

Report on

INNER LOOP FREEWAY SYSTEM
DISTRICT OF COLUMBIA

ENGINEERING STUDIES AND ESTIMATES

OCTOBER 1955

DE LEUW, CATHER & COMPANY • CONSULTING ENGINEERS • CHICAGO

Report on

INNER LOOP FREEWAY SYSTEM

DISTRICT OF COLUMBIA

ENGINEERING STUDIES AND ESTIMATES

Prepared for the

BOARD OF COMMISSIONERS

WASHINGTON, D. C.

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ACKNOWLEDGMENTS

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FINANCIAL 6-0424

October 31, 1955

Board of Commissioners
District of Columbia
Washington, D. C.

Gentlemen:

The accompanying report, INNER LOOP FREEWAY SYSTEM—DISTRICT OF COLUMBIA, contains the results of our study of and recommendations for a system of freeways circumscribing the central business and government district of Washington. It includes general plans for the recommended freeway system and preliminary estimates of construction cost.

The Inner Loop plan, conceived in 1944, was proposed to be a system of surface arteries consisting of broad avenues and pairs of one-way streets. It was felt such facilities would encourage traffic to by-pass the areas of greatest congestion and would provide for a more orderly distribution of this traffic into the principal shopping and employment areas. However, the phenomenal growth of the Metropolitan Area of Washington and the subsequent increase in the use of private motor vehicles has produced traffic volumes in excess of the street capacities indicated in the 1944 plan.

Traffic volume studies based on origin-destination surveys, forecasts of population growth, and predictions of future ownership and use of motor vehicles which were undertaken as a part of our study, indicate that the Inner Loop must be a fully grade-separated highway system constructed to the highest possible design standards if it is to adequately handle the traffic volumes anticipated during the next 25-year period. The general plans and estimates of cost for the Inner Loop Freeway System, which are combined in this report, have been prepared on this basis.

The 17.6-mile network of freeways recommended herein would integrate the principal traffic arteries presently serving the area and would permit traffic to avoid the zone of greatest congestion in passing through Washington or to move swiftly and safely to ramps near destinations within the central area before merging with surface vehicles.

Although the design standards would provide for the continuous safe movement of traffic at speeds of 50 miles per hour, the legal allowable limit would be somewhat less. It is contemplated that during peak periods the average speed would probably be under 40 miles per hour because of the heavy volumes of traffic to be served.

The cost of this loop system, forming a figure 8 around the central business and government district, including rights-of-way acquisition, relocation of District-owned utilities, engineering and an allowance for contingencies, has been estimated at \$272,667,000.

Our studies indicated that substantial savings would be realized by motor vehicle operators using the proposed Inner Loop Freeway System. These savings alone would justify an expenditure of about 1.4 times the cost of the facilities recommended herein if the latter were to be financed at liberal interest rates over a reasonable period of years. This computation does not take into account the even greater benefits which would accrue to the community as a whole. These benefits would include lessened congestion on surface streets, particularly as it would affect the operation of public transit vehicles, and the protection of property values in the central area which would suffer through lack of accessibility if present transportation deficiencies would be allowed to continue and gradually grow worse.

While the entire Inner Loop Freeway System is needed immediately, it would not be feasible, either from a physical or financial standpoint, to provide them within a shorter period of time than perhaps 12 years. We have recommended, therefore, a program of stage construction which would first, provide those portions of the system most sorely needed and second, assure that each portion, as completed, could be properly integrated into the existing street and highway systems.

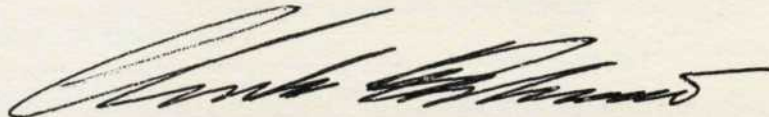
It is heartening that, based on this report, but even before its final printing, necessary approvals were obtained for an initial portion of the

Inner Loop System of freeways. Final contract drawings and specifications preliminary to actual construction are currently being prepared. It is hoped that the balance of the system will meet with the same spirit of cooperation and understanding of the need for urgency in providing superior highway facilities for the Washington Metropolitan Area. If so, the public needs will have been met as promptly and efficiently as permitted by the great complexities involved in a project of this magnitude.

We cannot express adequately our appreciation for the generous cooperation we received during the preparation of this report from the great number of individuals representing the various organizations listed under "Acknowledgments". We are particularly grateful for the fine spirit displayed throughout our study by members of your Department of Highways.

Very truly yours,

DE LEUW, CATHER & COMPANY

A handwritten signature in dark ink, appearing to read 'Charles E. De Leuw', written in a cursive style with a long horizontal flourish extending to the right.

