Designating the Urban Interstates

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Designating the Urban Interstates

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> *The urban Interstates proved to be the most difficult to build. They would have been difficult in any event because of the physical challenge of building freeways on new locations in an urban setting. However, they also proved controversial during the construction stage because of their impacts on people--their homes, businesses, and communities. Today, the urban Interstates are integral parts of our urban landscape, carrying millions of motorists every day, and yet their impacts on our cities remain controversial. "The Genie in the Bottle," published in the September/October 2000 issue of Public Roads www.fhwa.dot.gov/publications/publicroads/00septoct/urban.cfm, discussed how the Interstate System was intended to solve the urban problems it is now blamed for causing. This new article focuses on how the urban Interstates were selected.*

Setting the Stage

Section 13 of the Federal-Aid Highway Act of 1938, approved June 8, 1938, provided the following:

> The Chief of the Bureau of Public Roads is hereby directed to investigate and make a report of his findings and recommend to the Congress not later than February 1, 1939, with respect to the feasibility of funding, 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 on such roads.

Since the mid-1930's, the BPR had been gathering data for such a study. The he Federal-Aid Highway Act of 1934 included a provision at the suggestion of BPR Chief Thomas H. MacDonald authorizing the States to use 1 ½ percent of their Federal-aid highway funds for "surveys, plans, and engineering investigations of projects for future construction." This provision was the formal beginning of the planning that would remain an important part of highway development to the present, but initially it was intended for highway planning surveys conceived by MacDonald's assistant, Herbert S. Fairbank (Chief, Division of Information). The goal was a State-by-State national survey to collect data on road conditions, traffic, and financial and road use:

> Conditions covered a wide range of factors, such as width, type, design (curves, grades, and sight distance), and adjacent uses (such as farms, homes, and schools).
>
> Traffic surveys included classification of vehicles, origin-and-destination (O&D) data, and the cargo and weight of commercial vehicles.
>
> Financial and road use data involved all expenditures for and revenues from highways, with a goal of determining whether the main roads were supported by their users.

As explained in *America's Highways 1776-1976* (Federal Highway Administration, 1976):

> The inventory phase involved driving over every mile of rural highway, recording its width, type, and condition; on the more important routes the geometric features such as curves, grades and sight

> distances; all farms, residences, businesses, industrial plants, schools, hospitals, and any other cultural feature that the roads must serve . . . .
>
> [The surveys] involved intensive traffic volume counting on main routes, less intensive counting on secondary roads and spot checks on lightly traveled local roads. At all stations, vehicles were classified as to type, and on the main roads a sampling of commercial vehicles was weighed on portable scales, their cargoes classified, their origins and destinations ascertained, and their tare weights recorded where known. Origins and destinations of passenger cars were also sampled . . . .
>
> The third general area involved the recording of expenditures and revenues for highways and all other purposes from all units of government, including special districts, to ascertain the degree to which user and other taxes were being applied to road purposes by the individual units and, more generally, by the various levels of government. [Page 269]

Pennsylvania began the first State survey in September 1935. Within a year, 38 other States had begun their surveys.

Toll Roads and Free Roads

Fairbank used the data from the highway planning surveys available from 46 States to evaluate the superhighway network described in Section 13 of the 1938 Act. President Franklin D. Roosevelt submitted the report, *Toll Roads and Free Roads*, to Congress on April 27, 1939. The President's transmittal letter stated:

> The report, prepared at the request of the Congress, is the first complete assembly of data on the use being made of our national highway network. It points definitely to the corrective measures of greatest urgency and shows that existing improvements may be fully utilized in meeting ultimate highway needs.
>
> It emphasizes the need of a special system of direct interregional highways, with all necessary connections through and around cities, designed to meet the requirements of the national defense and the needs of a growing peacetime traffic of longer range.
>
> It shows that there is need for superhighways, but makes it clear that this need exists only where there is congestion on the existing roads, and mainly in metropolitan areas. Improved facilities, needed for the solution of city street congestion, are shown to occupy a fundamental place in the general replacing of the cities indicated as necessary in the report "Our Cities," issued in September 1937 by the Natural Resources Committee.

(*Our Cities*, an excerpt from W. Lee Mertz' *Origins of the Interstate System*.)

The BPR's report contained two parts. Part I, *The Feasibility of a System of Transcontinental Toll Roads*, evaluated a 14,336-mile network of toll superhighways that conformed with the statutory language. The statewide planning surveys revealed that transcontinental travel was light, and that highway trips were predominantly short. Moreover, the majority of automobile owners had low incomes ("Less than 5 percent of all family cars are owned by families that have an annual income of more than $5,000.") As a result, the toll superhighways would have a "traffic-repelling tendency" as motorists remained on the parallel toll-free U.S. numbered highways to avoid the additional cost of the tolls. Therefore, at an estimated cost of $2.9 billion, a toll network would not be financially self sufficient (i.e., revenue from tolls would not be sufficient to retire the bonds issued to finance construction), although some segments of it would be.

The key to Part I, however, was what the statewide highway surveys proved:

> The factual evidence presented in this report clearly indicates that the construction of direct toll highways cannot be relied upon as a sound solution of the problem of providing adequate facilities for the vitally necessary highway transportation of the United States, or to solve any considerable part of this problem.

Therefore, on the theory that "the report should be constructive rather than negative," Part II presented *A Master Plan for Free Highway Development*. It described a toll-free express highway network that would address the identified problems by meeting the growing interregional traffic needs rather than the limited transcontinental traffic. This network evolved into the Interstate System.

Based on the State planning surveys and consultation with the Department of War, MacDonald and Fairbank made a tentative selection of rural routes totaling 26,700 miles that would be "most useful for the accommodation of the ordinary peacetime movements." According to the report, the tentatively selected network "joins the populous cities of the United States, almost without exception, and one of its routes follows practically every one of the lines along which the population of the country has moved to its present settlement and along which it is still obviously thickest both in city and country."

This "Primary Highway System," which was twice as long as the studied toll superhighway network, could be achieved by upgrading the existing roads in the identified corridors:

> Specifically, the needed improvements include the reduction of excessive curvature; the flattening of heavy grades; an opening of longer sight distances; a general widening of pavement lanes; a construction of additional lanes and separation of opposing traffic where increased volume requires, and possibly also for the accommodation of slow vehicles on the heavier grades; the separation of grades at many railroad and highway intersections, and installation of protective cross traffic controls at others; the abatement of dangerous roadside conditions of all sorts; and a substantial improvement in the general directness of alinement between important objectives of the principal routes serving movements of the longer ranges.

However, as President Roosevelt's transmittal letter pointed out, the he primary traffic problem, as confirmed by the State planning surveys, was in metropolitan areas. Page 2 of the Master Plan put it plainly:

> The needed rebuilding and improvement of the main rural highways is only one element in the larger program of work required for the adequate modernization and extension of the public street and highway facilities of the country . . . .

The traffic data collected during the highway planning surveys conclusively identified the increasing traffic approaching the city limits and continuing into it on trunk line highways carrying a U.S. or State route number:

> Quite often, particularly in the older cities of the East, the present internal street, which before the city's growth was actually the external highway, still follows its historic radial course toward the center of the city, and cuts conveniently across the rectangular block plan of younger city streets. In alinement, the present street is in such cases distinctly the preferable route for much of the traffic entering the city; but its convenience on this score may be largely nullified by the fact that it retains the narrow width of the old country road it was meant to be. When this is the case, traffic conditions may become so bad, approaching the center of the city, as to force the abandonment of the route by the through traffic despite its convenient alinement.

The difficulty in securing right-of-way for expansion was the main reason the trunk routes were not improved:

> At the approach to the city road-bordering developments thicken to such an extent that the additional space required for the widening or other increase of the highway facility may be obtainable only at heavy cost because of the closely crowding suburban residences and industrial establishments.

The report dismissed the theory that construction of a bypass for traffic that was not bound for the city would relieve congestion. The survey data demonstrated that "the greater part of the heavy traffic at a city entrance is an in-and-out movement of local generation [that] cannot be drained off by a bypass route."

Any thought that problems could be easily solved, particularly in larger cities, must be dismissed:

> In the larger cities generally only a major operation will suffice-nothing less than the creation of a depressed or an elevated artery (the former usually to be preferred) that will convey the massed movement pressing into, and through, the heart of the city, under or over the local cross streets without interruption by their conflicting traffic.

These facilities would serve some through traffic and traffic from rural highways, but would also serve traffic from the immediate suburbs and outer reaches of the city during the morning and evening peak periods. Such traffic, typically, "is little concerned with intermediate city sections, but it must pass through them and, in so doing, is obstructed more or less frequently at the cross streets."

Express highways were the answer. A few examples could be found of attempts to address city congestion, including the West Side Highway and Henry Hudson Parkway in New York City, Roosevelt Boulevard in Philadelphia, and a short section of depressed highway in St. Louis. These were exceptions:

> In general, however, city administrations have been deterred from following these inspiring examples by what appear to be the literally stupendous difficulties and expense involved-difficulties and expense partly of an engineering nature, but first and usually in much the greater measure generated by the acquisition of right-of-way and the damage to, or obliteration of, private property . . . . In the circumstances it is easy to understand and sympathize with the hesitation of the city administrations. Yet the problem remains and is becoming more acute with each passing year. Soon it must be faced; and the strongest reasons urge against delay.

The "leapfrog like movement of traffic from the periphery of the cities over intervening areas to their centers" was largely caused by the automobile:

> The motor vehicle itself is the primary cause of this phenomenon. It made possible the outward transfer of the homes of citizens with adequate income from the inner city to the suburbs and it now conveys these citizens daily back and forth to their city offices and places of business.

Their former homes had, the report stated, "descended by stages to lower and lower income groups." Now, they were almost "untenable, occupied by the humblest citizens, they fringe the business district and form the city's slums-a blight near its very core!" The gradual deterioration of these homes and surrounding areas resulted in government-financed slum-clearance projects:

> Heralds of a better future though they are, these acquisitions comprise one of the reasons for avoidance of delay in dealing with the problem of trans-city highway connections and express highways. Another reason lies in the fact that, here and there, in the midst of the decaying slum areas, substantial new properties of various sorts are beginning to rise-some created by private initiative, some by public. There is growing danger that these new properties, sporadically arising, and the more compact developments by the Government in its slum-clearance projects, will block the logical projection of the needed new arteries into the city center.

That was one reason for planning and building needed express highways in the cities. Another was the "slow decay" in the central business district "that will not be arrested until there is radical revision of the city plan":

> Such a revision will have to provide the greater space now needed for the unfettered circulation of traffic, and will have to permit a reintegration of facilities for the various forms of transportation-railway terminals, docks, airports and the highway approaches to each-more consistent with their modern relationships. For such a revision of the city plan decision upon the location and character of the new highway facilities here described is a basic necessity. Toward the actual accomplishment of the much needed revision, little else that might be done by Government would be so likely to supply the impetus.

The report emphasized the need for action:

> When one observes the countless impediments that embarrass the movement of twentieth-century traffic through the eighteenth century streets of some eastern cities one wonders how long it will be, with the assured further increase in traffic, before complete congestion will result.

To address the city's problems, the "most urgently required" facilities were belt line distribution roads around the larger cities and bypasses around small cities. Although these routes would not relieve congestion, they would divert "a considerable amount of through highway traffic around the city." That was not, however, their primary purpose, which was to distribute traffic from the radial expressways linked to the center city. The belt-line or circumferential route could best be located "around the city at its outer fringe," but in some cases could be built within the city "generally somewhere within the ring of decadent property surrounding the central business area." The report added:

> Such a belt line, connecting at appropriate points with radial arteries extending out of the city, may avoid the cutting of a new route directly through the business sections, and may either serve as a substitute or supplement for the outer belt line.

In short, the largest cities might have two belt lines, one surrounding the central business district and the other at the outer fringe.

For smaller cities, the need for a bypass would depend on whether traffic is more or less likely to want to enter the city. For a city that lies between larger ones closely spaced (the example being Havre de Grace, Maryland, on U.S. 40 between Wilmington, Delaware, and Baltimore, Maryland), the bulk of traffic typically was headed to the larger cities, so a bypass would be appropriate. For a city in a more sparsely settled region (such as Las Vegas, New Mexico, on U.S. 85), motorists are more likely to want to drive through the city, so a bypass would serve little purpose.

Regardless of the size of the city, the belt-line distribution routes and bypasses should have one feature in common:

> [If] they are to be and remain the useful facilities they should be, they will have to possess one feature that is present in none or virtually none of the circuit routes thus far built around urban communities; i.e., they will have to permit access only at their points of junction with the main routes approaching the cities or towns and a very limited number of intermediate points. A so-called bypass route or belt line that is left open to access from the side at all points becomes in a very short time just another city street. The business-generating potentiality of a heavy traffic stream is so great that there is an immediate development of a great variety of roadside establishments all along every new heavily traveled route that is created. Every new highway also, especially in the vicinity of cities, immediately encourages residential development and attracts commercial establishments more interested in the new facility provided by it than in catering to its traffic.

Although right-of-way difficulties had so far discouraged construction of limited access roads, a related problem had rarely been experienced:

> There enters here the further difficulty, rarely dealt with heretofore, of publicly acquiring the legal authority or right to prohibit entrance upon the highway except at designated points.

These right-of-way issues, the report noted, would apply equally to the main highways.

Although the legal issues would have to be resolved, only by limiting access "can the bypasses by preserved for their proper function of serving through traffic." Moreover, the cities could expand beyond the circuit routes "without interfering with the discharge of the duty of such routes."

To illustrate how these ideas would work, Fairbank described a general plan for "relief of the critical traffic situation" in Baltimore. He chose Baltimore because it was his hometown and remained his home throughout his career. It also

was typical of the large older cities of the East:

> An old city, growing by the coalescence of numerous ancestor villages, the irregular and discontinuous street plan of Baltimore is the despair of the stranger and the daily inconvenience of its own citizens. The city lies in the path of one of the heaviest highway-traffic streams in the country, and by millions of travelers who have moved with that stream the difficulties of the Baltimore passage are well remembered.

Further, the city illustrated the pattern of suburbanization and blight that the report had highlighted in general terms:

> The old residential section of the city clustered closely about the central business section, which has grown little in size in the last 50 years. But, since 1900, the more well-to-do families that formerly lived in this older section have moved in large numbers to outlying suburban areas, some of which have been included within revised limits of the growing city. The old homes, vacated by this movement, have descended to the less well-to-do, and by stages large areas have finally reached a critical stage of decay.

The Master Plan included a map of Baltimore showing tentative locations of trans-city connections and express highways "along the approximate lines of several of the existing radial streets, running to suitably designed intersections and distributing squares, located at the east and west sides of the central business section." Using the designations that would eventually be applied to Baltimore's Interstate highways, the map shows:

- I-83 from two locations in downtown Baltimore north to a connection beyond the city limits with U.S. 111 (York Road), then the main road between Baltimore and York, Pennsylvania;
- I-95 coming into the city from the north, but to the west of the present alinement, and leaving the city in the south in the present State Route 295 corridor (Baltimore-Washington Expressway, the State extension of the Baltimore-Washington Parkway);
- Baltimore Beltway (I-695), but located within the city limits except in the southwestern arc. The Beltway included a bridge over the city's outer harbor (at the approximate location of the Baltimore Harbor Tunnel, I-895) that would also "serve to connect two rapidly growing industrial sections on opposite sides of the river."
- I-70 coming in from the west in the U.S. 40 corridor and continuing through the central business district and on beyond the eastern section of the Beltway.

Fairbank also envisioned an express route, not built in any form, in the Pennsylvania Avenue/Reisterstown Road corridor to the northwest.

