length of the parkway pay tolls at each of a series of barriers.

#### *New York Thruway*

The New York Thruway developed as a toll road after experience much like that of the Garden State Parkway. Started as a free expressway, intended eventually to connect Buffalo and New York City, slow progress soon showed that it could not be completed in reasonable time without credit financing. In 1950 the Thruway Authority was created by the New York Legislature and, in an election in November 1951, approval of an issuance of \$500 million in bonds backed by the faith and credit of the State was obtained. Subsequently, the legislature authorized the issuance of additional bonds, backed by revenues only, in the amount of \$350 million.

With this financing assured, the thruway was constructed rapidly and the major portion of its length, from Buffalo to the crossing of the Hudson River near Nyack, is open. On this portion tolls are collected in the customary manner of a "closed" system, except that holders of \$20 annual permits for automobiles have unlimited use of the facility. A barrier toll gate at which 50 cents will be charged will be placed on the approach to the Hudson River Bridge, and tolls will be collected at barriers between the bridge and New York City. The total passenger-car toll from Buffalo to New York City is expected to be \$5.60 for the 427-mile trip.

As these completed or nearly completed roads have come into operation, others are under construction, and 335 miles are scheduled to be opened in 1955.

In addition to the arterial toll roads listed in table 2, there are a number of parkways and other routes on which tolls are collected at barriers, and on which the revenues from the tolls are not intended to liquidate the cost of the facility but merely to provide additional needed revenue. These routes are listed in tables 3 and 4. Toll roads in all categories, as of January 1, 1955, are shown in figure 1.