Charles E. De Leuw, President

TABLE OF CONTENTS

	<i>Page</i>
Summary of Report	1
Introduction	5
Basis of Route Selection.....	7
General	7
Connections to Radial Routes	8
Description of Recommended Route.....	13
West Route	13
North Route—Northwest Section	13
North Route—Northeast Section	16
East Route	21
Center Route	23
South Route—Southwest Section	23
Alternate Route via Independence Avenue.....	26
South Route—Southeast Section	27
Design Standards	28
Estimate of Cost.....	31
Construction Costs	31
Contingencies	32
Engineering Costs	33
Right-of-Way Costs	33
Traffic Volume Studies.....	35
Importance of Estimates	35
Origin-Destination Survey	35
Methods of Allocating Traffic	37
Population	37
Expansion Factors	38
Traffic Volumes	41
Economic Justification	41
Coordination with Transit Modernization.....	51
Inner Loop System for the Interim Period.....	56
Stage Construction	59
Stage 1	59
Stage 2	60
Stages 3 and 4	60
Stage 5	61
Stages 6 and 7	61
Stages 8 and 9	61
Parking Structures Over Freeways.....	63

LIST OF EXHIBITS

Number

- 1 Existing and Proposed Major Streets, Parkways and Freeways in Relation to Proposed Inner Loop Freeway System
- 2 Cut-away Showing Whitehurst Freeway Connection to Inner Loop—Looking East
- 3 View of Interchange Between the East and Northeast Sections—Looking West
- 4 Suggested Layout for a Fringe Parking Lot and Bus Terminal at Interchange C
- 5 Suggested Layout for a Recreation Area at Interchange C
- 6 Typical View Showing Freeway in Cut with Ramp Connections
- 7 View Showing Typical Cut and Cover Section
- 8 View of Proposed Washington Channel Bridge and Freeway Connections to Highway Bridges—Looking South
- 9 Typical View of Freeway in Open Cut
- 10 Population Distribution by Districts—1948 and 1980
- 11 Mass Transit Passenger Trip Desire Lines and Potential Express Bus Patronage to Destination Area A
- 12 Mass Transit Passenger Trip Desire Lines and Potential Express Bus Patronage to Destination Area B
- 13 Mass Transit Passenger Trip Desire Lines and Potential Express Bus Patronage to Destination Area F
- 14 Mass Transit Passenger Trip Desire Lines and Potential Express Bus Patronage to Destination Area G
- 15 Recommended First Stage of Construction of the Inner Loop Freeways and an Interim Belt of Existing Streets

APPENDIX A

Estimates of Cost

	<i>Page</i>
Summary	67
West Route	68
North Route	70
Northwest Section	70
Northeast Section	72
East Route	74
Center Route	76
South Route	78
Southwest Section	78
Southeast Section	80
Alternates	82
Center Route	82
Southwest Section	84