The report described the look of these highways:

> [The] depressed and divided arterial lanes would be bordered on each side by one-way surface streets for local service. At intervals, important cross streets would be bridged over the depressed way and in the first blocks from each of such bridges, ramps at each side of the artery would afford separated up-and-down connections with the surface streets . . . . The belt line . . . would be a limited access facility, with all intersecting highway grades separated and access provided only from the most important roads.

The report included a plate illustrating the design of a depressed express highway.

As might be expected, U.S. 1 and U.S. 40 would be "the greatest single contributions" to traffic on Baltimore's belt line highway. "Between these two highways, the belt line would serve as a bypass route for that part of the Atlantic coastal movement that is desirous of avoiding the city entirely." A second plate illustrated a special Y connection where heavy volumes of traffic could shift from the main road to the bypass:

> In this sketch the belt line is shown in the middle distance coming from the west and continuing eastward toward the southern riverside industrial suburbs. In the center of the picture is shown the Y

connection with U.S.1, and the route of the belt line crossing the distant river toward the northeast.

Interregional Highways

On April 14, 1941, President Roosevelt appointed the National Interregional Highway Committee. As he put it, the goal was:

> . . . to investigate the need for a limited system of national highways to improve the facilities now available for interregional transportation, and to advise the Federal Works Administrator as to the desirable character of such improvement, and the possibility of utilizing some of the manpower and industrial capacity expected to be available at the end of the war.

(By this time, the BPR had been renamed the Public Roads Administration (PRA) and shifted from the Department of Agriculture to the Federal Works Agency.)

The Committee consisted of:

> Thomas H. MacDonald, Commissioner of Public Roads and Chairman of the Committee;
> The Honorable Bibb Graves, former Governor of Alabama;
> G. Donald Kennedy, State Highway Commissioner, Michigan;
> C. H. Purcell, State Highway Engineer, California;
> Frederic A. Delano, Chairman, National Resources Planning Board;
> Harland Bartholomew, City Planner, St. Louis, Missouri;
> Rexford Guy Tugwell, Chairman, New York City Planning Commission.

At an initial meeting on June 24, 1941, the Committee elected MacDonald to be Chairman, Kennedy to be Vice Chairman, and Herbert Fairbank to be secretary. In reality, Bartholomew, Kennedy, Purcell, MacDonald, Fairbank, and their PRA assistants did the Committee's work. Governor Graves died on March 14, 1942. Tugwell was appointed Governor of Puerto Rico (September 19, 1941, until September 3, 1946), and was unable to continue an active role in the Committee's work. Delano withdrew from the Committee in April 1941. Although the surviving members, including Tugwell, submitted the resulting report, *Interregional Highways*, it was drafted by Fairbank.

The report was basically completed by the end of 1941, but President Roosevelt did not want to submit it to Congress at that time. With the United States joining World War II following the Japanese attack on Pearl Harbor on December 7, 1941, Roosevelt saw the interregional highway system as a post-war initiative that would provide jobs for returning soldiers and help avert a return of the Depression. Therefore, he wanted to submit it closer to the end of the war, rather than at the start of American involvement in it.

In Section 5 of the Federal-Aid Highway Amendment of 1943, approved July 13, 1943, Congress (probably at MacDonald's request) asked for just such a report:

> The Commissioner of Public Roads is authorized and directed to make a survey of 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; and to report to the President and the Congress within six months after the date of the enactment of this Act, the results of such survey together with such recommendations for legislation as is deemed advisable.

In response, President Roosevelt submitted *Interregional Highways* to Congress on January 12, 1944.

The report discussed the rural segments as requested by Congress, identifying a 33,920-mile network, including 29,450 miles of rural highways plus 2,123 miles within the municipal limits of cities of 10,000 or more population-direct connections into and through the cities-and 2,347 miles within the limits of cities of less than 10,000 population. The total city mileage was 4,470 miles of urban sections. Of this network, the report explained that "although in miles it

represents scarcely over 1 percent of the entire highway and street system, it will probably serve not less than 20 percent of the total street and highway traffic."

The urban mileage did not include circumferential or distributing routes needed at the larger cities for the "dual purpose of bypassing through traffic and of distributing and assembling other traffic to and from the several quarters of the city." In the absence of detailed study, the report did not attempt to identify where these routes would be placed, but did estimate that the mileage would not exceed 5,000 miles, bringing the total interregional system to about 39,000 miles.

As was the case with *Toll Roads and Free Roads*, the *Interregional Highways* report went into considerable detail on freeways in cities. Despite the variety of cities in the country, they were "surprisingly uniform in their status and condition":

> The focal point of them all, however, is the central business district, which contains the large stores and office buildings and is often the cultural and civic center of the urban community. But this "downtown area" is cramped, crowded, and depreciated. Land values are often less than they were 20 years ago.
>
> This center shades off into a secondary business area which merges almost imperceptibly with a large area of mixed land uses and rundown buildings. This is the slum area where living conditions are poor.
>
> Around the slums is an even larger area of residential property in various stages of depreciation. This is the widely discussed "blighted area." Without the application of effective rehabilitation measures, it will become part of the city's slums.
>
> Beyond this blighted area lie the newer residential areas. They extend far out beyond the city limits, in the form of widely scattered subdivisions, merging almost imperceptibly into the farm lands.

The "most rapid urbanization ever known," without sufficient plan or control, had resulted in blighted or slum areas:

> The result is square mile after square mile of developed city that is functionally and structurally obsolete both as to buildings and neighborhood arrangements.

The progress of transportation was a factor in this deterioration:

> The automobile has made partial escape from this undesirable state of affairs easy and pleasant for at least some of the population. Suburban home developments have been made attractive largely by the possibilities of quick and individual daily transportation thus afforded.

Businesses followed the homes from the central city, where congestion and parking problems hurt the retail trade, resulting in "an outward movement of some large emporiums and a more numerous establishment of branch and chain stores in suburban communities." Two photos illustrated the problems that curb parking caused in a small and large city. Further, industries that needed more space at lower cost than was possible within the city were seeking outer locations, with the most favorable locations being those best served by transportation facilities.

The result of this outward movement was "the depreciation in value of city-contained land and property available by taxation for the financial support of the city government and the various services it must supply to its residents." The report stated:

> What the city will be like in the future depends on whether its future development is planned or haphazard. Several new conditions, however, will greatly affect city development. One of the most important of these is that future population growth of cities will be limited. To base the planning of highways or anything else on expectations of urban population increases like those of the past, would seem to be unwise.

Reversing the suburban home development and expansion of suburban businesses that were at the heart of the decentralization or dissipation of the urban area "is a most difficult problem to solve." However, as long "as the central areas of the cities are poor places in which to live and rear children, people will continue to move to the outskirts." The report added, "Undoubtedly, a factor that has facilitated this movement has been the improvement of highways."

Creation of the interregional routes would exert a powerful force on the shape of the future city. It was important, therefore, for the interregional highways to be located so as to "promote a desirable urban development." Because urban areas often consist of several political jurisdictions, the Committee recommended that "an overall authority" be created to cooperate with the State highway agency in developing an overall thoroughfare plan. For some urban areas, establishing an overall authority would be more complicated than in others, as the report explained:

> In some urban centers, cooperation between the State highway department and local authorities will be complicated by the fact that the metropolitan area will consist of several cities and perhaps one or more county jurisdictions and that decisions will need to be reached on a metropolitan rather than a city-by-city basis. Recognizing the difficulty of unifying a multiplicity of local agencies, the [Interregional] Committee believes that the creation of an over-all authority would be highly beneficial and desirable in complex urban areas. A metropolitan authority would avoid obvious mistakes in the location of the interregional routes and thus prevent distortions in the development of the area. Only through some over-all agency such as a metropolitan authority can there be developed an adequate thoroughfare plan to provide for all traffic needs. The interregional routes should be coordinated with the metropolitan street and highway plan. Such a metropolitan authority could anticipate and avoid obvious mistakes in the location of the interregional routes, prevent distortions based on short-sighted compromises, and in the long run lead to the best solution for all concerned.

To help the authorities, *Interregional Highways* included a 16-page section on "Principles of Route Selection in Cities" and followed it with a 4-page section on "Illustrations of Principles of Route Selection." The principles were:

- Connection with city approach routes
- Penetration of city
- Location internally through wedges of undeveloped land
- Circumferential and distribution routes
- Relation to traffic-generating foci and terminals
- Relation to other transportation media
- Relation to contemplated developments requiring large tracts of land
- Minimization of street intersections
- Relation to urban planning

Interregional Highways, discusses the principles in detail.

In illustrating the concepts of express highway location, *Interregional Highways* presented Figure 31, "Schematic lay-outs illustrating various combinations of main interregional routes required for the adequate service of traffic at cities of various sizes." Figure 31 depicted three circumstances, namely the small, medium-sized, and large city. The report stressed that the three situations were "purely imaginary cases." However, they "suggest most of the essential locational relations of the main interregional routes and circumferential and distribution routes." They also depicted "the difference between circumferential routes that should properly be considered as part of the interregional system and those that may not be so considered because of their primarily local function."

In a chapter on "Standards and Features of Roadway Location and Design," the report also summarized design standards for urban sections:

> All urban sections of the system shall be designed at all points and in all respects for safe travel by passenger vehicles at a speed of not less than 50 miles per hour, and by trucks and tractor combinations at a speed of not less than 35 miles per hour. All urban sections of the system shall

> provide a sufficient number of lanes and other facilities so that at no time, except during infrequent peak hours, will it be necessary because of the interference of other vehicles to reduce the average running speed to less than 40 miles per hour.

In Appendix V, *Interregional Highways* elaborated on basic standards for the urban sections of the Interregional System. All urban sections would be located between control points "as direct as feasible, shall affect adjacent property as favorably as possible, and shall conform to the topography and property improvements in such manner as to avoid the appearance of forced alinement." All sections would be limited-access highways, with access "only at designated points at which facilities for safe entrance and exit shall be provided." The preference was for "two distinct one-way roads rather than a divided highway of fixed cross section."

The report included two illustrations depicting urban expressways, one an elevated section and the other depressed. In addition, the report included photographs of expressways in operation, with commentary on their deficiencies. A photograph of East River Drive illustrated the riverside construction "that may be desirable" in large cities.

Acquisition of right-of-way as soon as possible was essential if construction of the Interregional Highway System was to be a post-war program. The two main hindrances to this goal were the failure to plan and provide funds for land purchases sufficiently in advance of construction and the "cumbersome and time-consuming land acquisition processes" under State law. While endorsing creation of a Federal land authority to purchase the land for States that did not have the constitutional authority to do so, the Committee was mindful of concerns expressed after release of *Toll Roads and Free Roads* regarding Federal intrusion into State affairs. The Committee, therefore, recommended creation of similar authorities at the State and local level under a Federal-aid plan that would finance the acquisition, by State and local authorities, of needed lands for highway and other public purposes. The authorities would, inevitably, "aid in the efficient assembly and appropriate redevelopment of large tracts of blighted urban lands."

The Federal-Aid Highway Act of 1944

In 1943, before release of *Interregional Highways*, Congress considered legislation to authorize a post-war highway program-one that would provide much needed money to repair highways damaged by war traffic and create jobs for returning service personnel. The House Committee on Roads had developed comprehensive legislation that proposed designation of a 40,000-mile Interregional Highway System. The system would connect all municipal and industrial centers and meet at suitable border points with routes of continental importance in Canada and Mexico. The bill also placed new emphasis on addressing the country's urban problem.

When, however, the committee took testimony, the members found that the highway community, even within the usually united American Association of State Highway Officials (AASHO), was sharply divided. The AASHO bill (developed with MacDonald), which was traditionally the basis for Federal-aid highway legislation, was not supported fully by the member State highway agencies. The concerns were many, but a key point of disagreement was the formula for apportioning funds among the States. Although AASHO's bill adjusted the formula, it could not secure unanimous support from the Northeast, with William J. Cox, head of Connecticut's highway agency, being the lone holdout. The heavily populated northeastern States had long believed that their citizens paid more in taxes than the States received in revenue from the Federal Government.

Rural interests were concerned about the urban focus of the Interregional Highway System and the new legislative proposals for urban areas. Others objected to a proposal to increase the Federal share of project costs to 75 percent, fearing that the increase would inevitably lead to greater Federal domination over the States. Some advocates of toll roads objected to the proposed toll-free Interregional System.

Rather than try to resolve the differences so far in advance of the end of the war, Congress passed a 1-year bill that President Roosevelt signed on July 13, 1943, continuing the Federal-aid highway program without provision for a post-war program.

In view of the stalemate, MacDonald, Fairbank, and other PRA officials went to their constituent groups to explain the importance of the Interregional System. A week after release of *Interregional Highways*, MacDonald addressed the Annual Meeting of the American Society of Civil Engineers on January 21, 1944, to discuss the proposal as it would affect cities. He explained that:

> [The] interregional system of highways has potential for beneficial effects upon urban areas beyond any tools that have as yet been devised if the use is designed and directed by superior intelligence. But the same tools may be used to produce disappointing, if not actually bad, effects.

Acknowledging that decentralization was the "storm center of the urban problem," he advocated coordination of interregional highway development with rational master plans for the cities. The new program was "the most plausible solution" for restoring decadent areas and preserving central business districts. But the key was planning:

> If the interregional highway system is to be truly effective for the uses for which it is designed, it must be conceived only after a careful and complete functional study of the city organism . . . . But whether or not there is acceptance of a rational course and control of development, the provision of interregional routes will exert a powerful influence in the shaping of future development of the city.

When hearings on a post-war Federal-aid highway program began in February 1944, the divisions within the highway community resurfaced. The House Committee on Roads heard from 110 witnesses whose testimony filled 3,100 pages. This outpouring of interest reflected a recognition that this bill was unusually important, as MacDonald explained when he testified on April 27:

> I wish to make as the urgent note of what I shall say to the committee that this is in no way temporary legislation. It is legislation that, in my judgment, will determine the progress of road development for the next quarter of a century.

The testimony revealed substantial agreement on some points. An urgent need existed to overcome the accumulated deficiencies of the road network. To preserve State sovereignty, the basic concepts behind the Federal-aid highway program should be preserved. The competitive bidding process should be retained for construction and major reconstruction projects. Congress should, without delay, enact a single, comprehensive highway bill so the States could get on with the complex legal, financial, and engineering problems that must be solved.

The disagreements among the States, revealed in 1943, were again on display. Of course, apportionment formulas were a major concern throughout the testimony and debates. The northeastern States complained that the formulas discriminated against them. States with large urban areas felt they were being forced to support rural States. The big States thought the fairest method of apportioning funds was to base it on motor vehicle registrations; less-populated States wanted increased Federal-aid to help them build the national network. In late 1943, AASHO had tried to reach a united position on formulas, but its outgoing president, Brady Gentry of Texas, told incoming president Samuel C. Hadden of Indiana, "I think we are getting in deep water and that our legislation is becoming harder to advocate and defend."

As for Hadden, he supported the Interregional Highway System-provided it was simply a route designation, that no special funds were provided for it, and that the States were given flexibility in setting standards. He said AASHO favored only one Federal-aid system and one Federal-aid fund, as in the past, so States that wanted Interregional Highways would be free to build them, while other States that saw no need for them would be free to fund their priority road projects.

Hadden also renewed AASHO's longstanding support for repeal of the Federal gas tax of 1 cents per gallon, which had been enacted in 1932 as a deficit-reducing compromise between the Democratic Congress and Republican President Herbert Hoover. The States should be allowed to pick up the 1-cent tax and dedicate it to their own highway programs. Alternatively, the Federal Government should use all Federal highway user tax revenues for an expanded highway program aimed at addressing the backlogged projects the States had on the shelf pending the end of the war.

The States were also divided on matching share. The war had left some States in such poor economic condition that an increase in the Federal share to at least 66 percent was vital if they were to have their programs ready to go at war's end. Other States saw an increase in the Federal share as a precursor to the loss of their independence. If the States paid only 25 percent, Connecticut's Cox said, "we are 'licked,' from the start." At the same time, petroleum interests opposed any increase in Federal spending for highways if the States would have to boost State gas taxes to match it.