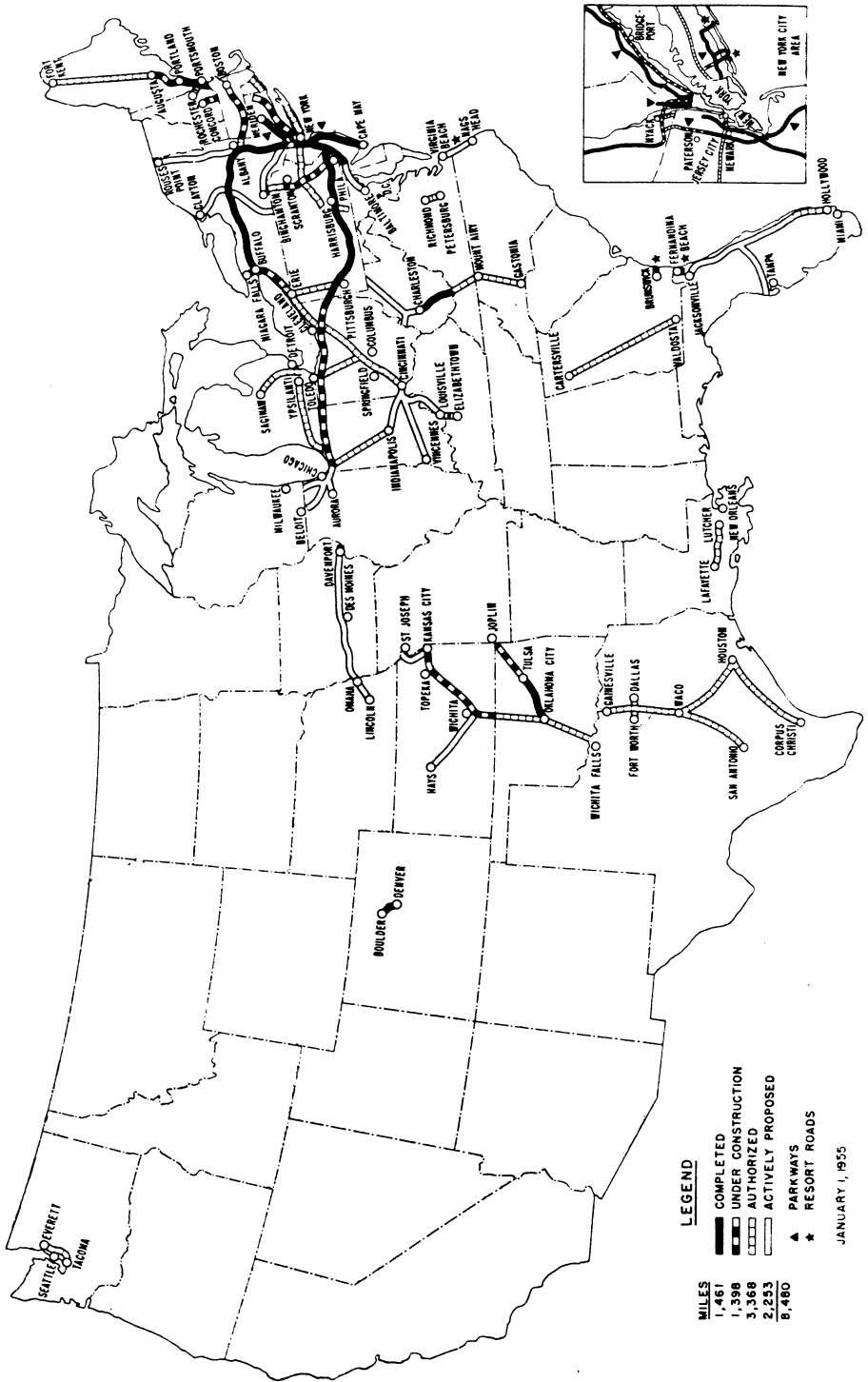


FIGURE 1.—Arterial toll roads, toll parkways, and resort toll roads in operation, under construction, authorized, and actively proposed, as of January 1, 1955.

*Past experience as a guide*

Because of variations in the methods of financing the present toll roads and the many special conditions that surround their operation, it is apparent that prospects for further toll financing cannot be determined simply by projecting past experience. Each proposal requires a detailed study of its financial feasibility and of the most effective method of collection of the essential revenue.

There has emerged from the experience to date, however, a rather standardized pattern of study of feasibility and a good knowledge of many of the factors essential in estimating feasibility. Estimates of the proportion of traffic that may be expected to be attracted to roads of modern design, the amount of revenue that may be expected from concessions for the sale of gasoline and food, and factors of safety that investment bankers regard as necessary before subscribing to proposed bond issues may now be made on the basis of actual experience on a number of toll roads operating under a variety of conditions.

One of the obvious conclusions from the experience of toll-road operation and studies of feasibility and cost that have been made is that the situation is never static. Conclusions reached today may have to be altered within a year as new developments appear. It is almost axiomatic, however, that with the steady increase in traffic volumes everywhere in the country and with traffic needs increasing so much faster than the facilities provided for its movement, financing through revenue bonds will become increasingly attractive unless provision of public funds is substantially increased. It appears, however, that even though the general level of attractiveness of revenue-bond financing will vary with the economic situation and with the amount of construction with public funds, the order of feasibility of individual routes relative to one another does not change materially.

As indication of the absence of change in relative feasibility of different routes, it is of interest to compare the location of toll roads now operating or under construction with the sections found to be the most likely to be self-liquidating in the 1938 study of the Bureau of Public Roads. The two maps in figure 2 show this comparison. The upper map shows the arterial toll roads now in operation or under construction. It includes a number of roads that were not considered in the 1938 study because they are not on one of the six routes to which that study was limited. The lower map shows the 2,977 miles of highway portrayed in plate 15 of the report *Toll Roads and Free Roads* (p. 28) as highest in order of estimated feasibility. A number of these routes probably will not be built as toll roads because existing or planned free routes will meet traffic needs.

The similarity of these maps is striking. The resemblance would be still closer, however, if from the upper map were removed the toll roads that do not lie along the routes selected for the 1938 study, and if from the lower map were eliminated the routes on the west coast, most of which probably will not be built as toll roads because of the adequacy of existing or planned free roads.

The conclusion is obvious that the greatly increased traffic pressures, caused by the tremendous upsurge in traffic and the lag in