APPENDIX B

Preliminary Plans

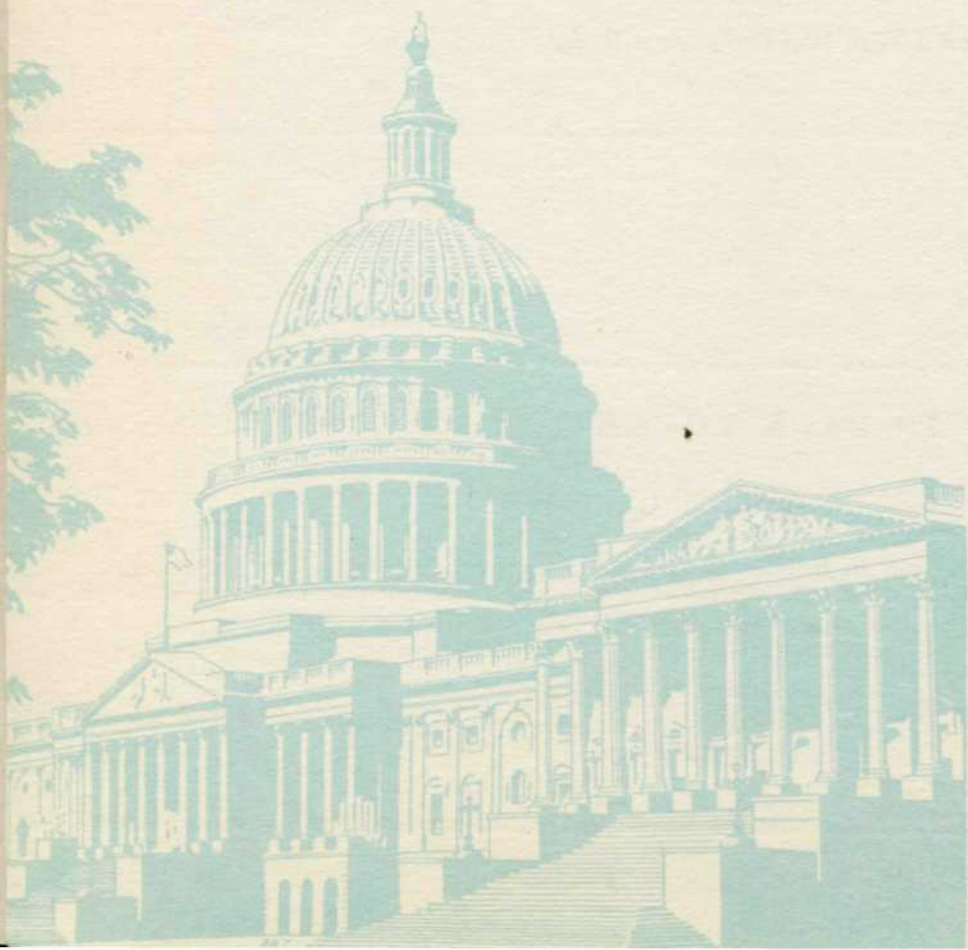
Sheet

- Key to Plan and Profile Sheets 1 to 9
- 1 West Route—Lincoln Memorial to 18th and T Streets N.W.
 - 2 West Route—K Street Connection to Whitehurst Freeway
 - 3 North Route—18th Street and T Street N.W. to 2nd Street N.E.
 - 4 North Route—2nd Street N.E. to Benning Road
 - 5 East Route—Anacostia River to C Street N.E.
 - 6 East Route—C Street N.E. to Mount Olivet Road
 - 7 Center Route—D Street S.W. to O Street N.W.
 - 7A Center Route Alternate—Southwest Freeway to Massachusetts Avenue
 - 8 South Route—Lincoln Memorial to 4th Street S.W.
 - 8A South Route Alternate (Independence Avenue)—Lincoln Memorial to 4th Street S.W.
 - 9 South Route—4th Street S.W. to John Philip Sousa Bridge
 - 10 Typical Cross Sections
 - 11 Typical Cross Sections
 - 12 Typical Cross Sections
 - 13 Typical Cross Sections

MAPS IN BACK POCKET

Recommended Stages of Construction of the Inner Loop Freeway

Recommended One-Way Streets in Relation to Proposed Inner Loop Freeway System



SUMMARY OF REPORT

The rapid increase in volumes of vehicular traffic moving in and through the central business and government district of Washington during the past decade has created a problem no longer capable of solution by improvement of existing streets and roadways or the construction of new at-grade facilities in the area. Transit patronage has decreased almost 50 percent since 1944 and automobile usage has increased proportionately, taxing the present street systems far beyond their practical capacities. Remedial measures—street widening, one-way streets and reversible flow streets—have been instituted but their benefits have been of momentary significance due to the increased use of the private automobile.

It has long been recognized that if the District's business and government activities are to continue to flourish, some means will have to be provided to safely and expeditiously move vehicular traffic in and through the central area. An Inner Loop highway system circumscribing the central district and connecting with principal traffic arteries serving the area was first proposed in 1944. The basic concept of this Inner Loop is as sound today as when originally proposed but our studies of present traffic volumes and those anticipated in the foreseeable future indicate that such a Loop system must, if it is to satisfactorily handle these volumes, be constructed as a fully grade separated facility with adequate connections to and from existing streets. We have estimated that there would be approximately 580,000 daily trips on the Inner Loop System in 1980 representing about 1,318,000 vehicle-miles per day. Commercial vehicles would account for approximately one-eighth of this traffic. The average length of trip would range from 2.24 miles for passenger cars to 2.49 miles for commercial vehicles.

The Inner Loop Freeway System recommended herein is approximately 17.6 miles in length—14.6 miles of main freeway roadways, three miles of connecting roadways—and forms a figure 8 around the central district of the city. There are approximately four miles of eight-lane freeway, nine miles of six-lane freeway and 1.5 miles of four-lane freeway. There are six miles of 2-lane, one-way connecting roadways in interchanges and in connections to existing traffic arteries. All traffic lanes are a minimum of 12 feet in width.

Center malls separating opposing traffic are 4 feet wide in fill or elevated sections and on bridges and 11 feet wide in depressed sections.

The alignment and grades of the Inner Loop Freeway as recommended herein would provide for the continuous, safe movement of traffic at speeds of 50 miles per hour even though the legal allowable limit would be somewhat less. It is also anticipated that during peak periods the average speed would probably be under 40 miles per hour because of the heavy volumes of traffic to be served.