> The Interregional Highway System was endorsed by the great majority of witnesses. Among the States, only Colorado testified against the system and that only because State Highway Engineer Charles D. Vail did not think his State had received sufficient mileage in the tentative map included in *Interregional Highways*.

Groups with an interest in transportation took a variety of positions. AAA proposed earmarking 60 percent of the Federal funds for Interregional Highway projects. Toll authorities favored a toll system, while the truckers opposed such a system but thought the States should be free to address their most urgently needed road work. Farm spokesmen agreed with the idea of an Interregional Highway System, but thought full consideration should be given to secondary and feeder roads directly serving farm population.

The debate within Congress continued most of the year. The final bill authorized $500 million for 3 years, about half what AASHO had asked for. It retained the 50-50 Federal-State matching ratio, but authorized the use of Federal-aid funds for up to one-third the cost of acquiring rights-of-way. Funds were authorized for the Federal-aid system, the secondary routes, and extensions of the Federal-aid system in urban areas.

Throughout the Senate debates in 1944, the original name, the "National System of Interregional Highways," had been retained. However, in May 1944, the House issued a new version of its bill with the network called the "National System of Interstate Highways." When the Senate-House Conference Committee met in December, the Senate yielded to the House regarding the name of the network.

Section 7 read:

> 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.

In that one paragraph, Congress set the Interstate Highway Program in motion. Although Section 7 did not authorize special funding for the new system, funds authorized for the Federal-aid system and its urban extensions could be used on Interstate routes. The Federal-State matching ratio for work on the Interstate System would be the same as for other projects: 50/50. As Chairman James W. Robinson (D-Utah) of the House Committee on Roads explained to AASHO:

> Because of variation in conditions among the States no attempt was made to specify what portion of available funds should be applied to the Interstate System.

Although he assured AASHO he saw no chance that the Federal Government would assume responsibility for the cost of construction, he indicated willingness to consider changes if experience showed they were warranted in such areas as matching share, standards, or the urban program.

What was also absent from the legislation was a commitment to the planning and coordination of highway facilities in urban areas, as called for in *Tolls Roads and Free Roads* and in *Interregional Highways*. MacDonald and Fairbanks would continue to argue for such coordination, but the urban segments of the Interstate System would be laid out in a statutory vacuum.

President Roosevelt signed the Federal-Aid Highway Act of 1944 on December 20. He issued a statement that said, in part:

> Adequate facilities for highway communication will be essential in the future as a part of an expanding, prosperous economy that will insure jobs. They will be essential also to the national defense, as well as to the safe and efficient transportation service which belong to America's way of living.

He added:

> This legislation makes possible the advance planning of the needed facilities on a sound basis. Now it becomes a challenge to the States, counties and cities which must originate the specific projects and get the program ready for construction after the war ends.

Planning for the Urban Interstates

Shortly after President Roosevelt signed the Federal-Aid Highway Act of 1944, the PRA began implementing it. Funds had been apportioned among the States on January 6, 1945. Rules and regulations implementing the Act were issued on April 6, 1945. By July 1, 1945, according to the PRA's annual report for 1946, "the States had completed plans for projects estimated to cost $590,000,000 and plans for improvements to cost 2½ billion dollars were under way."

Under the legislation, construction with the authorized funding could not begin until World War II had come to an end. The European phase of the war ended on May 8, 1945, with surrender of Germany. Japan surrendered on August 14, 1945. On October 2, 1945, Congress, by concurrent resolution, concluded that the war emergency had ended and that the Federal-aid highway program could resume construction under the terms of the 1944 Act.

The PRA was also moving rapidly on designation of the National System of Interstate Highways. On February 12, 1945, the PRA sent instructions to field representatives on the procedures to be followed for preparing recommendations on which routes should be included in the Interstate System. The procedures, contained in General Administrative Memorandum (GAM) No. 268 (February 6, 1945), had been formulated in cooperation with AASHO's Subcommittee on Legislation and Administrative Policy.

GAM 268 directed the State highway departments' attention to the system of highways identified in *Interregional Highways*. It also highlighted the recommendations in *Interregional Highways* on "Locating the Interregional Routes in Urban Areas" but stressed "the advisability of a further designation of circumferential and distributing routes within and around the larger cities connected by the system of the possible aggregate extent of 5,000 miles." In presenting these recommendations, the PRA stressed that it did not intend to limit the freedom of the States in making recommendations.

On April 7, 1945, the PRA issued GAM No. 274 on "Establishment of 'Urban Area' Boundaries." This designation was important, in part, because the 1944 Act had authorized $125 million for projects on highways in urban areas, defined in the law as "an area including and adjacent to a municipality or other urban place, of five thousand or more, the population of such included municipality or other urban place to be determined by the latest available Federal census." The urban area was a designation within which secondary and feeder road funds, also authorized by the 1944 Act, could not be spent.

Urban area funds, MacDonald pointed out in the GAM, "are clearly intended to be expended for purposes of substantial concern and benefit to the included municipality." He added:

> Most prominent of such purposes are the improvement of radial highways penetrating the included municipalities, and the improvement of circumferential routes. In respect to both of these classes of improvements, the concern and benefit of the included municipalities will diminish with increase of the outward distance of the improvement from them. This consideration suggests the desirability of establishing the boundaries of urban areas in reasonable proximity to the legal limits of the included municipalities or other urban places.

Beyond the legal boundary of the included municipality, MacDonald recommended that "it will generally be desirable to follow other legal boundaries (such as county or township lines or those of an adjacent municipality), streams, railroads or roads.

Another advantage of limiting urban area designations was that it would allow the expenditure of secondary or feeder road funds on "what may be very important roads of this class in the near vicinity of the included city." MacDonald summarized:

> Thus, both from the standpoint of an expenditure of the urban area funds of substantial benefit to the included municipalities and from the standpoint of a proper expenditure of the secondary feeder road funds, it is desirable that the boundaries of urban areas be fixed, at least initially, at reasonable short distances from the legal boundaries of the included municipalities or other urban places. Under some conditions it may be desirable to establish the urban area boundaries coincident with the legal boundaries of the included municipalities or other urban places.
>
> A reasonable general rule may be to fix the urban area boundaries in such manner as to include the narrowest belt of land adjacent to the legal boundaries of the included municipality that will encompass the outermost present or prospective circumferential route of substantial concern and benefit to the municipality or urban place.

By the end of FY 1946, State highway departments had prepared urban area maps for nearly 2,000 cities of over 5,000 population, resulting in PRA approval of $76 million in projects with urban highway funds.

As explained in the PRA's annual report for the year, highways in urban areas had long been regarded as the responsibility of city officials. Nevertheless, the most serious traffic problems, particularly congestion and safety, were to be found in and near the cities. The extension of major routes through cities "as broad express highways" was one of the most important elements of highway development. Locating arterial urban routes and establishing the character of needed improvements "affects many interests, all of which must cooperate to avoid delays and insure the success of the projects."

Because neither State nor urban officials were prepared for this new challenge, "important problems arose in determining how to spend the newly authorized funds" in urban areas:

> Many administrative officials, versed in the solution of rural highway problems, hesitated to tackle the problems of urban highway location and design without a better knowledge than existed of the actual traffic and over-all city needs.

The problems were not confined to State officials:

> In many cities local officials and civic bodies strongly supported specific proposals, sometimes agreeing among themselves, but more often alining themselves in factions supporting different projects or plans.

The fact that the urban funds were intended to finance projects that would provide "substantial relief to urban traffic congestion" caused officials to lean heavily on their planning divisions for facts on which to base decisions. Methods of measuring rural traffic had been refined in the State highway surveys of he 1930's, but traffic in urban areas "is more complex than that on rural roads," making it difficult to collect needed data by interviewing motorists on the highway.

For planners, the challenge was to decide which facts were needed, how to assemble them, and what to do after they were gathered. Fairbank believed that simply gathering information on the origin and destination of traffic-something the PRA and States had extensive experience with in rural areas-would not be enough for urban areas. On May 2, 1946, he explained his ideas in an address to the 34th Annual Meeting of the Chamber of Commerce of the United States of America. The speech, titled "City Rebuilding is Tomorrow's Business: Development of Thoroughfares," discussed the major classes of facts needed for officials to select the proper location of controlled-access express highway thoroughfares:

1. Facts regarding the city's topography, generally depicted on existing topographic maps.
2. Facts concerning the present kind and degree of land usage and property values, generally available in property plats and tax assessment records.
3. Facts concerning the volume and direction of major traffic movements within the city. These are the facts developed by O&D surveys. They are usually depicted on a new kind of map, differing materially from the familiar form of street traffic map, which we may call a motographic map-a map of movement.

   Such a motographic map shows clearly the directions and volume of the principal arterial movements, indicates the desirable general direction of new thoroughfares, and permits a determination to be made of the volume of arterial movement that can be attracted to thoroughfare lines located in detail in consideration of known topographic and property conditions.

Fairbank stressed that he did not mean that better thoroughfares were a "complete answer to a city's internal transportation problems." He explained:

> Mass transportation, which at one time served almost the totality of arterial movement, is still a large factor in terms of the number of persons moved. Its facilities should be improved both in routing and vehicular design and operation, in order to reattract as much as possible of the lost patronage.

To put these ideas into practice, the PRA took several steps. As the annual report of FY 1945 had explained, "it has been necessary to bring together Federal, State and city agencies interested in highways and representatives of adjacent areas not a part of the city to agree on concerted action in developing a highway plan." The PRA assisted in several ways. At the invitation of State highway officials, PRA sent "technicians experienced in planning and designing urban expressways to numerous cities to advise on problems that arise in guiding projects through the preliminary stages." The technicians prepared preliminary reports "for public discussion to crystallize opinion as to an acceptable general plan."

In addition, the PRA improved its ability to gather information on urban traffic demand. In an article in the October-November-December 1945 issue of *Public Roads* ("Traffic Planning Studies in American Cities"), John T. Lynch, Chief of the PRA's Planning Surveys Section, described how the PRA had conducted O&D surveys in major urban areas in the past:

> In Chicago, Ill., the movement of vehicles throughout the city on a typical weekday was determined by observing license numbers as the vehicles passed different survey stations. Several thousand Boy Scouts were used to man the stations and several hundred supervisors were required to direct the work . . . . One difficulty inherent in the method is that the zones used in traffic observation are necessarily large, and it is not always possible to fix the desired routes of travel with an accuracy as great as is needed.
>
> In Detroit, Mich., questionnaires were given to war workers to determine the daily number of workers traveling between their homes and places of work. The questionnaires were distributed in all major industrial plants through the employers, and the answers showed the location of the employees' homes, how they went to work, participation in group riding, and at what time. To these data were added the origins of downtown employees obtained by the street railway department through a questionnaire

> distributed in cooperation with building managers, and information concerning shoppers obtained through the department stores.

Although these methods were "extremely useful," they were not "sufficiently comprehensive to serve as a desirable basis for long-range highway planning" in the larger urban areas. To support the large expenditures expected in these areas, the PRA began looking for a new method of conducting urban traffic studies.

In consultation with the Bureau of the Census in 1944, the PRA developed a method of gathering information on urban traffic that relied on sampling techniques. *America's Highways 1776-1976* explained the origins of this consultation:

> After exploring a variety of methods, some theoretically and some on the ground, with little prospect for satisfying results, the home-interview method was accepted as a possible approach. [Pollster] George Gallup was having considerable success in his early opinion polls. His method involved interviewing the right number, as determined statistically, of representative members of the different occupational groups comprising the total population, such as doctors, plumbers, teachers, housewives, laborers and even unemployed. This approach offered serious problems in attempting to adapt it on a scale necessary to a transportation survey. Fortunately the Bureau of the Census at that time was exploring means of reducing the costs of its complete censuses by the use of sampling methods. It was its view that by preselected geographic sampling, say one house in ten, a representative sample of occupational groups would be obtained. That approach would also provide a geographic spread of interviews for origins and destinations of trips needed in travel studies. So the Bureau of the Census, while exploring for their own purposes and finding in the highway field a companion interest, agreed to assist by joining in assaying the statistical soundness of the studies so selected. Thus was born the home-interview approach, the basis of today's urban transportation planning process. [page 276]

Lynch described the basic approach under the new plan. Information about traffic entering and leaving the city was gathered by the traditional method of establishing a station, staffed 24 hours, by interviewers who stopped all vehicles "and asked the drivers their origins and destinations and if stops were made in the city that required them to follow the route traveled even though a more attractive and more direct route were provided." The new sampling technique was applied for traffic within the city:

> Information concerning trips made wholly within the area by persons residing there is determined from home interviews conducted in dwellings selected to form a representative sample . . . . The basis for the sample selection is a map showing the streets and all of the residences. If the same is 1 in 10 in a zone of one-family houses, every tenth house is selected proceeding clockwise around a block. If there are apartment houses, each apartment is treated as though it were a separate dwelling unit and the counting proceeds through the apartment house, selecting every tenth apartment.
>
> Each interviewer is given a list of the dwelling units in his territory selected for inclusion in the sample, and he is instructed to obtain interviews in these dwelling units and no others. He obtains information concerning all trips made by automobile or by public conveyance on the preceding day, including the means of travel, the origin and destination, the purpose of the trip, the times of starting and arrival, and other information which varies somewhat from city to city. There have been refusals to give the information in only a negligible number of cases.

Truck data was also collected:

> [A] sample of trucks is selected from the registration list. The owners of the trucks selected are called on by an interviewer and information concerning all of the trips made by each truck on the day preceding the interview is recorded . . . . The data concerning truck trips generally consists only of the type of commodity carried, the origin and destination, a list of the stops made, and the time of starting and ending the trip. Taxicabs are sampled and data collected concerning their movements in the same manner as for trucks.

Based on early surveys, the PRA concluded that the sampling would usually involve interviewing residents of 1 in 10 dwellings, distributed through the area in proportion to population density. However, the sample might vary from a low of 1 in 30 or 40 in the largest areas to as high as 1 in 3 in a city of 30,000 population. Special studies to check the accuracy of the results demonstrated "that this technique offers a thoroughly reliable means of analyzing urban traffic needs based on present modes and amounts of travel."

The first home-interview studies for urban transportation planning were launched at about the same time in Tulsa, Oklahoma, and Little Rock, Arkansas. By the end of FY 1944, the PRA reported, surveys had been completed in three metropolitan areas (the other being New Orleans, Louisiana) and were underway in eight others.

In 1945, the PRA assisted State highway officials and local officials in initiating surveys in 30 large metropolitan areas and in 135 cities of 50,000 or less population. The following year, the PRA reported that surveys of large metropolitan areas had increased to 50, including Atlanta, Georgia; Boston, Massachusetts; Clinton and Ottumwa, Iowa; Kansas City and St. Louis, Missouri; New Orleans, Louisiana; and Jacksonville and Tampa, Florida.

For the PRA, whose leaders had developed intellectually during the Progressive Era prior to World War I, the data collected by these surveys performed the classic Progressive function of providing facts from which experts could draw authoritative conclusions. The PRA's annual report of 1945 described the result:

> By providing the means to estimate the traffic volumes that will use any specific route, these studies serve to evaluate the merits of proposals advanced by different groups within an urban area, and to bring together the various local agencies in the support of a single plan. Availability of the facts often permits harmonizing the views of differing factions, each of whose proposals, in the absence of the facts, is of necessity based on opinions.

The traffic surveys were essential, but additional factors had to be considered:

> City planning reports and preliminary engineering reports, found necessary in developing undertakings of a complex nature, advance plans, and studies of alternate routings through cities have been reviewed, analyzed, and commented upon.