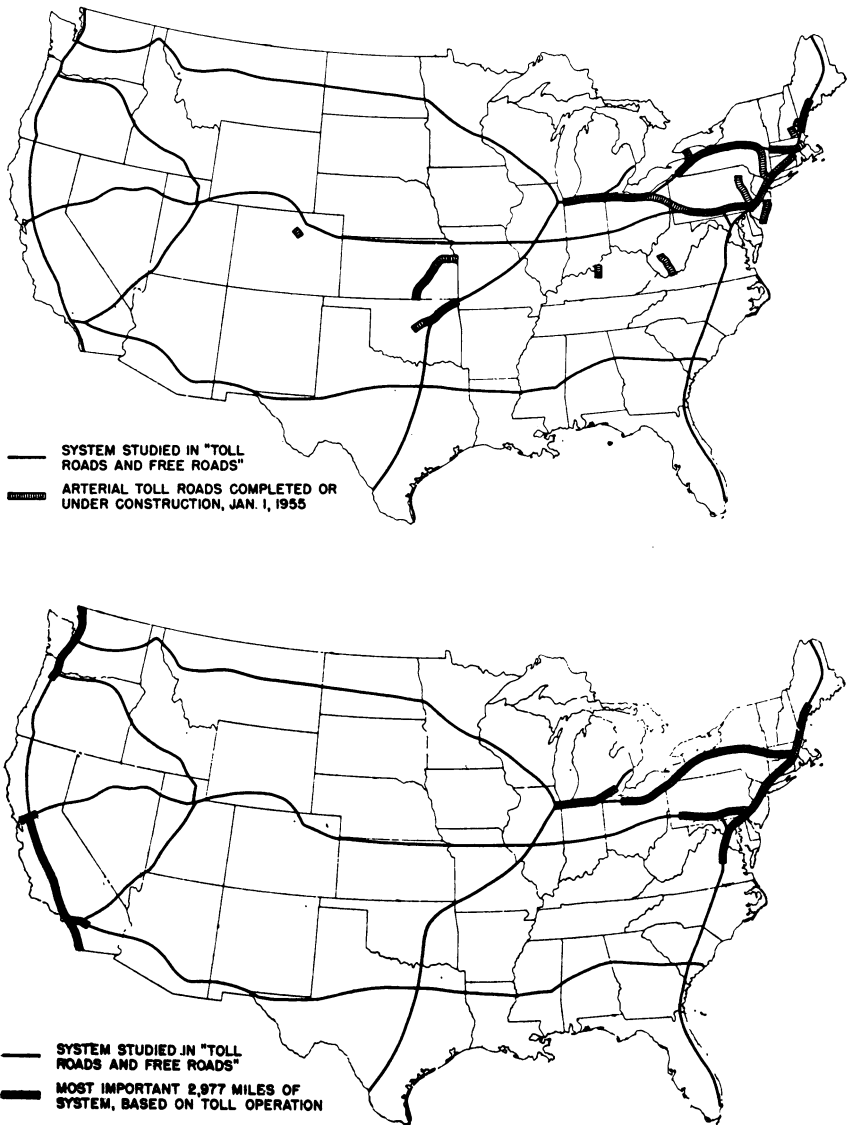


FIGURE 2.—Relation of the arterial system studied in Toll Roads and Free Roads and toll roads completed or under construction as of January 1, 1955.

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meeting the increased needs, coupled with the more optimistic current view of the economic future, have raised the whole level of financial feasibility of toll roads, but have had but little effect on the relative order of feasibility of particular routes.

*Toll roads authorized or proposed*

In addition to the mileage of toll roads already in operation or under construction many more miles have been authorized or proposed. Table 2 shows that over 3,300 miles of arterial toll roads have been authorized and another 2,250 proposed, making in total—operating, under construction, authorized, or proposed—nearly 8,200 miles of such roads.

Some of the mileage authorized or proposed undoubtedly will be found feasible and will be built. Certain mileage authorized has already been found not to be feasible at this time, however, and has been deferred at least for the present. And some routes have been authorized with the understanding that sections will be financed as they may be found feasible, without expectation that the entire length will be constructed in the near future.

On the other hand, at the close of 1954, authority for financing highways through revenue bonds existed in but 29 States. Undoubtedly projects in some States in which such authority does not exist would be financially feasible and might be built as toll roads should the policy be changed in those States.

Thus the projected toll roads included in the last two categories in table 2, approximately 5,550 miles in length, must be regarded merely as those that might be built should conditions of the future justify. It should not be assumed that there is definite prospect of toll roads on the particular locations listed or in the total amount shown.

FEASIBILITY OF ADDITIONAL TOLL ROADS

Study of the feasibility of toll roads made at the direction of Congress included analyses of the feasibility of constructing roads through revenue-bond financing supplemented by such other revenues as normally accrue in toll-road operations. The estimates of feasibility were made for routes in all States, irrespective of whether legislation authorized toll financing of highways. The investigation excluded routes on which improvement now existing or programed was expected to meet the traffic demands of the future. Thus the mileage estimated to be feasible as toll roads is in addition to mileage, either toll or free, that now meets traffic requirements or on which definitely programed improvements will make it satisfactory. The mileage estimated to be feasible of toll financing is in no way related to the mileage of toll roads now authorized or proposed in the various States.