In our selection of freeway route location, we were governed by several factors. The freeway should be so located that it would

1. be properly integrated with other existing and proposed street and highway facilities,
2. provide for the preservation of historical sites, parks, playgrounds, and institutional buildings insofar as possible, and
3. provide the maximum in traffic service, attracting sufficient traffic to justify its construction in accordance with highest possible standards of design.

It is our opinion that the freeway routes recommended herein meet the above-listed requirements. Almost the entire route of the Inner Loop Freeway System is within areas which have been recommended for redevelopment. We realize that the existing pattern of surface streets within such areas may be changed in the planning for renewal of the area. We recommend that close cooperation between the agencies responsible for the urban renewal planning and the Department of Highways be maintained to assure that rights-of-way for the freeway will be provided and that any change in the pattern of surface streets will fit the traffic pattern for the area when the freeway is completed. The Inner Loop Freeway System and its relationship to existing and proposed major streets, parkways and freeways is shown on Exhibit 1. The several segments—east, west, center, north and south—which make up the entire system are shown in more detail on Sheets 1 to 9 inclusive. Alternate alignments considered for the center and south portions are shown on Sheets 7A and 8A. Although these alternatives would satisfactorily handle the traffic anticipated, their construction would require an expenditure of approximately 14.5 million dollars more than the recommended Center and South Routes.

It is recognized that construction of the Inner Loop System cannot progress without some interference to mass transportation facilities however, changes in routes and operations, therefore, should be coordinated with the construction stages.

More detailed plans for the Inner Loop System than those contained in this report have been filed with the District of Columbia Department of Highways. Official adoption of these plans, after all required preceding steps have been taken, will protect the needed rights-of-way. Without such designation of routes for future highways, new developments could take place which would make the cost of the freeways prohibitive. Adoption of the preliminary plans and profiles will also permit all official agencies as well as private builders to plan and construct their projects in complete coordination with the highway program.

Plans will not alleviate traffic congestion, however. It is urged, therefore, that prompt action be taken following adoption to transform these plans into steel and concrete. Only in this way can the motorist and trucker, the transit patron and pedestrian, and the businessman and property owner be given the benefits envisioned from the building of the Inner Loop System.



INTRODUCTION

Washington has the problem in its central business and government district of accommodating a rapidly increasing number of moving vehicles on a street system designed long before the advent of the motorcar. While Washington's streets are wider than those of most cities, their capacity is seriously curtailed by the great number of complex intersections created by diagonal streets superimposed on a basically rectangular pattern.

It is known from various traffic studies that many of the vehicles in the most congested area have no purpose there except to pass through or to reach points on the opposite side of the area from which they entered. Removal of such vehicles by provision of a highway of superior design standards circling the downtown area would bring substantial time savings to vehicles in both of these classifications. This would, at the same time, provide additional capacity for anticipated increases in the number of vehicles terminating in the area. This would be particularly advantageous to transit buses which must enter the area of greatest congestion because it is the region in which most of their passengers have destinations.

The Inner Loop is intended to relieve the congestion on the city street system by providing additional lanes of roadway for faster movement of vehicles within the District. It is intended to further relieve the congestion on the city street system by serving as a by-pass route for vehicles which at present are moving through the District on surface streets.

Connections have been provided at the Highway Bridges, the proposed Constitution Avenue Bridge, Whitehurst Freeway, and New York Avenue which will encourage through traffic on the Interstate routes to use the Inner Loop as a by-pass artery through the central business and government area. Connections to the Anacostia River Bridges and the proposed Anacostia Freeway, to South Capitol Street, Massachusetts Avenue, Rhode Island Avenue, 16th Street N.W., North Capitol Street, West Virginia Avenue and many other major surface arteries is intended to relieve congestion on these main thoroughfares.

The problem was approached on the basis of designing a highway which would provide the greatest relief of traffic congestion for all groups at the

lowest investment, considering at all times the effect of the proposed highway facilities on other aspects of the City's functions.

In considering the many facets of urban life concerned with a major undertaking of this scope, we had the cooperation of officials and staff members of innumerable organizations. The names of organizations whose representatives made substantial contributions are acknowledged hereinbefore. It was found impractical to list the individuals who took part, however, because of their great numbers. This fine cooperation permitted the development of a plan integrated with many important projects now being considered for the continued enhancement of Washington as the Nation's capital city.

It is important in this era of rapid urban growth and redevelopment that plans for freeways be adopted officially even though construction of some sections may be several years away. Thus, rights-of-way for these indispensable facilities can be preserved against use in other projects which would make the later development of the highway system financially impractical. Even during the short time required to prepare this report, at least one new building was placed under construction which required changes to be made in the recommended alignment.