The O&D surveys and the PRA studies demonstrated that some long-held beliefs were incorrect. For example, the PRA found that the capacity of an expressway lane may be as high as 1,500 vehicles per hour, without undue crowding, at a speed of about 35 miles an hour. However, "the commonly held belief that the greater the number of traffic lanes the lower the capacity of each lane is fallacious." The PRA's studies "show conclusively that lane capacity does not necessarily decrease with the number of lanes, but can, in fact, increase."

Using survey data, the PRA prepared maps showing traffic volumes desiring to travel between different zones of each city:

> The next step is to make tentative selections of main routes to accommodate this travel. It is seldom that routes can be placed precisely on the ideal location, as indicated by the desired lines of travel, because of geographic obstacles and the character of city development.
>
> Once a route is selected, or when several alternatives are under consideration, the travel habit data are used to determine the probable traffic volume, the traffic design requirements at interchanges, and similar data. Travel from each zone to every other zone is reviewed and assigned to the route if use of the proposed facility would be advantageous. Generally, the use is regarded as advantageous if it would save time for the user. Assignment of traffic to routes thus requires the assumption of average speeds over alternate routes. In this way traffic between zones is assigned in whole, in part, or not at all, to the various sections of a proposed route depending on the likelihood that use of the new route would be advantageous.

By the time of the annual report for FY 1946, the PRA had prepared a map showing a tentative integrated rural Interstate System, dated March 14, 1946, and transmitted it to the States with a request that they concur or propose alternatives. Nebraska was the first State to accept its System designation (on March 28, 1946), with 37 States and the District of Columbia submitting acceptances by the end of the fiscal year. However, the PRA was concerned about progress on urban segments:

> It had been hoped that the main interstate routes could be held to a total of about 35,000 miles, leaving 5,000 miles for circumferential and distributing routes in urban areas and for desirable extensions of the system in case the entire 5,000 miles was not needed for that purpose. Examination of the proposals for the circumferential routes disclosed widely differing concepts among the States as to their purpose and extent, and 18 States requested no mileage for that purpose, even though urban conditions in some clearly indicated the need.

Therefore, the PRA decided to postpone many of the urban designations while moving forward with designation of main Interstate routes.

Design Standards for the Interstate System

While working with State and local officials to identify the location of the Interstate System, the PRA had been working with AASHO's Special Committee on Planning and Design Policies to develop standards for the location and design of Interstate highways. (H. E. Hilts, Deputy Commissioner for Design of the PRA, was Chairman of the committee and the PRA's Joseph Barnett, Chief of the Urban Roads Division, was Secretary.) The PRA's annual report for 1945 summarized the goal:

> There was no thought of requiring that every mile of the system be built according to a rigid pattern but it was believed essential that there be a high degree of uniformity where conditions as to traffic, population density, and other factors are similar.

The committee met in Washington on June 18 and 20, 1945. After considering the comments received from the State highway agencies, the committee adopted a set of standards. These were approved by the State highway agencies via letter ballot and forwarded to the PRA, which concurred in the committee's action. On August 1, 1945, AASHO formally adopted the standards.

The design standards began, in the first paragraph, by recognizing the basic standards in *Interregional Highways* as "embodying the elements of design to produce the highway facilities that now appear, as a long-range plan, necessary for the limited mileage of highways to be designated as the National System of Interstate Highways." In general, the standards were intended to "represent the best practice in the light of present knowledge." However, the standards acknowledged a practice consideration:

> These are long-range standards for the future and it is recognized that, for the interim period, stage construction may be permitted and that, for certain conditions, it may be necessary to utilize values lower than the minimum standards.

Nevertheless, the goal was to design Interstate highways "to allow for the subsequent provision of facilities capable of serving safely and efficiently a mixed traffic of passenger automobiles, motorbuses, and motortrucks and tractor-trailer and semi-trailer combinations" under conditions "which will exist 20 years from the date of construction."

The standards called for:

- Full control of access would be provided where State law permitted it. If permitted, full control would be provided on new locations and on old locations wherever economically possible. If not permitted, additional right-of-way would be obtained to provide for construction of frontage roads to provide the required access from abutting properties.

- In most cases, railroad crossings of the Interstate System would be on structures. However, where the railroad operated five or less regular train movements at a crossing, separation of grades would be provided only if justified by an economic analysis. Where separation was not justified, adequate warning devices would be installed.
- Similarly, on Interstate routes carrying 3,000 or more vehicles a day, every effort would be made to separate cross traffic. For Interstate routes with lower traffic density, grade separation would be provided when justified by an economic analysis. When grade separation is not provided at a cross road, traffic signal control installations, channelized intersections, or stop control on the cross road would be provided.
- Design speed varied based on location. In flat topography, rural segments would have a minimum design speed of 60 and a desirable design speed of 70; in rolling topography, 50 and 60, respectively; and in mountainous topography, 40 and 50. All urban sections would have a minimum design speed of 40, with a desirable design speed of 50.
- On sections carrying less than 200 vehicles per lane, the lanes would be 11 feet wide; on sections carrying a higher volume, lanes would be 12 feet wide. All lanes in urban areas would be 12 feet wide.
- The width of median strip would vary. In rural areas, the minimum width would be 15 feet and the desirable width, 40 feet. In urban areas, the width would be 4 feet and 12 feet, respectively.
- The standards did not recommend specific right-of-way widths for urban sections "because of the widely variable conditions but provision should be made for the acquisition of sufficient right-of-way for the ultimate design.

The standards were criticized by some observers because they were not comparable to the standards used on existing parkways and turnpikes-and nothing like the visions favored by some "superhighway" advocates. The committee, however, operated on the assumption that even for the Interstate System, design should be based on "the highest standards commensurate with traffic needs," as Barnett later explained (in 1955 when he was Assistant Deputy Commissioner, Engineering Division). He summarized the committee's view:

> Except for the fact that interstate highways constitute links in a national system and are given priority due to their importance for long-distance transportation and the national defense, their design should not be materially different from that of any other road carrying a comparable volume and kind of traffic. ["Our Interstate Highway System," *Civil Engineering*, July 1955, p. 40]

Fairbank on "Express Highways"

On November 13, 1946 , Fairbank addressed The Advertising Club of Baltimore. His subject was "Express Highways."

As a life-long Baltimorean, Fairbank began his talk with recollections of "Baltimore of the Nineties as it impressed itself upon the consciousness of one small Baltimorean." From the perspective of a child of his time, he recalled the bumpy cobblestone streets and the street cars:

> Cobblestoned streets were accepted by their users as one accepts any natural fact-the weather, for instance. But small boys preferred to use the cable slot-wherever there was one-as a track for their "bikes"; and teamsters deemed the street car rails a better place for their wheels, nor were easily persuaded to change their minds, not even by the most insistent clanging of the motorman's bell.

Fairbank also recalled the stiff opposition that attempted to halt each change in the city's transportation system. As he put it, some people are of "that cast of mind which inclines to the belief that whatever is, is right, and can't be helped if it is wrong."

Now, the traffic stream was clogging the city's old arteries "and when the arteries clog, the body dies." He added:

> You are going to have to do something about it. And the answer is: Expressways.

He then outlined his vision of the needed expressway network:

> Approaching the problem . . . from the standpoint of a city's own transportation needs-just plain common sense, applied to a knowledge of street traffic volumes present and to come, tells us that the city needs, and needs badly, some free-flowing arterial streets. Just which streets will best repay improvement, or along what lines new facilities should be provided are matters that must have particular study in every city.
>
> However, in most cities it is a safe bet that the lines that will be found to be most serviceable will be lines that connect at the city perimeter with the principal rural highways, and lines that converge radially inward from these perimetal connections toward the city center--the downtown business section.
>
> Toward the city center, I say: not into it, or through it . . . . To rid the business section of this superfluous traffic, a free flowing belt highway around the section is required. For maximum utility such a belt highway must be located around the fringe of the central business section-not too far out, not too far in. At this same belt highway, the radial arterials should terminate. When the radials reach this belt they have done all they can for their traffic. Their business-section traffic is about to scatter toward its ultimate destinations in the central section. Their traffic bound for cross-city destinations should be conducted around the center. The belt then becomes both a distributing and a by-pass facility. But, if it is to accomplish these purposes, it must, like the radial arterials, be a truly free-flowing route, a route to be preferred over ordinary streets of the central district or its fringe for the superior facility it affords.
>
> What we have pictured so far, as you will see, looks very much like the hub and the spokes of a wheel. We can now complete the picture by adding a rim. The rim is an outer by-pass around the city, intended for the convenience of external traffic that would benefit by avoiding the city altogether, and for the highway connection of outer city and suburban areas. If necessary, you may add one or more intermediate belt lines between the rim and the hubs. And there, you have the type-picture of a system of arterial highways for almost any large city.

Fairbank had outlined this vision in *Toll Roads and Free Roads* and especially in *Interregional Highways*, but stressed one other important point:

> The whole system is needed. The radials must be as numerous as the determined need requires, and follow the lines indicated as best by specific study. The belt lines, inner and outer, and intermediate, if required, are likewise essential. No part or parts of the system can possibly serve all the intended purposes. Eventually, you must have the whole; and the whole must consist, eventually, of truly free-flowing arteries. Until you have free flow, you have only partial benefit.
>
> Well, free flow means no intersections; it means physical separation of the traffic moving in opposite directions; it means avoidance of all lateral interference and friction with the main traffic stream; it means controlled access; it means a complete separation of the highway from any bordering development, business or residential. It means highways depressed below, or elevated above cross streets. It means Expressways. [Emphasis in original]

Fairbank stressed, too, the importance of conceiving the entire plan before starting to build it. "You should know what you are building toward." It was also important to coordinate the expressway plan with all of the city's future undertakings.

> I am sure that the rehabilitation of blighted areas must have a large place in the further undertakings of the City, and I should not like to see a blighted area rehabilitated athwart the path of a future expressway without taking full account of the expressway to come, in its best location and appropriate dimensions.

He concluded his Baltimore talk with a comment that, extrapolated to a national perspective, would summarize the legislation that would be needed to launch the Interstate System:

> I would like to see a well considered financial plan that would give assurances that in a reasonable future period we can have our expressways and all the other new things we want and need, with prudent maintenance of the things we already have, and all within a fairly well defined limit of total cost, and annual expenditure, to be met with reasonable certainty by a taxing program that the people are likely to approve.

The Case for Urban Expressways

MacDonald, too, was using speeches and articles to promote urban expressways. For example, in the June 1947 issue of *The American City*, he made "The Case for Urban Expressways" in response to opposition that had developed in several unidentified cities. The opposition was "not surprising," he said:

> Between 1890 and 1916, when early good-roads advocates and far-sighted civic leaders were campaigning to get the farmer out of the mud with gravel and macadam roads, they were met with apathy and inertia. Most states and communities preferred mud roads to the "luxury" of stone or gravel surfaces that cost $5,000 or $6,000 per mile.
>
> From 1916 to 1925, when federal-aid and state systems were being designated and improvement begun, there was again strong opposition. The program was too big and too costly. There was no real need. In the early twenties, a prominent economist actually asserted that the country could not stand the drain that highways would impose on its resources.

Now that cities were debating whether to deal with their traffic problems or leave things as they were, the answer would "have a far-reaching effect upon business and industrial expansion during the next ten years." Traffic was increasing much faster than expected--volumes were at least 5 years ahead of post-war projections.

> Traffic generally tends to avoid congestion if it is at all possible to do so. Cities that ignore this obvious fact and refuse to modernize their arterial routes will pay a heavy price in loss of business and depreciation of property values in central business districts.

MacDonald cited the common objections to urban expressways:

> (1) the width of the right-of-way . . . necessitates razing a large number of dwellings at a time when the city is in the throes of an acute housing shortage; (2) depressed sections of the expressway would be "big ditches" which, in effect, would disrupt the customary activities of the community by creating a barrier between neighborhoods, and (3) it would be less costly to widen streets which, if moderately improved, would serve present traffic needs. The loudest objection is that express highways cost too much.

Based on experience with existing expressways in and around New York, the Merritt Parkway in Connecticut, the Davison Expressway in Detroit, Chicago's Lake Shore Drive, and the Arroyo Seco Parkway in Los Angeles, MacDonald stated that these objections "can readily be answered."

Numerous buildings would be razed, he conceded, but that was not necessarily a negative:

> In most instances, routes selected for expressways, as they approach the center of the city, pass through "blighted" sections where property values are low, and most of the buildings are of the type that should be torn down in any case, to rid the city of its slums.

He added that new housing facilities should be provided for dispossessed occupants; this was one of the "major planning problems" as a city decides whether to build expressways.

The "big ditch" argument was an outgrowth of the view that expressways should be elevated or depressed, but preferably depressed. For the depressed expressways, MacDonald indicated that overpasses at selected street intersections would not only allow for free flow of traffic but "increase the ease of communication and business interchanges between adjacent neighborhoods."

As for improving existing streets, this was at best "an expedient which may lessen traffic congestion temporarily." But it would not address the conflicts at street intersections or with parked vehicles:

> Traffic studies and construction costs indicate that it will be far more economical to build expressways for large traffic volumes than to try to serve a growing traffic through street widening or other expedients.

MacDonald recognized that cities could not afford to build an entire expressway network in 5 or 10 years. The idea was to begin developing the network to "avoid traffic stagnation." With the plan in place, even if not built, "growth and development of the city will then be according to the pattern of main routes that has been decided upon." In short, "the question for our largest cities to consider is not can they afford express highways, but how can they possibly afford to be without them." (The statement was a variation of an idea closely associated with MacDonald in his early days: "And so I say that we pay for improved roads whether we have them or not, and we pay less if we have them than if we have not.")

In closing the article, MacDonald stressed that expressways were only partly about moving traffic:

> These roads, developed with vision, will do much to stop the decay of our cities at their centers and prevent the attendant decrease in property values. They will help to check the accelerated growth of blighted areas, which are the product of traffic congestion, lack of planned land use, and the failure to create attractive opportunities for the investment of private capital.

The Fairbank speech and the MacDonald article are typical of the arguments the two were making during the mid- and late 1940's. As their comments suggest, MacDonald and Fairbank had lavished considerable attention on the urban sections of the Interstate System because that's where the problems were. Those were the problems the Interstate System was, in their view, uniquely qualified to correct.

First Designations, August 2, 1947

Efforts to identify routes for the Interstate System continued well into 1947, as the PRA worked with the States to identify the network and resolve disputes about connections at State borders. On August 2, 1947, however, the PRA was able to announce the first designations approved by Major General Philip B. Fleming, the Federal Works Administrator, and MacDonald. The routes included 37,681 miles of the Nation's principal highways, including 2,882 miles of urban thoroughfares. The routes were assigned neither names nor numbers; they were simply black lines on a white map. To fill out the 40,000-mile Interstate System, the PRA had reserved 2,319 miles for additional urban circumferential and distributing routes that would be designated later.

In announcing the designations, MacDonald pointed out that the existing routes in the designated corridors comprised only 1.1 percent of all rural roads, but carried 20 percent of all rural traffic. These routes averaged 2,963 vehicles per day in 1941, compared with 1,439 on the Federal-aid system, 972 on State highways, and 155 on rural roads. But MacDonald wanted to emphasize a point that was often misunderstood. Although the Interstate map, with its lines located between cities, implied that the current main roads would be upgraded, that was often not going to be the case:

> Although the new Interstate System follows, in general, the principal routes in the present Federal-aid system, it may be necessary in many instances to relocate existing highways or build alternate routes for express traffic in order to meet essential standards of width, grade, alinement, and control of access.