*Basis of estimates*

A report on the feasibility of toll roads throughout the United States, prepared within the time and cost limitation of this study, must necessarily be in most general terms. Accurate determination of the feasibility of a single project requires intensive studies of construction cost and of traffic, taking into consideration the origin and destination of trips, which generally cannot be completed in less than about a year. Such studies have been made for some individual projects but the

mileage of these is very small indeed when viewed in the light of a nationwide highway program.

However, information on the costs of toll roads, and of free roads of comparable design, is sufficient to permit engineers in the field to make estimates of the cost of constructing the various portions of the Interstate System and of other routes as toll roads, which should be reasonably accurate on the average. Information is also available on the volumes of traffic using all the principal roads throughout the Nation as a result of continuing studies made by the State highway departments in cooperation with the Bureau of Public Roads. This traffic volume information is insufficient, in itself, to determine the traffic that would use a toll road, but it may be interpreted, in the light of the results of intensive traffic studies made before and after the construction of several of the existing turnpikes, to form a basis for reasonable estimates. Such estimates, while certainly not sufficiently accurate for use in the final appraisal of individual projects, are believed, when combined for several sections or routes, to provide a fairly reliable general measure of toll-road feasibility.

For the purposes of this study, estimates were made of construction costs and traffic volumes for all sections of the Interstate System, exclusive of sections already adequately improved and those known in 1954 to be scheduled for early improvement either as toll or free roads. Traffic was forecast for the years 1964, 1974, and 1984. General rates of traffic increases assumed were consistent with those rates used in the report, Needs of the Highway Systems, 1955-84, recently submitted to the Congress (84th Cong., 1st sess., H. Doc. No. 120).

Similar estimates were made for those routes not on the Interstate System but believed to have toll potential. All of the State highway departments cooperated fully in this undertaking by providing the basic cost and traffic data from which toll feasibility was calculated.

Estimates made by the States were carefully reviewed and compared. Revisions were made in a few instances for consistency or where indicated as proper on the basis of additional information. While these revisions were substantial in certain cases, they were not such as to make appreciable differences in the broad, overall determinations.

#### *Basic assumptions*

The costs and traffic estimates were used to determine the probable extent of toll-road feasibility. Certain basic assumptions had to be made.

First, it was assumed that the financing would be by revenue bonds, which is the method for most of the toll roads now being built. In keeping with current toll-road financing practices and experience on existing toll roads, the following values were assigned to the various items entering into the calculations:

- (a) Amount of bonds: 1.12 times construction cost.
- (b) Term of bonds: 40 years.
- (c) Rate of interest: 3.5 percent.
- (d) Toll rate, passenger cars: 1.75 cents per vehicle-mile.
- (e) Toll rate, trucks: 4.00 cents per vehicle-mile.
- (f) Revenues from concessions: 7 percent of gross receipts from tolls.
- (g) Administrative, operational, and maintenance costs, and replacement reserve: 20 percent of gross revenues.

Items (a), (b), and (c) are based on the most recent experience or practice in financing toll roads through revenue bonds. Item (d), toll rate for passenger cars, is higher than the average collection on some roads and below that on others. The average on the New Jersey Turnpike, for example, was 1.94 cents in 1953 (with proper weight given the larger volumes on the northern end where the rate for some trips was as much as 3.0 cents per mile). It is believed that 1.75 cents per mile for passenger cars and corresponding rates for trucks can be collected if necessary. Item (f) is based on the experience of existing toll roads. Item (g) is consistent with current practices in estimating feasibility. While the first three factors could be estimated from existing toll roads, the factor of replacement reserve cannot be estimated on the basis of experience to date.

For purposes of this analysis it was assumed that bonds would be sold in 1957, roads opened to traffic in 1959, and amortization started in 1960, interest from 1957 to 1960 being paid from bond receipts and accounted for in the 1.12 factor, item (a).