BASIS OF ROUTE SELECTION

General

The problem of selecting the route for a limited access highway is complicated by the inter-relationship of many factors. The physical problems of line and grade imposed by higher or lower design standards must be weighed against estimated construction costs under each. The highway must also be integrated with other existing and proposed facilities so that it will complement them and serve them rather than interfere with their best development. In selecting the route for the freeway, the preservation insofar as possible of historic sites, parks and playgrounds, and institutional buildings must be considered as well as the intrinsic value of the property.

Finally, the highway must be so located and designed that it will provide the maximum in traffic service, considering all elements of cost. For this reason, the studies considered the economic justification for the Inner Loop System.

Selection of a suitable route for the Inner Loop System was based on the assumption that a properly located highway would attract sufficient traffic to justify its construction to the highest possible standards of design. These design criteria will provide a fully grade separated highway with no cross traffic, no left turns from the express roadways, and limitation of access to properly designed interchanges. These interchanges will be so spaced that vehicles will have appropriate distances in which to accelerate or decelerate when entering or leaving the streams of through-traffic. The design criteria are described more fully on page 29. In general, the standards are such as to permit safe and continuous travel at speeds of approximately 50 miles per hour.

Freeways provide more capacity per lane than any other type of highway. The Committee on Highway Capacity of the Department of Traffic and Operations of the Highway Research Board published a report in 1950 which states that a multi-lane highway has a basic capacity of 2,000 passenger vehicles per lane per hour and a practical capacity of 1,500 passenger vehicles per lane per hour. In this study the 1980 volumes desiring to use each of the ramps and roadways have been estimated. It is recognized that in

places the facility as designed will have to operate at a capacity per lane in excess of the above indicated practical capacity if it is to handle all of the traffic assigned. In such instances, a slight reduction in average speed may take place but the overall attractiveness of the freeway and the intended function of the Inner Loop will be maintained. Thus the proposed Inner Loop Freeway should carry the estimated traffic demands for 1980 with the possible loss of some freedom of movement as volumes approach basic capacity.

The freeways will be so superior to the parallel surface streets in safety, capacity, and time-saving features that they will attract vehicles from a wide area even at the expense of somewhat greater distances to be traveled by some motorists.

Connections to Radial Routes

It became apparent that a limited access highway of the design standards proposed for the Inner Loop System should be connected wherever possible with highways of comparable quality radiating to various parts of the Metropolitan Area. It would be undesirable and particularly hazardous to have short sections of surface streets, with all their inherent disadvantages, between these radial freeways and the Inner Loop, whereas integration of all limited access highways in the area into a continuous network would be obviously desirable and worthy of achievement. Routes were selected, therefore, to provide limited access connections between the Inner Loop and the proposed Constitution Avenue Bridge, Whitehurst Freeway, and a new freeway to connect to the Washington-Baltimore Parkway along New York Avenue. Connections are also provided to West Virginia Avenue, Benning Road, John Philip Sousa Bridge, Anacostia River Bridge (11th Street S.E.) including a new bridge parallel to the existing structure, and Highway Bridge as proposed to be improved by construction of a second one-way bridge. Exhibit 1 shows the existing and proposed major streets, parkways and freeways in relation to the Inner Loop.

Connections will be made by means of properly designed ramps to other principal streets. Major arterials in this group include Massachusetts Avenue N.W., 16th Street N.W., Rhode Island Avenue N.W., North Capitol Street,

South Capitol Street, and others. While these are not of limited access characteristics, they carry substantial volumes of traffic.

A study was made of the possibility of connecting the proposed Inner Loop System with Rock Creek and Potomac Parkway as well as with Connecticut Avenue N.W. in the vicinity of Calvert Street. The study included investigations of the physical feasibility, approximate cost, and desirability from the traffic standpoint.

Traffic assignments were based on the assumption that the connection would provide only for movement on the Inner Loop to and from the east, since existing roadways in and paralleling Rock Creek Parkway, as proposed to be improved, will in a sense supplement the west leg of the Inner Loop.

Three alternate routes were found for a physically feasible connection between the proposed freeway, the Parkway, and Connecticut Avenue. Each of these routes involved substantial length of tunnel, however, so that the estimated cost of providing a four-lane connection would be approximately \$29,000,000. A two-lane connection was considered impractical because of the restriction on passing that would be imposed for a distance of approximately 2,700 feet in the tunnel section.

The volumes of traffic which were estimated as potential to such a connection were found to be substantial. This traffic, if added to that normally tributary to the North Route of the Inner Loop System, would load that route far beyond any capacity that could reasonably be provided. This finding illustrates the fact that the Inner Loop System cannot stand alone as the solution to all of the District's traffic problems. In this particular instance, consideration should be given to future completion of a second highway loop at an intermediate distance from the central business district. This loop which could be constructed to lower standards will serve to funnel off cross-town traffic and carry it expeditiously between outlying areas.