He also commented on design standards, which had been approved by AASHO, following collaboration with the PRA, on August 1, 1945:

> Design standards . . . call for four-lane divided highways wherever the traffic volume is 800 motor vehicles in peak hours. For such highways in rural areas, a right-of-way of 250 feet is advocated as desirable. Traffic lanes 12 feet wide are recommended on all heavily traveled routes. Where traffic density exceeds 3,000 vehicles in peak hours, elimination of all cross traffic at grade is advocated.
>
> Control of access to the interstate routes, particularly in and near cities, is considered essential. Large streams of traffic cannot move swiftly and safely if obstructed continually by vehicles entering and leaving an express route. Access points are to be placed as frequently as they are needed, but accomplishment of the main objective prevents permitting access at every cross road or street, business place, or residence. Many States do not yet have adequate legal authority to control access.

In describing the urban segments, the PRA explained:

> In many large cities depressed or elevated expressways will be built, making possible city travel at an average speed of 35 to 45 miles an hour, without stops for traffic signals and free of interference by cross--traffic. Depressed portions of expressways will be supplemented by parallel frontage roads for "local" traffic, and bridges will be constructed at intersections to serve cross-traffic.

The 1947 annual report illustrated the concept.

Although the 1944 Act had not authorized funds for an Interstate program, the State highway agencies could use other apportioned Federal-aid funds for projects on the Interstate System. The decision to do so would be based on priorities assigned by the State highway agencies, which often favored their own residents rather than the national goals behind the Interstate program.

The PRA kept close track of locations where the State decided to fund Interstate projects. The 1948 report was the first to contain a status map showing "Postwar Federal-aid projects on the National System of Interstate Highways." The map illustrated how designation of the Interstate System "has had the desired effect of centering official and public attention on these most important routes of the Nation." Out of $908,623,917 in 1944 Act funds assigned to projects by the end of the fiscal year, Interstate System projects accounted for $193,947,404 (21 percent). The estimated cost of projects initiated on the Interstate System totaled $384,245,114. "These funds were for 2,052 miles of highway, 704 bridges, and 95 grade-crossing elimination structures."

The narrative added:

> In studying this map it should be kept in mind that many of the projects are for sections of urban expressways at costs running into millions of dollars . . . . Construction of such projects is generally preceded by extensive study of travel habits, careful consideration of alternate plans, and public discussion of the kind that invariably precedes approval of a large undertaking. Nearly every city on the system has engaged in some such activity. The volume of construction will increase greatly as such cities reach agreement on a highway plan, and on a method of financing a part of the cost.

Fairbank on Decentralization

During this period, MacDonald and Fairbank stressed that city planners must face reality. In 1947, MacDonald told a Business Men's Conference on Urban Problems:

> There is altogether too much fear of the so-called decentralizing effect of expressways. The type of decentralization now in progress is inevitable, expressways or no expressways. Our cities are expanding, de-densifying, to use the action term.

Fairbank took up the theme in an address to the Annual Meeting of the Institute of Traffic Engineer (ITE) on October 13, 1948. He discussed the single issue that most concerned city officials and planners, namely "decentralization." His speech, "Highway Needs of Expanding Urban Areas," began:

> It is no new thing for cities to expand. Down the ages, in all lands, cities have been expanding. In no land, and in no time has their expansion been more rapid and constant than in the United States within the relatively brief period of our national existence.
>
> We have boasted of the growth of our cities. Repeatedly, established municipal limits have been moved outward to include more and more of surrounding area in process of change from rural to urban character. If, recently, we have come to doubt the occasion for pride in the fact of this growth, our doubts have yet resulted in no alteration of the fact. Our cities are still expanding.

Statistically, he found that all evidence pointed to two continuing trends: "A movement toward the cities from the remoter rural area; and a movement out of the more densely populated centers of urban aggregations into their less densely populated satellite towns and rural environs." Although observers were divided on the merits of these changes, Fairbank said, "there is no possibility of halting the further expansion of urban areas short of the arbitrary reduction of existing population aggregations." The feasibility of doing so was "highly speculative":

> The fact remains. Our cities are continuing, they will longer continue, to expand in area.

Noting that decentralization was met with "mixed emotions" depending upon the inclination of the individual, Fairbank said that all who comment on decentralization acknowledge that it is "in some measure abetted by highways and motor vehicles." Of course, the opposite, centralization, would also be abetted by highways and motor vehicles. "For, as all know, highways run both from and to, and motor vehicles run both ways upon them." The highway, "being the servant and not the source of human desires," was not responsible for the good or the bad, depending on how any individual valued decentralization. Highways cannot, he said, "against the reluctant force of human desire, turn a tide of human movement either one way or the other."

Human desires were at the heart of every O&D survey. Highway engineers must combine the surveys with past and present records of city growth to read the "manifestation of human desires" and "design and regulate highway facilities accordingly."

After summarizing the studies that led to the designation of the National System of Interstate Highways, Fairbank described how the PRA had called on State and local officials to join in designating the Federal-aid urban system. Although the designation had succeeded in some locations, "some immediately insurmountable hindrances" had occurred that would have to be overcome:

> But, these apart, the program is delayed by grave indecision, by lack of accord in principle, and most seriously by a deficient public understanding of the facts of the problems and the efficacy of the proposed solutions.

Facts clearly seen by highway engineers "are not fully supported by general city planning authorities." These misunderstandings and disagreements, Fairbank speculated, resulted from "a difference of perception or of acceptance of the certainty of further city expansion." To illustrate, he cited the example of a planning authority in an unnamed city who stipulated that if an "expressway was to be built it must terminate at its outer end well within the established municipal limits, lest it serve further to extend an undesirable development of suburban area." In speculating on whether such an expressway would help or hinder the central business district, the planning official had lost sight of a simple reality:

> There is apparent utter blindness to the fact that the dreaded "decentralization" is already far advanced, in the uprising of many outer subsidiary shopping and business centers. The fact that seems so clear to the traffic engineer-that a center-bound traffic stream, now, and certain to remain of great volume, come

> what may, is congested in its present channels and needs a channel of greater capacity, less resistant to flow-that fact seems to make little impression.

Fairbank exclaimed: "Look at the cities!" Past expansion had occurred without any expansion of the streets in the center city:

> How else can we interpret center-directed streets that diminish in width as they run inward? How else explain the street discontinuity that exists where continuity is the obvious present need, than by the accretions and engulfings of past stages of expansion that took no account of the future that is now the present?

It was time, he said, to repair the errors of the past and avoid "repetition of the more obvious errors of the past." No error was "more obvious" than the "utter failure to anticipate and plan for the city expansion that has occurred." It was time to "heed the portents all about us" of decentralization and not "indulge the hope, or permit the persuasion that by any arbitrary act it will be ended." Fairbank predicted:

> And the size of these areas? Well, lest we err again, let us plan for no less than the doubling of present areas; and lest reality too soon overtake the dream, let us in our dreams envision cities twenty, thirty-shall we say, forty miles across!

Free-flowing arterial highways were "a manifest need of today's city" and "the vital necessity of tomorrow's greatly expanded city."

The task, therefore, was to use the ongoing surveys to measure "the determinable needs of present cities." This information must be combined with the best advice available on future change. Although the future would always be uncertain, establishing general lines of the intended systems was essential. Then, begin building. "The logic of demonstrable prior need may have to yield momentarily to the possibilities of practical accomplishment." But get started.

Fairbank realized that cutting arterial routes through the older central cities "is a task beset with prodigious difficulties." These difficulties were all the more reason to cut extensions through the outlying section now before the city's expansion made the task more difficult:

> If only the ultimate form of desired improvement be clearly envisioned and held as a goal, there are many expedients of development by which that form can be approached by practicable stages. Outright improvement to full plan, if possible; progressive development by stages where necessary: This will be a good rule to follow.

He realized that one question would be asked: "Where is the money coming from?" He took his answer from history:

> Had we stopped, ere we began, to count the cost of what has been done in the past thirty years to improve the conditions of the rural arterial highways, the odds against a beginning would have been great indeed.
>
> Now, as we contemplate the beginning of a similarly needed improvement of the arterial highways of our expanding cities, let us not puzzle ourselves too much with riddles that only time and its many timely decisions can unravel.

Measuring the Urban Problem

The key for urban areas was measurement. Throughout the late 1940's and early 1950's, the BPR tried to enhance the ability of State and local officials to predict traffic trends as a means of locating and designing urban express highways.

The 1947 annual report described a modification of the BPR's procedures for O&D surveys:

> In cities smaller than 100,000 population the problems are generally not sufficiently involved to require a study of the magnitude required in larger cities. Information relative to origin and destination of vehicles can be obtained from parked vehicles where the traffic problem is limited mainly to the central business district. Drivers entering and leaving the city may be interviewed. From these sources essential origin and destination information may be obtained for all trips extending beyond the city and for local trips which result in a parking in the downtown area. Such studies have been undertaken in Albert Lea, Minn.; Portsmouth, N.H.; Alexandria and Monroe, La.; and Corpus Christi, Tex.

The following year, the PRA reported that detailed O&D reports of urban traffic had been expanded, with work undertaken in 10 additional cities, including Washington, D.C. The report observed:

> The total number of metropolitan areas with studies of this kind either completed or underway is now 69. Extensive use is being made of the data already collected, in laying out expressway systems and in location and design.

The total had reached 85 metropolitan areas in 33 States by the 1950 annual report. The Bureau of Public Roads (as the PRA had been renamed at the start of the fiscal year, July 1, 1949) pointed out that the studies were yielding facts that were essential for the location and design of urban arterial routes, but also helped officials understand urban highway transportation in general:

> For example, from a study of the travel data collected in 38 cities, involving more than 17 million trips, it has been found that 34 percent of the trips were made by mass transit while the remaining 66 percent were made in private automobiles and taxis.

The BPR also had launched a study of travel on arterial routes in urban areas. The purposes of the study were summarized in the 1950 annual report:

1. To determine the amount of traffic, under different circumstances, that will be diverted from existing roads and streets to a new arterial route which provides improved travel conditions.
2. To determine the amount of travel that is generated by a newly constructed or improved route. It is definitely known that a new route generates a certain amount of travel that did not occur before the improvement was placed in service, but the relative amount of increase has been unknown.
3. To develop a reliable basis for estimating the volume of traffic which may be expected to use new routes on locations where previously no facility existed.

The review involved O&D surveys of vehicle operators on existing arterial routes and "before-and-after" O&D studies where new routes were being constructed.

In addition, the BPR had found that "the increased use of motor vehicles is rapidly changing the social-economic pattern of urban areas." The BPR, as part of its "responsibility in planning urban routes," had launched specialized studies "to determine and measure changes in expanding suburban areas." The studies served several purposes:

1. To estimate the volume, characteristics, and length of work trips from large multiple housing projects;
2. To analyze the effect upon employee travel where large employment centers are relocated from urban to suburban locations; and
3. To measure and correlate the attraction of traffic by the central business district and suburban commercial centers, with respect to purpose of trips, mode of travel, and area from which drawn.

The BPR also wanted to test its premise that "one of the major factors affecting urban traffic is the generative nature of cities' individual and collective land uses." In cooperation with the Columbia University's Institute for Urban Land Use and Housing Studies, the BPR had launched an exploratory study in Philadelphia:

> The purpose is to formulate and test methods for obtaining data pertaining to movements of persons and goods in relation to various kinds, locations, and characteristics of urban land uses, which will aid in evaluation of highway requirements for such movements.

The 1951 annual report summarized preliminary results:

> Analysis of the trip data collected in four different cities shows that a considerable number of drivers choose a superior facility in going from one point to another even though the trip requires both added travel time and added distances. Preliminary results indicate that, when travel time is the same by either route, approximately 50 percent of the drivers choose the superior facility even though the distance is greater than it would be by an alternate, less-attractive route. When both time and distance are saved, the percentage of drivers that choose the superior facility approached 95 to 100 percent.

The following year, the BPR reported that 92 comprehensive studies had been undertaken since the first one in 1944. "Abbreviated procedures are now being developed for bringing up to date the data collected in the earlier studies."

In 1953, the BPR summarized results of the O&D surveys "by which basic relations between residents' daily trips and various types of land use can readily be determined."

> Results show that both central and suburban business centers have definable areas of attraction as measured by either distance or travel time from place of residence to such centers. The procedures provide quantitative measurement of automotive and mass transit usage in relation to distance and travel time from places of residence to various land uses. Effects of decentralization of offices and industries from central to suburban areas upon employees' travel to work and the characteristics and volume of the traffic generated by various types of residential land use were also studied.

Results of the study of employees' place of residence and mode of travel to work in view of decentralization of government employment centers in the Washington, D.C., area were available in time for the BPR's 1954 annual report:

> Results show that residences of those employed in the central area are distributed throughout the city and metropolitan area in the same proportion as general population distribution. However, as agencies are relocated at increased distances from a central point, a larger number of employees have residences in the area of the new office location, with a secondary group having residence in the area of greatest population density near the central business district. When place of employment is removed approximately 8 to 10 miles from the central business district, most of the employees live in the vicinity of employment or in the semirural area beyond. As the distance from the central business district increases, there is a corresponding increase in the proportion of work trips made by automobile.

The study also considered residential areas based on population density, income, and single-family or multi-family dwellings. Economic status affected the number of trips per dwellings "somewhat," especially automobile trips. Based on trips to shopping centers, the study suggested the possibility of "predicting the amount of travel to such centers by a formula based on travel distance and retail floor space of the shopping center." In a comparison of shopping destinations, the study found that department stores in the central business district retained a strong attraction. Approximately 70 percent of all shopping trips to the central business district, other than by walking, were destined for a department store.

End of the Vision

Throughout World War II, the highway community had focused on the idea that to avoid a return of the Depression, the country must have a big post-war roads program ready to go at war's end to provide jobs for returning soldiers. In 1943 and again in 1944, the urgency of completing the post-war highway bill was accepted by all concerned: the road builders needed this bill as soon as possible so they would have time to prepare plans for use as soon as Germany,

Italy, and Japan were defeated. For this reason, the Federal-Aid Highway Act of 1944 contained the trigger mechanism prohibiting use of the funds it authorized for construction before the beginning of the first post-war fiscal year.

In fact, the immediate aftermath of the war seemed to support this expectation of economic doom. The Pentagon canceled billions of dollars in war contracts. Layoffs from wartime jobs were common. Strikes broke out across the country. The Nation faced the biggest housing shortage in history. And the soldiers came home in need of work. As President Harry S. Truman wrote in a letter to his mother, "The Congress are balking, labor has gone crazy and management isn't far from insane in selfishness." Truman biographer David McCullough stated that Secretary of Commerce Henry A. Wallace predicted a $40-billion drop in the gross national product, and a $20-billion drop in wages, all of which would translate into millions of unemployed workers. [McCullough, David, *Truman*, Simon and Schuster, 1992, p. 469]

After a period of disruption, however, the Nation entered what is typically known as the "post-war boom." By the time of Truman's State of the Union address on January 6, 1947, he could accurately say that the Nation was prospering as never before. The boom was in full swing by 1948. McCullough summarized the impact:

> Profits were up. Farmers were prospering. American prosperity overall was greater than at any time in the nation's history. The net working capital of American corporations hit a new high of nearly $64 billion. For the steel, oil, and automobile industries, it was a banner year. Unemployment was below 4 percent. Nearly everyone who wanted a job had one, and although inflation continued, people were earning more actual buying power than ever before, and all this following the record year just past, 1947, which, reported *Fortune* magazine, had been "the greatest productive record in the peacetime history of this or any other nation." [p. 621]

The shift of America's population to the suburbs had accelerated in response to the housing shortage. The first Levittown development, created by William Levitt on Long Island, New York, had opened in 1947. It had been built on the mass production concepts that had transformed the auto industry, with the houses priced low (initially $7,990, with easy monthly payments for veterans), and arranged in a community that included village greens, shopping centers, playgrounds, bowling alleys, swimming pools, and a town hall. Levittowns, as they and their suburban imitators spread to other States, filled the housing need for the growing families that gave the country the demographic upsurge known as the "Baby Boom."