#### *Feasibility ratios*

Feasibility ratios were calculated by dividing the estimated net operating income for 1978 (the midyear of the period of bond amortization) by the annual cost of debt service. Net operating income was determined by deducting the amount needed for administrative, operational, and maintenance expenses and replacement reserves from total receipts from tolls and concessions. Experience in recent years shows that bonds offered to finance projects having a feasibility ratio of 1.5 or more, calculated in the manner described, would be marketable. Therefore, any section having a ratio of 1.5 or more was regarded as feasible of construction through toll financing.

As previously pointed out, these studies could not be made in such detail as to permit the determination of the feasibility of individual projects with assurance. However, since the factors used for such items as traffic diversion and generation were based on average conditions as determined from traffic studies of existing toll roads, it is believed that the national totals resulting from the study are reasonably reliable.

#### *Mileage feasible of toll financing*

The most significant finding of the study of toll feasibility is probably that, of the highways found to be feasible, all but about 200 miles lie along the lines of the Interstate System. This finding not only attests the importance of the Interstate System, but permits the consideration of toll roads to be related almost entirely to the completion of the Interstate System. Opportunity for revenue-bond financing of improvement of routes of the other systems is so rare as to be of no importance.

Calculations were made on the basis of the individual sections for which data were supplied by the States. These sections varied greatly in length, some being as short as 1 mile. The results reflect a feasibility based entirely on the traffic and cost, disregarding completely the desirability of integration and continuity.

On the assumption that each section showing a feasibility ratio of 1.5 or above is acceptable for toll financing, the total length of the Interstate System that could be thus financed would be about 6,700 miles, estimated to cost \$4,260 million. This is mileage on the system,

in addition to that now adequately improved or scheduled soon to be made adequate, either as toll roads or free roads, that might be financed through the proceeds of revenue bonds if issued in keeping with current practices. It bears no relation to the mileage of roads authorized or proposed as listed in table 2.

Some of the 6,700 miles lie in States that have not authorized toll financing and, as a matter of policy, may prefer not to finance roads in this way in the future. Other mileage lies in States in which authority to construct toll roads is limited to particular routes and in which there is no authority to construct sections on other routes that might have been found in this study to be feasible of toll financing. To the extent that these conditions prevail, the mileage that might be constructed as toll roads would be less than the 6,700-mile figure.

On the other hand, some States have provided for the pooling of revenues from separate sections of a route or from different routes so that an entire system may be financed as a unit and not as separate independent sections. In such cases earnings on a particular section or route in excess of requirements may be applied to supplement the earnings on other sections or routes that in themselves do not show a feasibility ratio sufficiently high to make them attractive investments. In such States sections now found not to be feasible might be possible of inclusion as a part of a more complete system. Pooling of revenues through interstate compacts might further increase the feasible mileage, and should a national toll authority be set up through which excess revenues from toll roads in one State could be used to augment revenues in others, a substantial increase in feasible mileage might result.

There are many factors involved, some working to increase and others to decrease the mileage that apparently would provide attractive investment opportunities if proposed for revenue-bond financing. The greatest uncertainty, however, is as to the policies of the States and the Federal Government with respect to the public funds from taxes or bond issues that will be applied to the improvement of the Interstate System. Assurance of public funds to provide reasonably early completion of the system would soon spell the end of revenue-bond financing of roads in the system. Continuation of the present inadequate allocation of funds to this system, however, can only serve to increase the mileage that would be potentially feasible as toll roads.

#### EFFECT OF TOLL ROADS ON THE FEDERAL-AID PROGRAM

In the Federal-Aid Road Act of 1916 (39 Stat. 355) the Congress provided (sec. 1)—

\* \* \* That all roads constructed under the provisions of this act shall be free from tolls of all kinds.

That provision was reaffirmed in section 9 of the Federal Highway Act of 1921 (42 Stat. 212), and is still in effect.

The early decision of the Congress came at a time when recollections were fresh of tolls collected on roads badly maintained or nearly impassable. Such conditions were thought to have no place in the transportation system, and it was to prevent their recurrence that Federal aid was barred from participation in toll-road construction. Now, nearly 40 years later, the resurgence of toll roads has brought

about the need to review their place in the highway systems of the country.

### *Acceptance of toll roads*

Financing of roads through the sale of revenue bonds has developed because provision of public funds through accepted channels has lagged far behind highway needs. In this situation, revenue-bond financing has provided many miles of badly needed controlled-access highways when other means have failed. The financial success of the early examples of the modern toll road and the rapid extension of toll roads on some of our most important routes raises serious questions as to the place of the toll road in the Federal-aid systems and to its effect on the Federal-aid program.