Appropriate ramps are provided on the proposed Inner Loop System for Connecticut Avenue traffic which could not conveniently use the intermediate loop highway. Such traffic would route itself southbound via Calvert Street Bridge and 18th Street N.W., and northbound via T Street N.W. and Connecticut Avenue.

Benning Road, Sousa, and Eleventh Street Bridges are well placed to serve traffic attempting to by-pass Central Washington as well as that moving between areas east of the Anacostia and northwest and southwest sections of Washington. These bridges, therefore, have been given direct connections to the Inner Loop System.

The proposed Anacostia Freeway will connect to Sousa and Eleventh Street Bridges. The direct connections between the Inner Loop and these two bridges will provide for movements between the Inner Loop System and the Anacostia Freeway.

Ramp connections have been provided between the East Route of the Inner Loop Freeway System and existing surface streets which will serve as temporary approaches to East Capitol Street Bridge. More direct connections may be provided when plans are developed for the improvement of bridge approach streets either prior to or coincident with development of the East Capitol Mall.



DESCRIPTION OF RECOMMENDED ROUTE

West Route

The West Route of the Inner Loop System will begin at Lincoln Memorial Circle and extend northerly at surface grade through an interchange with the proposed new Potomac River Bridge in the vicinity of Constitution Avenue. See Sheet 1. The interchange ramps as shown in broken lines on Sheet 1 are not included in our cost estimates. The freeway will displace a number of unsightly and non-conforming structures between the Navy buildings just south of E Street N.W. and park lands bordering the Potomac River.

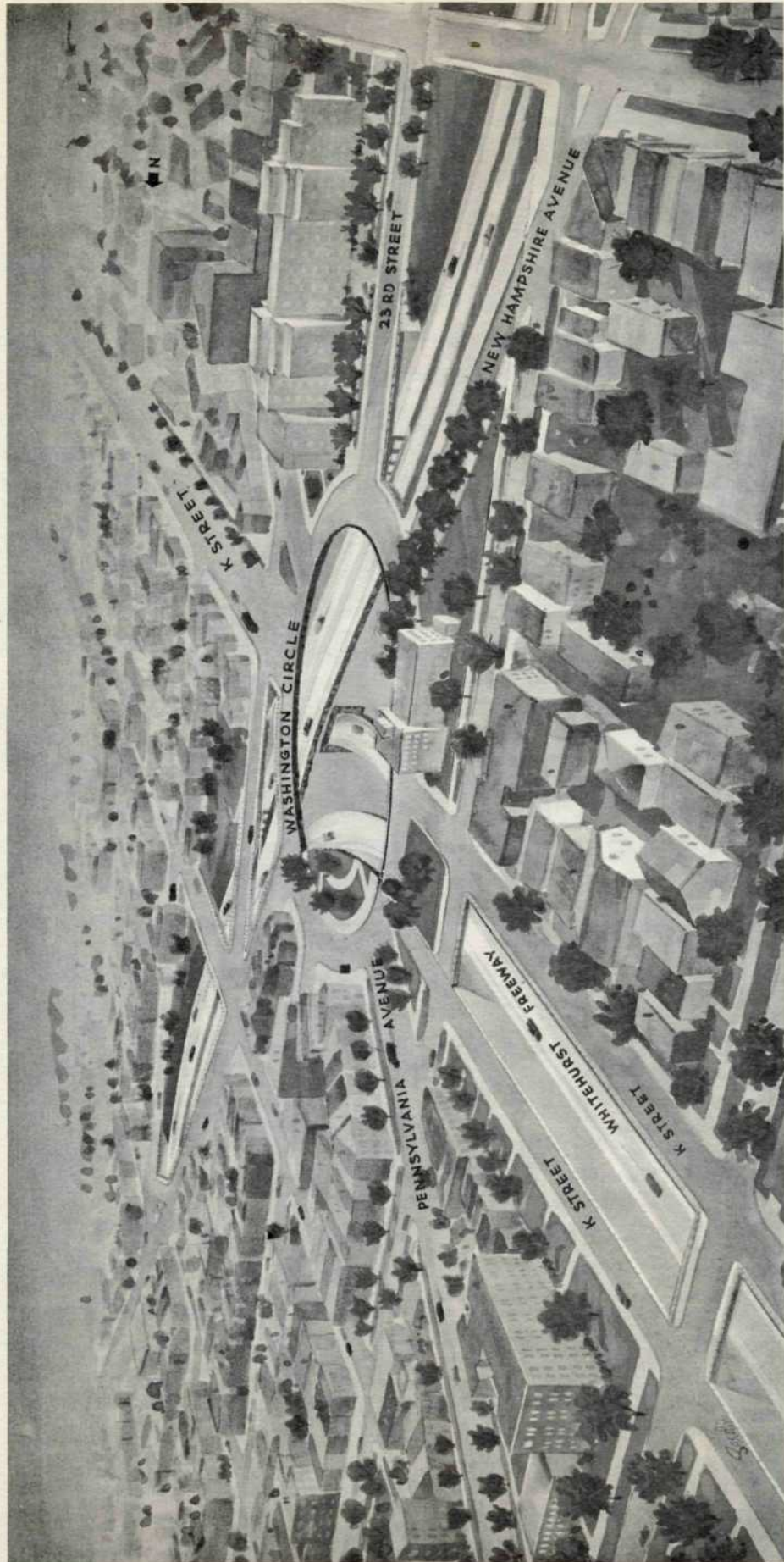
North of E Street N.W. the freeway will swing to the east of the proposed Potomac Plaza development in the several blocks formerly occupied by the Washington Gas Light Company's plant. The freeway will continue north on the east side of 24th Street and pass under Washington Circle in a covered 6-lane section with controlled access connections with Whitehurst Freeway serving traffic to and from the north. See Exhibit 2 and Sheet 2.