Automobile sales did more than keep pace with the boom-the sales spurred the economy. Historian Mark H. Rose described the boom:

> Between 1946 and 1950, Americans replaced older vehicles and added new ones rapidly, forcing up registrations by more than two-thirds. In 1945, about 31 million vehicles of all sorts were registered; in 1946, state officials listed more than 34.4 million; and by 1950, they had registered 49 million, including 8.6 million trucks. [Rose, Mark H., *Interstate: Express Highway Politics 1939-1989*, Revised Edition, University of Tennessee Press, 1990, p. 31]

Meanwhile, the urban problems that MacDonald and Fairbank had developed the interregional highways to address were accelerating. Rose summarized the growing urban problem:

> After World War II, urban businessmen and residents continued to flee to the suburbs, leaving behind declining property values, falling retail sales, and an unsightly collection of decayed buildings and unrented space in the cities. Traffic congestion, since the 1920s a headache for urban leaders, motorists, truckers, and residents alike, composed a particularly critical part of the dilemma. Between 1945 and the mid-1950s, as trucks and autos poured onto narrow streets, traffic tangles grew larger, making the American city an even less desirable place to visit, to play, and to conduct business. [p. 55]

In May 1949, nationally known city planner Harland Bartholomew, who had been a member of the National Interregional Highway Committee, told the students and faculty of the Carnegie Institute of Technology that unplanned growth along the urban fringe had brought "economic strangulation" to central city areas.

Application of MacDonald and Fairbank's theory on the resuscitation of the cities had been frustrated on several counts. The ranks of unemployed men who would build the expressways did not materialize; the unexpected post-war economic boom defied expectations, provided work for soldiers elsewhere, and gave others the opportunity to go to college on the G.I. Bill, all while creating greater demands than ever on the Nation's worn out highways. As noted in the BPR's annual report for 1951: "We are being overwhelmed by a flood of traffic."

The Federal-aid highway program and State road building programs were also being overwhelmed, particularly by inflation and the difficulty of securing road building materials. Historian Bruce E. Seely described the problem:

> From 1945 through 1949, American highway construction budgets jumped from $1.43 billion to $3.69 billion, yet the BPR estimated the larger sum bought fewer miles of finished highways. Both material costs and labor expenses almost doubled; steel and cement were in short supply at any price. Many highway departments delayed construction; others were outbid in efforts to attract the engineers to plan, design, and superintend ambitious post-war projects. [Seely, Bruce E., *Building the American Highway System: Engineers as Policy Makers*, Temple University Press, 1987, p. 195]

With the States unable to use their Federal-aid highway funds at the expected pace, more than $500 million went unspent in the post-war years through 1947.

Further, designation of the Interstate Highways in urban areas had fallen behind schedule. The PRA's August 1947 designation of Interstate mileage included 2,882 miles of "urban thoroughfares"-expressways carrying long-distance routes through the urban areas in their path. Designation of the loops and arterials that were essential to urban revitalization had proven more complex than originally imagined-with the future of the cities, in MacDonald and Fairbank's view, hanging in the balance.

Finally, the highway program had taken a back seat within the Truman Administration to other priorities, particularly the housing crisis. While giving priority to housing programs, the Truman Administration reduced other public works projects to fight inflation, the inevitable result of growing demand outstripping resources. In 1948, for example, as Congress considered reauthorization of the Federal-aid highway program, Truman sided with his economic advisors who considered the program inflationary and wanted to constrain it. The surplus in Federal-aid highway accounts-accumulated because the States' Federal-aid highway programs had not been able to keep pace with the funding-prompted the President to ask for only $300 million a year. In the Federal-Aid Highway Act of 1948, Congress did not provide any funds for FY 1949, but authorized $450 million a year for FY's 1950 and 1951, compared with the $500 million a year authorized by the Federal-Aid Highway Act of 1944.

The housing shortage, as Rose explained, gave MacDonald and Fairbank a chance to realize their vision of expressways as part of an urban redevelopment program:

> The postwar housing scene, according to one observer, was a "national calamity" . . . . Several bills were pending before Congress to correct the housing problem. As early as November 1947, [General Philip B.] Fleming and MacDonald perceived upcoming legislation as an opportunity to insinuate themselves into the urban renewal field, retain control of highway building, and direct both toward a broader program of urban redesign.

On December 21, General Fleming wrote to President Truman to indicate that contemplated housing legislation involving slum removal and replatting was too limited and would "defeat the basic purposes of the program." Fleming proposed a coordinated approach centered within the Agency. Mark Rose described the plan:

> MacDonald could continue his urban road-building program, thus quickly eliminating "thousands of substandard houses." Leaders of the Public Buildings Administration, another of Fleming's subagencies, would plan federal buildings as part of the civic center redevelopments taking place in many cities. Executives in the Bureau of Community Facilities, still another Federal Works subagency, would loan funds for planning additional public buildings in redeveloped sections. New express highways, in the final picture, "will be the framework of the redeveloped city." [p. 61-62]

As Rose pointed out, Fleming's proposal had been intended to combine rival approaches to Federal urban programs, with Fleming and MacDonald in command. One approach, favored by city planners and downtown businesses, was to use expressways and upgraded mass transit to revive cities. Instead of providing expressways based on traffic flow studies, this approach proposed to locate freeways in accordance with "expansive visions of physical renovation . . . and downtown business revival," as Rose phrased it. Engineers took a more straightforward approach. Joseph Barnett, Chief of the PRA's Urban Road Division, told the American Society of Civil Engineers:

> We have heard a great deal about ivory tower planning and long haired planning. It is unfortunate that a few wild-eyed broad plans which might ignore the realities can bring discredit on broad planning generally . . . . The plans which appear to give the best results are not those which start as broad over-all plans but those which are built up piece by piece from the compelling and overwhelming desires of individuals in great numbers.

The highway engineer, in contrast with the "visionary enthusiast," favored placing the expressways where the traffic was.

This moment in history, with the President considering the Fleming proposal, was the point where the MacDonald and Fairbank vision of expressways as the centerpiece of urban revitalization came closest to reality. However, the President brought the vision to an end for all practical purposes on April 20, 1949, when he turned town Fleming's request. Although the housing bill was not as comprehensive as might be wished, Truman replied, it was better than anything accomplished thus far. After discussing the matter with his aides, he felt it was wisest to "hold to the provisions [of the pending legislation] . . . for the present." [p. 62]

MacDonald and Fairbank held to their vision of urban revitalization, but as Fairbank had told the ITE in October 1948, highways cannot, "against the reluctant force of human desire, turn a tide of human movement either one way or the other."

By 1950, the highway community finally appeared ready for the challenge of addressing the deficiencies of the Nation's highway network. Material shortages had lessened. Labor was available. The economy continued to boom. The Nation's motorists were ready. Then, o on June 24, 1950, while spending a weekend at home in Independence, Missouri, President Truman received word that North Korea had invaded South Korea. Within a month, the northern Communists occupied most of the Korean peninsula. President Truman ordered American troops to join with forces the United Nations Security Council had sent to the Korean Peninsula. An advance battalion under Major General William F. Dean landed in Pusan on July 1.

Demands of the war would again delay the Interstate System.

Highway Needs of the National Defense

In the late 1940's, as tensions built in other parts of the world, Congress became concerned about the growing inadequacy of the Nation's highways to sustain defense mobility. Section 2 of the Federal-Aid Highway Act of 1948, therefore, directed the Commissioner of Public Roads to cooperate with the State highway agencies in a study of the status of improvement of the National System of Interstate Highways, to work with the Secretary of Defense and the National Security Resources Board on indicated or potential needs for national defense, and to submit a report reflecting current conditions and deficiencies.

The study, *Highway Needs of the National Defense*, began with a detailed inventory of the Interstate System and a measure of the traffic using each section on the existing roads in the corridors, usually the U.S. routes and their extensions through urban areas. For the 37,800 miles designated in August 1947, the report described the extent of urban mileage:

> Of this total, 3,778 miles are composed of streets in "urban areas" including all cities of 5,000 or more population by the 1940 census, and 2,191 miles consist of streets in towns of less than 5,000 population. The total included mileage of streets in urban places is, therefore, 5,969 miles. The 5,969 miles of urban streets included in the system represent about 2 percent of the 316,536-mile total length of all city streets . . . . In 1948, the 5,969 miles of urban streets included in the system served an estimated 20,740 million vehicle-miles of travel. This traffic, served by 2 percent of the total city-street mileage, was almost 11 percent of the traffic served by all city streets . . . . The existing streets, constituting the urban sections of the system, carried in 1948 an average of 9,500 vehicles daily. This compares with an average for all other city streets of about 1,600 vehicles per day.

The study found that the 5,969 miles of the Interstate System in urban places included 9,036 installations of stop signs or traffic lights, "an average of 3 for every 2 miles." Stop signs and traffic signals were even more frequent in the largest cities. This condition had an effect on speed, as did such factors as unsignalized cross streets, jay-walking pedestrians, midblock halting of vehicles to load or unload, business and residence entrances, and vehicles maneuvering into parking spaces or double parking:

> All of these causes together result, as shown by actual running tests made in all cities of 5,000 or more population, in an average speed of movement on sections of the system in cities of these sizes of only 18.1 miles per hour during the hours of peak traffic and 23.5 miles per hour during the off-peak hours. There is almost no variation from these averages in cities, from the smallest to the largest.

The most serious deficiency uncovered by the study was the lack of capacity on the Interstate System for the ever-increasing number of motor vehicles. The report illustrated the problems in urban areas with **four photographs,** (photo 1, photo 2, photo 3, and photo 4).

In estimating the cost to upgrade the Interstate System, the PRA worked with the State highway agencies to compare present conditions to the standards agreed upon by the PRA and AASHO in 1945. Those standards were expected to produce a roadway that would be adequate for the service of traffic as it may develop for 20 years after the section is improved. This projection of expected traffic presented a problem for purposes of estimating costs:

> This necessitates an estimate of future traffic growth which can be undertaken with reasonable assurance only in the light of specific consideration of the potentialities for each section of the system. For the purpose of this report such specific consideration has been impracticable. The standards have therefore been applied to all sections of the system in relation to their traffic in 1948. Appraisal of the deficiencies of the existing roads and bridges has been based upon the actual 1948 traffic as reported. The improvements contemplated to eliminate the determined deficiencies, which improvements form the basis of the cost estimates reported, have been planned to serve with adequacy the traffic which it is judged would have used each section of the system, had it been so improved in 1948.

On this basis, the PRA and States found that only 1,900 miles of the Interstate System in rural areas and 398 miles in urban areas (including 98 miles in towns of less than 5,000 population) required no improvement. For the remaining mileage, urban needs were found to be:

381 miles	Widening only
816 miles	Reconstruction involving minor relocation
2,024 miles	Reconstruction involving complete departure from existing alinement and relocation

The PRA estimated that an investment of $11.3 billion, at 1948 prices, would be needed to bring the Interstate System up to an acceptable standard to handle 1948 traffic. Approximately $5.3 billion of this amount (or 47 percent) was for improvement of urban segments. This need could be met over a 20-year period with an annual investment of at least $500 million for the Interstate System alone. A substantially more rapid improvement would be needed to meet the needs of national defense.

The estimate was flawed in several ways. It did not include the 2,300 miles of urban auxiliary routes not yet designated. Another major flaw was the PRA's and States' assumption that a large part of the Interstate System, even in urban areas, could be built by reconstructing or widening existing highways. This assumption reduced the estimated cost, but proved unrealistic in practice because development along existing highways made the cost (financial and social) of upgrading the routes to Interstate standards prohibitive. As noted, the estimate made no attempt to project cost to accommodate traffic that would develop over a 20-year period.

Appendix III reprinted Secretary of Defense James V. Forrestal's report on highways for national defense, dated March 11, 1949. In one section, Secretary Forrestal discussed Urban Arterial Highways:

1. The National Military Establishment considers that urban arterial highways should be given equal consideration in their development to the highest practical standards with the National System of Interstate Highways and other strategic highways.
2. Methods of modern warfare require the rapid movement of military forces through or around urban areas and may requirement movement of much of its civilian population and industry. Air attacks directing missiles of extreme reaction can render highways in areas with concentration of tall buildings and structures of little use.
3. Circumferential routes in large cities are potentially of greatest value to national defense from the standpoint of the movement of cargo and personnel by highway transportation when located in the outer development adjacent to smaller buildings and serving as many as possible of the transportation terminals and industrial areas.
4. Radial highways so constructed as to serve efficiently the local civilian economy and with appropriate connections to circumferential highways will, it is believed, serve effectively the national defense.
5. In the construction of the above referred to radial and circumferential routes, it is important that they incorporate the controlled or limited-access characteristics or have wide rights-of-way which would make possible the exercise of priority in their use and in event of bombing would reduce to a minimum the rubble that would fall on at least a portion of the traveled way.
6. Correcting the various major deficiencies in critical urban areas should be a matter of continued coordination between the Public Roads Administration and the National Military Establishment.

Based on these considerations, Secretary Forrestal recommended that improving circumferential and radial highways to the highest practical uniform design standards be considered "a matter of high priority in the Federal-aid highway construction program." He urged that all circumferential and radial highways incorporate controlled or limited access or have wide rights-of-way. And he urged continued study by the PRA and the National Military Establishment "of the various major highway deficiencies in critical urban areas as viewed from a defense standpoint."

President Truman transmitted the report to Congress on June 30, 1949, with a perfunctory four-paragraph letter, ending with a lukewarm endorsement:

> This report is a useful document. I recommend it to the consideration of the Congress in connection with such further provision as may be made for the continuance of Federal-aid for highway construction.

The Final Push for Designation of Urban Segments

When President Dwight D. Eisenhower took office on January 20, 1953, he had many problems to deal with, including the war in Korea. On July 26, 1953, he went on radio and television to inform the American people that the war was over.

By 1954, President Dwight D. Eisenhower was ready to turn his attention to a subject he considered one of the most important he would address: the Nation's highway network. In 1953 and early 1954, Congress had considered the future of the national highway program. However, the Federal-Aid Highway Act of 1954, which President Eisenhower approved on May 6, was a continuation of the existing program, with only token funding for the Interstate System. The Federal-Aid Highway Act of 1952 had authorized $50 million over 2 years and the 1954 Act authorized an additional $350 million for its 2-year period. President Eisenhower had a broader vision.

In a July 12 presentation delivered by Vice President Richard M. Nixon (in place of the President who was unable to attend because of a death in the family), the President asked the Nation's Governors for help in a "Grand Plan" for highway development by the Federal, State, and local governments. The centerpiece, based on importance to national goals, was to be the Interstate System. The President asked his friend and informal advisor, retired General Lucius D. Clay, to head the Advisory Committee on a National Highway Program to work with the Special Highway Committee of the Governors' Conference in this effort.

Part of General Clay's assignment was to estimate the cost of needed improvements to the Nation's highways, and find a way to pay for the work. As he discovered, the BPR was at work on such an estimate. The Federal-Aid Highway Act of 1954, which President Eisenhower had approved on May 6, directed the Secretary of Commerce "to make a comprehensive study of all phases of highway financing, including a study of the costs of completing the several systems of highways in the several States . . . ."

Although the report, which was due to Congress on February 1, 1955, was underway, its release was delayed. When Senator Albert Gore, Chairman of the Subcommittee on Roads, opened hearings on February 22, 1955, he and other members of the subcommittee expressed frustration that the Commerce Department had not submitted the report in time for consideration. Francis V. du Pont, the former Commissioner of Public Roads (head of the BPR) and now Special Assistant to the Secretary of Commerce, was the first witness. Senator Gore asked du Pont to begin by responding to the concerns about the delay in providing the report on highway needs and a companion report on the cost of utility relocation to accommodate highway development.