Toll roads are most readily accepted on routes where existing congestion and delays are great and the construction of a controlled-access highway would produce substantial savings of time and increased comfort and safety of travel. Additional acceptance is found when out-of-State vehicles are prominent in the traffic.

With all highway needs so pressing, administrators in a State are reluctant to ask for general increases in taxes to build roads of principal interest to one section of the State or to drivers from other States. At the same time, drivers traversing the section of the State where a controlled-access highway is needed, particularly those from out of the State who are usually on long trips and are infrequent users of the road, are not reluctant to pay a toll for the assurance of rapid travel on a safe and uncongested highway.

Toll roads already in operation have relieved congestion for the through traffic on main routes in a number of States, and as others come into operation they also will offer facilities superior to those now existing, for drivers who wish to pay the tolls. Diversion of traffic to toll roads from existing routes reduces traffic on those routes and usually relieves the pressure for their immediate improvement. To this extent, the toll roads are distinctly beneficial to the Federal-aid program. With the steady increases in traffic, however, the need for improvement of the existing facilities in many cases soon recurs.

Two conditions inherent in toll-road operation produce a pronounced effect on the Federal-aid program:

1. A toll road cannot serve all the traffic for which some route must provide service.

2. The first responsibility of operators of a toll road is to the investors.

This is not to imply that in many instances toll roads are not practicable and thoroughly satisfactory answers to traffic problems. In all cases, however, these two factors must be considered in weighing the desirability of including a toll road in the overall highway network.

### *Duplication of facilities*

By their nature, toll roads require that interchanges providing access and egress be placed only at infrequent intervals. The cost of collecting tolls is such that toll stations are usually operated only where there is sufficient usage to make them profitable. Even in the congested section of the country with a closely spaced road network, the average distance between interchanges on existing toll roads ranges from 7 to 14 miles.

Since short trips predominate in the traffic stream, many drivers are precluded from the use of a toll road merely because their trips are not long enough to permit them to take advantage of it.

Moreover, certain drivers who might use a toll road do not do so because of the toll, or for some other reason.

As an example, studies of traffic using the Maine Turnpike and the parallel U. S. 1 show that of the drivers whose origins and destinations were such that use of the full length of the turnpike was feasible, between 75 and 80 percent used the turnpike, the percentage increasing as the total traffic on the two routes increased. In contrast, less than 15 percent of those whose trips permitted the use of only part of the turnpike took advantage of it. Of the total vehicle-mileage on the two routes, excluding the mileage within the towns along U. S. 1, the percentage on the turnpike ranged from 38 to 50 percent, again with the percentage using the turnpike increasing as the total traffic on the two routes increased. Significantly, average traffic on U. S. 1 in 1954 had regained its level of 1947, the year before the opening of the turnpike.

Thus, even though a toll road may be readily self-liquidating, it can never relieve some public agency from the responsibility of continuing to provide local service and service for through travelers who, for whatever reason, prefer not to use a toll road.

On the other hand, a properly located and designed free road can serve both the through and local traffic. As an indication of the limitation of traffic service that can be provided by toll roads, it was estimated that the Interstate System, if its inadequate sections were completed as toll roads located in keeping with current practice, would serve only two-thirds of the traffic that the system would serve if it were completed as a free system.

In the more congested areas, where traffic volumes are sufficient to require two or more roughly parallel routes, there is advantage in locating one to accommodate principally the through traffic, whether it be toll or free, and another to accommodate local or shorter-range movement.

In the more usual case, however, a single facility appropriately located and adequately designed can accommodate the traffic for many years to come. To build a toll road in such a situation might be financially feasible. And the toll road would relieve to some extent congestion that might exist on the free road that must also be maintained. Further, by this measure of traffic relief, it might be found considerably less costly for the responsible public agency to maintain the free route in condition suitable for its remaining traffic than it would be to provide and maintain a single facility for the entire traffic flow through the area. Despite whatever saving may accrue to the public agency, however, the fact remains that the two facilities must be maintained, one from public funds and one from funds from private sources; and regardless of the source of funds the total cost will in all probability be greater, and the greater cost is, of course, borne in one way or another by the public.