Continuing north along the east side of 21st Street N.W., the freeway will lie below the grade of surface streets with appropriate ramp connections in sufficient number to serve anticipated traffic. All important surface streets will be carried over the freeway on architecturally attractive structures.

North of Massachusetts Avenue the freeway will swing to the east, still one level below street grade. It will pass under the streetcar ramp in Connecticut Avenue just north of R Street N.W., connecting with the Northwest Section of the North Route at 18th Street N.W. and T Street.

North Route—Northwest Section

The freeway forming the North Route of the Inner Loop System will lie just north of T Street in the section between 18th Street N.W. and 10th Street N.W. See Sheet 3. In this location it will be a buffer between the commercial properties along U Street N.W. and the church, hotel, and apartment district south of T Street N.W.



CUT-AWAY SHOWING WHITEHURST FREEWAY CONNECTION TO INNER LOOP — LOOKING EAST



VIEW OF INTERCHANGE BETWEEN EAST AND NORTHEAST SECTIONS — LOOKING WEST

East of 16th Street N.W. the freeway will be built to an 8-lane depressed section providing 4 lanes of traffic in each direction. Appropriate ramps will serve traffic originating north of the freeway.

Continuing on a profile below surface grade, the freeway will swing southeasterly at 10th Street N.W. to Interchange A with the Center Route of the Inner Loop System south of Q Street N.W. just east of New Jersey Avenue. In the same general area, ramps will provide connections with such important surface thoroughfares as North Capitol Street, Rhode Island Avenue, New Jersey Avenue, and 1st Street N.W.

North Route—Northeast Section

The freeway will continue east of North Capitol Street as an 8-lane facility on elevated structure. See Sheets 3 and 4. The alignment skirts the existing Peoples Drug Company warehouse and their proposed new warehouse, and passes over the Washington Terminal tracks just south of and parallel to Florida Avenue. Connections with New York Avenue designed to Interstate Highway standards will be provided as well as an off-ramp into Florida Avenue.

A number of plans for the freeway structure at the railroad were tested before finally selecting the recommended alignment. Profiles were studied for both over-passing and under-passing the railroad and alignments both north and south of Florida Avenue were examined before selecting the route. The problem in crossing Florida Avenue and the railroad was complicated by an existing 15x17.5-foot sewer which lies just below the street surface in Florida Avenue. See Sheet 4.

East of the railroad, freeway routes both north and south of Florida Avenue were investigated, those on the north involving the use of a portion of the lands of Gallaudet College. A location was finally selected south of Florida Avenue which will give excellent alignment and profile and permit construction at a reasonable cost. The freeway in the section east of 5th Street N.E. will consist of an 8-lane facility on fill one level above existing street grade until it connects with the East Route at 11th Street N.E. in Interchange B. Side slopes will be adequately landscaped by using appropriate ground cover planting and low shrubs.

Existing Florida Avenue east of 4th Street N.E. will become a one-way street westbound, and a new eastbound roadway will be provided south of the freeway.

An interchange will be provided at 11th Street N.E. between the Northeast Section and the East Route of the Inner Loop System. See Exhibit 3. No connection between the Northeast Section and West Virginia Avenue will be necessary since the volume of traffic potential to such a connection is small and can be readily accommodated on the street system.