Du Pont indicated that the reports had been delayed by two circumstances that were unforeseen when the Federal-Aid Highway Act of 1954 was enacted. First had been the unexpected demands for information by the Governors' Committee and the Clay Committee. The second circumstance was the illness of the Director of the Research Division, Herbert S. Fairbank, the lifelong Baltimorean who had played major roles in developing all the important reports of the Interstate gestation period: *Toll Roads and Free Roads* (1939), *Interregional Highways* (1944), and *Highway Needs of the National Defense* (1949). While vacationing in Italy the year before, he had contracted an illness from which he had not fully recovered:

> Regrettably, Mr. Fairbank has not recovered completely and he has not been able to spend more than about half his time, in my judgment, since last summer on this work, which handicapped the bringing together of the factual data and completing the report . . . .
>
> It was just physically impossible, gentlemen, in view of those circumstances, lack of control and other circumstances, illness on the part of the Director, and the demands by the governors committee and the Clay committee, it was physically impossible to comply with the direction of Congress.

As for when the studies would be submitted:

> I discussed that matter at length with Mr. Fairbank, who now comes to the office about half the time, and, while we have asked for a 60-day extension, I should be quite disappointed if it is not available within half that time.

On March 25, Secretary of Commerce Sinclair Weeks finally released the BPR's report on *Needs of the Highway Systems, 1955-1984*, as requested by the Federal-Aid Highway Act of 1954. The report covered all highway needs,

but its estimate of the cost of the Interstate System would be the estimate used by General Clay and the Congress during the debates in 1955 and 1956 on how to finance construction of the Interstate System.

The estimate covered the 37,700 miles of the Interstate System designated on August 2, 1947; the BPR estimated that about 15 percent of this mileage was adequate according to the standards used for the study. The estimate did not cover the 2,300 miles or urban expressways that had not been designated. In sum, the BPR estimated that the cost of the Interstate System, as defined, would be $23.2 billion-covering construction over a 10-year period to make the 37,700 miles structurally adequate and provide sufficient lane width for expected traffic in 1974. The report divided the estimate among rural mileage ($12.5 billion) and urban mileage designated thus far ($10.7 billion).

Under this estimate, about 28,000 miles would be four-lane divided highways, while about 2,300 miles, mainly in urban areas, would have six or more lanes. For about 7,000 miles in rural areas, two lanes would be satisfactory. As in the past, the BPR assumed that most Interstate construction in rural areas would involve upgrading, improving, and rebuilding existing roads, rather than construction on new location. The estimate was based on midyear 1954 prices, a period when the country was just emerging from a mild recession.

The Clay Committee added $4 billion for the urban routes not included in the BPR's estimate, for a total 10-year cost of $27 billion (1956-1965). General Clay referred to the mileage as urban feeder and distribution routes and does not appear to have based his estimate on construction to Interstate standards. Nevertheless, his estimate of $27 billion became the target all parties were trying to reach in what became the Federal-Aid Highway Act of 1956, having lost sight of the limitations of the estimate.

With the President's Grand Plan initiative and the study requirement emerging from the 1954 Act, the BPR increased its efforts to move from planning and research to designation of the remaining urban mileage. On August 4, 1954, the BPR issued Policy and Procedure Memorandum (PPM) No. 20-4, "Policy on Interstate System Projects." It stated that the BPR's policy was "to effect the construction of the system to the high standards necessary for fast, safe and economical travel." The PPM mentioned the established mileage, now totaling 37,600 miles measured along existing roads, and commented on the remaining mileage within the 40,000-mile limitation:

> The remaining 2,400 miles and any additional mileage brought about by future relocations that reduce length are reserved for additions to the system as needed. It is anticipated that these additions will be principally additional routes into, through, and around urban areas.

The policy included three items on Interstate routes in urban areas:

a. Where the final location of an interstate route is through a city and the traffic justifies in addition a belt route around the city, the belt route may be added to the Interstate system.
b. Where the development of a route to Interstate standards through a community would result in such substantial damage to the abutting property or to the community that the development would be unreasonable and not in the public interest, the Interstate route should be located around the community where it can be developed to Interstate standards. The location should be as close to the central area of the community as feasible and should depart from the direct route through the community at such a distance therefrom as necessary to avoid undue indirection or appreciable additional distance of travel on the Interstate System.
c. Where the final location of an Interstate route is around an urban area, spurs may be provided to connect with important arterial routes or other desirable objectives therein. Such spurs may be included in the appropriate Federal-aid system.

A Circular Memorandum dated November 1, 1954, provided suggestions on "Approval of Locations of the Interstate System." The document explained how the mileage designated on August 2, 1947, had been recalculated. At the time of the designation, the mileage was estimated "as if the routes were located on the existing traveled ways." Referring to the map issued on that date, the memorandum pointed out that of the places identified, some are "principal" metropolitan areas, cities and industrial centers, "while others are of lesser rank":

> All places on the approved map regardless of rank are approved controls for the system. Although they do not include all places on designated routes which may quality as principal metropolitan areas, cities and industrial centers, the requirement of the law that principal places of this description be connected by routes "as direct as practicable," has caused us to make a comparison of the length of direct lines between the principal cities named on the 1947 map and the length of existing traveled ways. It appears that substantial savings in length are possible as shown on the attached map. The mileage via present traveled ways averages 17 percent more than via direct lines . . . . Considering the system as a whole, distance saved by more direct routing could be used for designation of additional well-qualified routes of the Interstate System within the 40,000-mile legal limitation.

On January 25, 1955, Deputy Commissioner A. C. Clark issued a Circular Memorandum to the BPR field offices regarding designation of the urban additions to the Interstate System. The designated mileage had been recalculated and was now measured at 37,600 miles. This left 2,400 miles reserved for additional routes into, through, or around urban areas. Clark explained:

> Several requests for additions to the Interstate system have been submitted by State highway departments recently. It has been decided to defer action on any such requests until we have a fairly complete understanding of the needs for the urban areas along the routes of the Interstate system so that the mileage available can be distributed equitably on a needs basis.

He asked the field offices to urge the States to "make appropriate studies" and to submit requests for mileage "with substantiating data for adjustments and additions in the vicinity of urban areas."

On June 9, 1955, Clark released a Circular Memorandum on "Criteria for Selection of Additional Interstate System Routes at Urban Areas." Clark explained that in response to his January 6 request, 38 States and the District of Columbia had submitted requests for urban Interstate additions. (Five States indicated they did not need additional routes in urban areas.) The problem was with the requests:

> In many cases the submissions were inadequately supported in that the probable volumes and character of traffic and the purpose for each route addition were not clearly set forth. Few States accompanied their submissions with adequate data justifying their proposals. Some States, on the other hand, made good presentations with maps which clearly indicated their needs. These requests are now being analyzed . . . .

Clark summarized the criteria for additional urban designations:

a. No purely intercity routes can be considered.
b. All additions must be located to serve interstate routes effectively either as feeders thereto or distributors therefrom. Routes which are principally for local service without direct relation to the Interstate System cannot be considered.
c. Belt routes are those which are circumferential to the center of a city. An outerbelt proposed for a large urban area should be sufficiently close to the limits of the urbanized area to act for Interstate traffic approaching the area both as a bypass of all or part of the urban area and as a distributor to city radial routes. Each section of an outerbelt between approach interstate routes should be separately justified. In large cities 360-degree belts may be justified. An innerbelt generally will consist of sections of the separate interstate routes passing through the city.
d. A penetrating loop is a route which passes through a city that is bypassed by the interstate route and connects with interstate routes at both ends. A loop reasonable in length may be considered when fully justified as necessary for interstate traffic to be distributed and reach concentrations of population, commerce or industry or defense installations.
e. Where the final location of a presently designated interstate route does not pass through an urban area, well located penetrating spurs into the urban area may be considered to the extent that it is feasible to develop such

spurs to standards characteristic of a freeway. Such spurs must be reasonable in length and should connect with principal routes serving the urban area.

In considering State requests, the BPR's Washington Office would assess the relative importance of the several types of additions. Because the final locations of the remaining mileage were to be made "shortly," Clark told the field offices that it was "incumbent upon the States which have not already done so to make requests for urban area additions and submit adequate supporting data as quickly as possible."

The primary purpose of the Circular Memorandum was to distribute copies of a statement that Commissioner of Public Roads C. D. "Cap" Curtiss had submitted to Senator Gore's subcommittee on April 15, 1955, on "Criteria for Selection of Interstate System Routes." In the statement, Curtiss summarized the designation of mileage since the 1944 Act. For designation of the remaining mileage reserved for circumferential and distributing routes adjacent to and in urban areas," he said that detailed studies were needed:

> There is no standard pattern of cities or metropolitan areas. The requirements for mileage of highways of interstate system characteristics adjacent to, into and through urban areas vary according to their area, topography, physical barriers such as rivers and other bodies of water, location of industries, commercial developments and residential sections, volumes and types of highway traffic, existing street, boulevard and other highways, and other similar factors.

Curtiss stated that the BPR would use the same criteria for the remaining mileage as for the mileage already designated. However, some unique considerations applied to the urban mileage:

> In addition, particular consideration will be given to problems associated with urban systems, such as estimates of future urban expansion or growth, the proportion of the traffic on a proposed route that is of the type the interstate system is expected to serve, and the need for belt routes and loops for through traffic that is not destined for a section of the urban area directly served by the presently designated route. The objective is to designate the remaining 2,300 miles in such manner as to best supplement and increase the service potential of the 37,700 miles of the interstate system now designated, insofar as peacetime, wartime or national defense interests are concerned.

As with the initial mainly rural designations, the BPR planned to work closely with the Department of Defense in making the final designations. After summarizing Secretary Forrestal's report on defense needs in urban areas, Curtiss listed the seven criteria the BPR would consider beyond the cooperative studies conducted by the State highway departments and appropriate local planning and highway authorities and officials:

1. Connection with city approach routes-For the service of interstate system traffic and other traffic bound in and out of the city to and from exterior points, the routes selected should provide for convenient collection and delivery. Although the interstate routes must bear a proper relation in location and character to other parts of the street system, they will be the routes of principal service to the interstate system traffic.
2. Penetration of city-At the approaches to cities and particularly the larger cities, a very large part of the traffic on the interstate system originates in or is destined to the city itself. Distributing routes within cities should be provided in addition to circumferential routes which serve to bypass the traffic that is not destined for the city.
3. Location on undeveloped land-To the extent consistent with other requirements, undeveloped land offers the best possible locations for routes entering a city.
4. Circumferential and distributing routes-Routes which avoid the business centers of cities are needed to serve traffic bound to or from points other than the center of the city. Such routes may be so located as to serve both as arteries for through traffic around the city between various approach highways and as distribution routes for the movement of traffic with local origins and destinations to and from the various quarters of the city. The pattern of such routes depends upon the topography and plan of each particular city. At many of the relatively large cities the need is for routes completely encircling the city. In some of the larger cities a belt route near the central business district may be needed in addition to an outer circumferential route.

5. Relation to traffic-generating focal points and transportation terminals-Railway terminals, both passenger and freight, wharves and docks, and airports generate large volumes of street and highway traffic associated with the essential interchanges between the several modes of transportation. The location of the interstate system routes at cities should be so placed as to give convenient express service to these various major traffic-generating locations within and in the vicinity of cities and also to the business center of the city and main industrial areas. The location of the interstate system should permit and encourage a desirable coordination of highway transportation with rail, water and air transportation.
6. Relation to urban planning-Interstate system routes will provide for only a small portion of the movement of traffic in most cities. The routes should be located and designed to be an integral part of the entire urban transportation plan.
7. Civil defense-The interstate system routes to be provided in and near any city should be carefully studied and integrated with the planning for civilian defense.

By early August, BPR was in the final stages of the urban designation. Coordination with civil defense authorities and the Department of Defense was among the final steps. In a meeting on August 8, the Defense Department reported that it was well pleased, particularly because the BPR had accepted practically every belt route proposed by the States.

The formal designation took place on September 15, 1955, when Commissioner Curtiss approved the general location of the Interstate System, "including additional routes into, through, and around urban areas, submitted by the several State highway departments, as adjusted." The additions were contained in the publication *General Location of National System of Interstate Highways Including All Additional Routes at Urban Areas Designated in September 1955*. Because the cover of the publication was yellow, it became known as the Yellow Book.

The book consisted of Commissioner Curtiss' approval memorandum, a reprint of the August 1947 map showing rural designations, maps showing designations in 123 urban areas, and a "List of Maps" that functioned as a table of contents. No additional text was provided to explain how the designations were made.

Baltimore, which had been used as an illustration in *Toll Roads and Free Roads*, was one of the 123 urban areas shown in the Yellow Book. The 1955 map is similar to the 1939 map, but differs in several key ways. The Baltimore Beltway (later numbered I-695) is located outside the city limits except in the southeastern arc; and two routes are omitted. The remaining routes cross the city in the east-west U.S. 40 corridor and bisect the city on a north-south alinement through the central business district.

On September 23, 1955, Commissioner Curtiss wrote to each State highway agency director to provide a copy of the Yellow Book. His cover letter indicated that the approved routes totaled approximately 2,300 miles. The designations and the criteria, he said, by which they were selected had been reviewed by the Department of Defense from a national defense standpoint and found to be sound. They also had been reviewed from the standpoint of civil defense and found satisfactory. He commented on the maps:

> Both the new routes and routes previously approved are shown without differentiation on the maps which are a part of the approval document. All routes are approved in the general locations shown on these maps. It is unavoidable that some of the general locations shown will be associated with detailed locations such as existing traveled ways, but this should not preclude reasonable changes when studying final locations.

Frank Turner on the Yellow Book

In August 1955, the Congress had recessed without completing work on legislation establishing a program for constructing the Interstate System. General Clay's plan, as submitted by President Eisenhower in February of that year, had failed largely because of the proposed funding mechanism (a bond issue backed by revenue from the Federal excise tax on gasoline), but so had all other attempts to pull together a funding mechanism.

The fact that copies of the Yellow Book were provided to the Members of Congress after the failure of legislation in 1955 has often been cited as a key factor in passage of the Federal-Aid Highway Act of 1956, the landmark legislation that made construction of the Interstate System possible. Members, particularly those representing urban areas, could see what their constituents would be receiving from the legislation.

In this respect, the Yellow Book's importance has been overestimated. The primary factor in passage of the legislation in 1956 was that key Members of Congress and the interest groups that had lobbied against the funding mechanisms in the 1955 bills reached agreement over the winter on how to share the cost. That issue resolved, Congress approved a bill that otherwise had no opposition.