#### *Effect on programing of improvements*

The impact of a toll road is, of course, not confined to any particular system of roads, but because most existing and prospective toll roads lie along the general lines of the Interstate System, the effect is greatest on the planning and construction of that system and on the other Federal-aid roads closely integrated with the Interstate System.

The Federal-aid program is affected immediately upon decision to consider the construction of a toll road. Public officials then generally hold in abeyance further activity in construction or even in planning and programming improvements along the line of the route and also on roads intersecting or closely paralleling the proposed toll road. Should improvements be made and the toll road later constructed, highway officials might be placed in the position of having wasted public funds or of entering into competition for traffic with a toll authority whose income depends on the continuance of a substantial advantage in traffic service of its facility over that of parallel free facilities.

On the other hand, to defer planning or construction of free highways may, if the projected toll road is not subsequently built, merely serve to delay for a period the active prosecution of badly needed public improvements. Many toll roads are proposed but not built, and in many instances years elapse between the first proposal and the ultimate decision. A period of 2 to 3 years between the date of formal authorization and the time that financing is assured is common. Meanwhile progress on the route in question, presumably one of the more important in the State, is at a standstill.

Up to this time, these conditions have been somewhat disconcerting, since they upset the orderly programming of improvements that the States and the Federal Government try to achieve. Probably they have not seriously delayed progress on the Interstate System, but only because the funds that have been available have been insufficient to permit marked progress. Should substantial funds for improvement of the Interstate System be available, such delays could be serious unless, of course, sufficient public funds were provided to assure reasonably prompt undertaking of needed improvements.

#### *Effects of completed toll roads*

Other effects on the Federal-aid program are felt once a toll road is completed. It is the responsibility of the toll-road authorities to locate the route and determine its access points to the maximum benefit to the route itself, an action that may be taken without regard to its effect on the free road network that must be integrated with the toll road.

With infrequent access points it may well happen that the volume of traffic that should be attracted to or discharged from the toll road at any particular interchange is too great to be satisfactorily accommodated on the existing crossroad. In such a case the public authorities will immediately be urged to improve the connecting highways, not only to benefit the toll road, but also as a proper service to the local traffic to be served by the interchange.

In addition, with interchanges widely spaced on the toll road, it will become necessary for the public officials to develop traffic-collecting routes and perhaps paralleling routes that would be unnecessary were the more frequent interchanges characteristic of a free route available.

This condition is particularly evident as a toll road approaches or bypasses an urban area. Here right-of-way costs and other factors that must be taken into consideration when a route is expected to be liquidated from toll revenues often prevent a close approach to the center of the urban area. Provision of the necessary connections

must then be made from public funds, involving routes that may, but equally well may not, be of the most service to the community as a whole.

Some of the adverse effects of toll roads on the programing of public highway improvements and many problems of integration of toll roads with public highway networks would be greatly alleviated if the responsibility for toll roads were vested in State highway departments. The consolidation of responsibility for toll and free highways would permit the most effective use of available engineering and technical personnel, avoid duplicating administrative organizations, and promote orderly development of all highway improvements.

#### RECOMMENDATIONS WITH RESPECT TO FEDERAL PARTICIPATION IN TOLL ROADS

1. *No Federal participation in toll roads.*—The present law forbidding the collection of tolls on highways constructed with Federal-aid funds should be continued.

2. *Inclusion of toll roads in Federal-aid systems.*—The present law should be changed to permit the inclusion of toll roads as part of the National System of Interstate Highways when they meet the standards for that system, and when there are reasonably satisfactory alternate free roads on the Federal-aid primary or secondary systems which permit traffic to bypass the toll road.

This recommendation is made to meet present-day conditions. A number of toll roads which are in operation, under construction, or authorized, lie along the preferred location of interstate routes; duplication of these roads would generally be an economic waste. Accordingly, if there is to be a continuous integrated Interstate System, it is reasonable that these toll roads be included in it. The inclusion of a toll road in the Interstate System would not be contrary to recommendation 1. It would merely make it unnecessary to construct a free road to interstate standards closely paralleling the toll road.

No toll roads should be permitted on any Federal-aid system except as provided in the first paragraph of this recommendation. Continuous travel over free roads will then be possible except over those portions of the Interstate System on which tolls are collected. On those portions, drivers will have the alternative of travel over a toll road built to interstate standards, or over a reasonably satisfactory free road of another Federal-aid route.