Francis (Frank) C. Turner was one of the central figures in development of the Yellow Book and the legislation. As Special Assistant to the Commissioner and the BPR's liaison to the Clay Committee and the Senate and House Subcommittees on Roads, Turner observed and influenced creation of the Yellow Book and passage of the 1956 Act. Having joined the BPR in 1929, he would rise to its highest position, Federal Highway Administrator, in 1969 and serve in that post through 1972. In early 1988, John T. Greenwood interviewed Turner for an oral history project funded by AASHO's successor, the American Association of State Highway and Transportation Officials. In the interview, Turner discussed the Yellow Book. The following excerpt is presented without ellipses:

> Q: I would like to take you back a little bit and review the question of the Yellow Book, which was supposed to be a critical event or product that leads to the acceptance of the 1956 bill. Can you talk about that a little bit, about where the Yellow Book came from?
>
> A: Well, it's appeared in a lot of discussions on the subject but I think it-what you just said about it highly overrates its influence and importance in the thing. It was-it was more of a kind of routine scratch pad memorandum to ourselves, I guess, more than anything else. It was not intended to be a big landmark item. And I don't think it ever was except possibly in the interpretation in the minds of some people. But it was sort of a tying up of some loose ends.
>
> When the *Interregional Highways* report was submitted to the Congress it described the several systems that had been tried and it talked about various systems that had been actually worked out, ranging all the way from systems somewhere around 14,000-15,000 up to one almost 80,000. It became particularly apparent in the suburban areas between the farmland and the dense downtown CBD sections-as a result of the original estimates, approximations of the cost, projections of traffic and so forth which had started out to be on the basis of existing rights-of-way, had to be adjusted and as a result the original interregional report did not really go into the cities in terms of trying to make even a cost estimate, because we realized that conditions would be so vastly different that we had no experience, really, on which to project the cost or anything.
>
> So as a result the report indicated that we did not-while there had to be a line, there had to be a route into the area, we had not selected any route (on the ground) and therefore we could not make any approximations of cost, and to some extent we couldn't even make approximations of traffic volumes and so on. So that report did not include any delineations or anything in the cities-and in the rural areas we explicitly said that these are all based upon an existing roadway between two cities. And we went around all the curves, more or less, on the right-of-way, and therefore, the distance as we measured it was along the existing road. Therefore, we overestimated the mileage for the Interstate System. Then put a 40,000 limitation on it, using the old roads. But we specifically said in the report that we did not have routes laid out or designated within the urban areas, but that we needed about so much mileage for that purpose. What actually we did was measure the rural mileage and up to the 40,000 miles we said whatever it is in between, that should be left reserved for urban mileage, which we have not been able to really measure and make an intelligent report on.
>
> And when the legislation became real and we had to actually make selections, locations on the ground and all, we first started with pretty much diagrammatic things, in order to diagram these routes that we

had reserved for the urban areas, even before we got around to actually locating them on the ground. We made a diagrammatic book, and that's what the Yellow Book was, merely to pick up that gap that we'd left from the original interregional highway system report and study. They were never intended, never thought of as being designated routes. They were picked up quickly by a lot of people, a lot of the highway people, particularly by the politicians and local people and all. That these were the routes that have been assigned to us here in Los Angeles, or here in Moline, Illinois, if there was one in Moline, Illinois, that this is the route and looking at the city diagram there, which is just really the urban boundary lines there and fine line. That here is the route, which is where you propose to put the route, and this has been assigned to us. This is-we don't want that transferred and we don't want it tampered with where somebody else said, "I do want it moved. I don't want it there."

So that became a real battleground for a long time, and it was nothing more than a-kind of a memorandum, so to speak, of carrying forward a gap in that original report.

The 1957 Extension

Over the winter, the interests that had blocked passage of legislation in 1955 reached agreement with congressional leaders on the controversial aspects of funding construction of the Interstate System. Although many issues still had to be resolved, Congress completed work and sent the Federal-Aid Highway Act of 1956 to President Eisenhower, who signed it on June 29. It established a Federal commitment to build the Interstate System, creating a funding mechanism based on highway user taxes, called for high design standards, and changed the name of the network to the National System of Interstate and Defense Highways.

Section 108(1) of the Federal-Aid Highway Act of 1956 extended the statutory limitation on the length of the Interstate System by 1,000 miles. On July 27, 1956, Commissioner Curtiss issued a Circular Memorandum to field offices on "Selection of additional interstate system routes in accordance with Federal-Aid Highway Act of 1956." Curtiss informed them that:

> The State highway departments may request either city-to-city routes or supplemental urban area routes so long as the routes integrate with the presently designated interstate system.

He appended a copy of his statement on "Criteria for Selection of the Interstate System Routes."

The States submitted requests for 13,775 miles of new Interstate highways. Careful review of the applications revealed to the BPR that many had low Interstate significance in view of the criteria Congress had established in Section 7 of the 1944 Act. Others duplicated service provided by designated routes. In reviewing urban additions, the BPR established an objective of providing alternate auxiliary routes for service into, through, and around the larger urban places connected by city-to-city routes of the System.

During the selection process, the BPR again coordinated with the Department of Defense. Turner, in an internal memorandum dated May 7, 1957, to Federal Highway Administrator Bertram D. Tallamy explained that some adjustment might be necessary because of the Defense Department's "strong feeling, (based on target analyses of our cities) for need for designating additional routes at cities." He characterized discussions thus far:

> As expressed informally to date the coordinated Department of Defense thinking with respect to designation of the 1,000 miles is that the greatest deficiency in the presently designated system occurs at urbanized areas; and that as much of the new mileage as possible be applied to provide service "both into and around" urbanized areas beginning with the largest place and including as many urban places as possible down to the population level of 125,000.

As Turner pointed out in a footnote, with the 1955 designation of 2,300 miles at urban places, "service both into and around urban places was achieved at all places of 1,000,000 or more population, and at many smaller places."

Before concluding the process, Tallamy wrote to Major General Paul F. Yount, the Department of the Army's Chief of Transportation, about the planned designations. Tallamy's letter of October 10, 1957, explained that the BPR proposed to designate 2,102 miles (1,000 miles added by the 1956 Act and 1,102 miles made available for designation by adopting more direct locations of previously designated routes). Although the total freed by establishing more direct routes was 1,435 miles, the BPR had decided to retain 333 miles "to meet changing system requirements and to avoid exceeding the statutory limitation on mileage pending establishment of final locations." Tallamy enclosed a map illustrating the proposed designations:

> From the attached map you will note that the 1102 miles proposed for designation under the 40,000-mile authority is composed of five city-to-city routes, totaling 886 miles, and routes at 20 urban areas totaling 216 miles. The routes at urban areas include: (1) 36 miles of high priority connections which we cannot accomplish as adjustments of previously designated routes; and (2) 180 miles earmarked to provide service both into and around those urban places of more than 200,000 population where such service has not yet been achieved by previously designated routes or by existing high-type facilities
>
> The 1000 miles proposed for designation under the 1000-mile authority [from the 1956 Act] is composed of four city-to-city routes totaling 1000 miles.

Tallamy thanked General Yount for "the helpful advice contributed by your office" and pressed the "urgency of this matter" in seeking "the concurrence or receipt of comments of the Department of Defense."

General Yount quickly concurred in the additions. He explained:

> From the standpoint of national defense, it is believed the greatest deficiency in the previously designated National System of Interstate and Defense Highways is the failure to provide belt or circumferential type routes for traffic to pass around potential target areas where populations and industries are concentrated. Accordingly we are pleased that you have proposed the addition of belt routes for all cities with a population of 200 thousand or more if not presently served with this type route.

On October 18, Secretary Weeks announced 2,102 miles of new routes, noting the Defense Department's concurrence. After listing the city-to-city additions, Secretary Weeks described the 216 miles added in or near urban areas:

> [The] 216 miles includes: urban connections in Chicago, Philadelphia, St. Louis, Washington, D.C., Kansas City, Louisville, Omaha and Duluth, as well as the earmarking of mileage to provide circumferential or belt routes for cities of more than 200,000 population where routes already designated fail to provide such facilities.
>
> The cities involved are Cincinnati, Ohio; Louisville, Kentucky; San Diego, California; Akron, Ohio; Springfield-Holyoke, Massachusetts; Dayton, Ohio; Hartford, Connecticut; Oklahoma City, Oklahoma; Syracuse, New York; Jacksonville, Florida; Scranton, Pennsylvania; Salt Lake City, Utah; and Sacramento, California.

Pinning Down the Locations

For the first 3 years under the 1956 Act, Interstate Construction funds were to be apportioned among the States on a formula basis involving mileage, land area, and population. Succeeding apportionments would be made on the basis of the cost-to-complete in each State as determined by Interstate Cost Estimates (ICE).

Secretary Weeks submitted the first ICE to Congress in January 1959. The estimated cost of $37.6 billion (Federal share: $33.9 billion) covered only 38,548 miles, not the full 41,000 miles Congress had authorized and that BPR had designated. The 1956 Act had specifically excluded the 1,000-mile addition from the first ICE. The additional 1,102 miles added on October 18, 1957, had been designated too late for inclusion. However, preliminary cost data for the

remaining miles was provided to the House Ways and Means Committee in July 1959, increasing the estimate to $41 billion (Federal share at 90 percent: $37 billion).

Based on the complete 1958-1959 ICE, rural segments of the Interstate System accounted for approximately 58 percent of total estimated costs. At 42 percent, the urban share was far higher than in the estimate General Clay had compiled in 1955 on the basis of his assumption that total urban costs would be approximately $4 billion (15 percent of the total estimated cost of $27 billion). The new estimate of urban costs was far more realistic because it was based on the assumption that full-scale Interstate express highways would be built in the urban areas, not simply connectors.

Frank Turner, in his oral history, compared the first ICE with Interstate designations shown in the Yellow Book:

> The Yellow Book just was completely discarded at that point because we had to-we had to sit down and put our nose to the grindstone and select locations, actually, that we could price out. And that was being done in the 1956 to 1958 period, I guess, 1959, when we turned in that first estimate. And [the Yellow Book], in effect, became just totally obsolete at that point. And it never had, in our minds at least, any key significance of any kind except as a worksheet or memorandum to us internally, more than anything else. But as I say, a lot of people picked it up and assigned to it great importance and significance that really it never had.
>
> When we had to start making this new estimate in the middle 1950s, late 1950s there, we picked routes, translated these diagrammatic lines in the Yellow Book into actual conceptual locations on the ground with looking at them and saying, "Well, the diagram, the desire lines traveled diagrams that we've got for each city indicate that this is the heaviest traveled route in here and it has X number of trips that have to be taken care of. And here is the location-here is where the desire line is." A straight line from point A to point B.
>
> But obviously, you can't very often do it on a straight-line basis. You have got to go around on this thing here. So you had to adjust it physically on the map. And then you made estimates from that.

Turner added:

> And then, of course, the thing hit the fire when you start talking about a specific location.

Continuing Urban Studies

Throughout this period, the BPR continued the urban studies it had launched earlier in the decade. In a discussion of the continuing home interview O&D studies, the 1956 annual report described a resurvey in Tulsa, a 1954 followup to the initial survey in 1944:

> The resurvey shows important changes in the distribution of traffic during the 10-year period as well as sizable shifts in the population. Only 24 percent of the people interviewed in 1954 were living in Tulsa in the earlier year. This illustrates the importance of periodic checks on travel habits and resulting traffic movements.

The home-interview O&D study in Detroit showed a "need for a 259-mile freeway system, estimated to cost $1.5 billion, to serve an estimated population of 4.4 million and its traffic by 1980." The summary added:

> Very definite relations between trips and land use were found and these relations will aid in the conversion of future land-use forecasts into traffic forecasts.

Similar studies were underway in 114 urban areas.

As the Detroit study suggested, the goal was to find ways to estimate where traffic would want to go in coming years ("to establish the relationship between residents' vehicular trips and such variables as population size or density, distance from central area, automobile ownership, family income, and land use"). Initial analysis found "remarkable uniformity in the proportion of trips for each particular trip purpose, i.e., work, shop, and social and recreational, in cities of all sizes."

By the 1957 annual report, the BPR was reporting that it was using a new tool to find ways of basing highway plans on reliable estimates of future needs. Problems connected with the planning and designing of the urban portions of Interstate routes had provided the impetus for increased research in the field of traffic forecasting and "for the use of high-speed electronic computers to achieve desired results." The report added:

> In planning urban highway systems, the transportation plan must be integrated with urban area growth to the benefit of the whole community as well as to the benefit of the highway users. During the past year staff assistance was provided by Public Roads to the Joint Committee on Highways of the American Association of State Highway Officials and the American Municipal Association. This committee, through the holding of State and regional meetings and through the dissemination of examples of effective coordination between highway planning and city planning, seeks to aid community development through planning.

As MacDonald and Fairbank Leave the Scene

By the time the BPR released the Yellow Book in September 1955, Thomas H. MacDonald had left the agency. He retired on March 31, 1953, and moved to Texas where he helped establish what is now called the Texas Transportation Institute. Herbert Fairbank retired on April 30, 1955, mainly because of the illness du Pont had cited in testimony earlier that year. The Yellow Book, therefore, was in some respects Fairbank's final statement on the subject that had absorbed his attention for so many years. The alignment of urban mileage embodied the concepts Fairbank had developed in *Toll Roads and Free Roads* and *Interregional Highways*.

Beginning with the highway planning surveys in the mid-1930's, Fairbank had contributed more than anyone to the Interstate System. He had conceived the means of gathering the data on highway usage in the 1930's and used the data in drafting the "Master Plan" for *Toll Roads and Free Roads* that provided the System's first official description. For President Roosevelt's Interregional Committee, Fairbank had written *Interregional Highways*, which refined the plan and provided the basis for congressional authorization in 1944. He had also compiled and laid out the data for the 1949 report on *Highway Needs of the National Defense* and the 1955 report on *Needs of the Highway Systems, 1955-84* that was used by the Clay Committee and the congressional committees that considered the National Highway Program.

And yet, the vision Fairbank and MacDonald shared was only partly understood by the legislators. Thanks in large measure to President Dwight D. Eisenhower, they had accepted the need for the Interstate System. They had found a way to pay for its construction. They also accepted the importance of addressing urban highway needs, as Fairbank and MacDonald had stressed. But they had overlooked some of the concepts Fairbank knew were essential to the success of the program in urban areas. For example, he and MacDonald had consistently recognized the importance of developing the urban freeway networks in concert with the plans for each urban area. But the Federal-Aid Highway Act of 1956 was silent on the subject.

Designation of the urban networks in 1955 and 1957 foreclosed the type of planning that might have defused some of the urban controversies that would surround development of the Interstate Highway Program. For example:

- Coordination among Federal, State, and local officials had been informal, and often focused more on traffic service than metropolitan planning; Congress would not act on the metropolitan planning authorities recommended in *Interregional Highways* until 1962, long after the urban Interstates had been designated.
- No mechanism was put in place that would allow for changes in the network, regardless of need, or alternative transportation facilities if they proved desirable-if a State chose not to build an urban segment, the BOR could

shift the mileage to another segment, but the city would lose the Federal funds it would have received for that purpose. This problem would not be resolved legislatively until the Federal-Aid Highway Act of 1973 began the Interstate substitution program.

- The 1956 Act focused on highways, with no provision for a parallel expansion of transit service to meet urban needs. Because most transit systems were privately owned, Federal funding for transit was not considered-or sought by cities or transit owners-in the 1950's. As cities began taking over inefficient private transit companies, pressure for Federal funding began in the 1960's; representatives of New York City and other urban areas had to overcome considerable resistance to the idea.

E. H. "Ted" Holmes worked for Fairbank during preparation of *Toll Roads and Free Roads* and the later phases of Interstate planning and designation, going on to become an internationally recognized expert on urban planning. In a December 1960 speech to AASHO's Special Committee on Urban Planning Seminars, Holmes discussed the difficulties facing Federal, State, and municipal officials in the 1940's as they tried to designate urban Interstate networks:

> Highway planners were by no means satisfied with the limited analyses then possible, or with the extent to which the possible analyses were actually carried out. Highway departments made effective use of the results in planning specific routes or projects, but had little desire or reason to continue analyses to aid in broad urban planning. And city planners seemed unable or uninterested in capitalizing on the wealth of information available in the boxes of punch cards filed away in some storage area. It soon became evident, however, as planning and research people delved into the facts assembled and tabulated in one city after another, that basic relations between travel desires and land use and other social and economic factors of the metropolitan area must exist. But it was not until the high speed computer became available, and perhaps the almost simultaneous introduction into the field of highway planning of the sociologist, the geographer, the economist, and the city planner, that a real breakthrough in establishing these relations was achieved.

By the time of Holmes' speech, the urban Interstates had been laid out-and the new specialists available to help the highway planners could not alter the plans.

As a result, with MacDonald and Fairbank gone from the scene, the vision they had championed was only partially enacted. In some ways, the Interstate System would be far more than they had foreseen. In others, it would be less. In urban areas, the massive traffic carrying capacity of the Interstate System could not disguise its failure to relieve traffic congestion or revitalize cities as MacDonald and Fairbank had predicted.