The freeway will continue east of the interchange as a 6-lane facility one level above existing street grade and will over-pass existing streets including Maryland Avenue and 15th Street N.E. At 16th Street N.E. the profile will drop from one level above existing grade to a depressed section, and the freeway will continue easterly one level below grade to connect with Benning Road in Anacostia Park just east of Oklahoma Avenue.

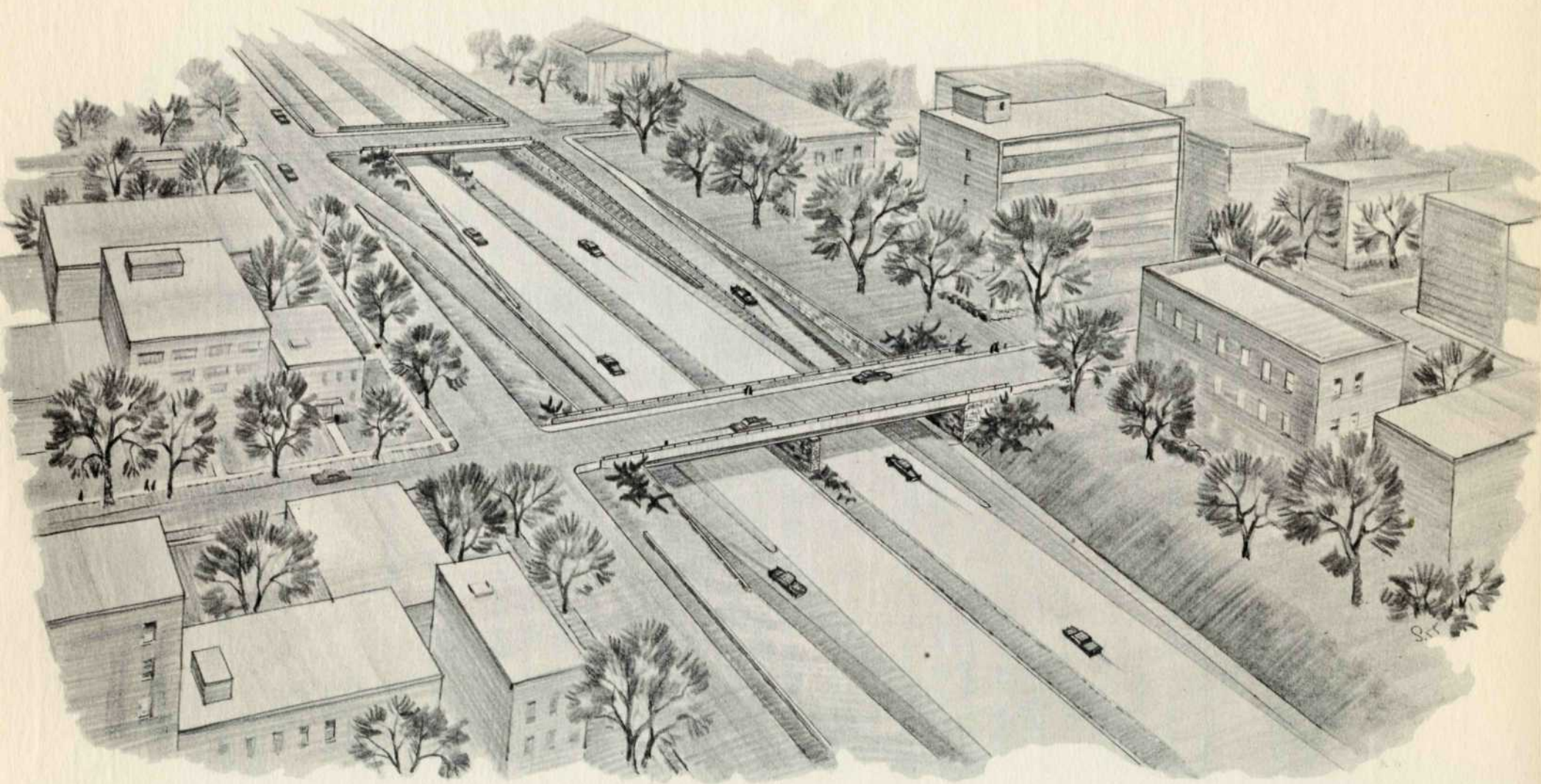
East Route

The East Route of the Inner Loop System will start at the Anacostia River. See Sheet 5. Either a new 8-lane bridge or two 4-lane bridges will need to be built to provide the required capacity. Continuing north between 11th and 12th Streets S.E., the East Route will connect with the Southeast Section of the South Route at Interchange C in the vicinity of K Street S.E. and 11th Street.

This interchange will accommodate all movements except those between the east and the south, these having been found too small in number to justify provision for them. The area inside the interchange can be developed to provide an off-street fringe parking lot which will accommodate 400 vehicles with direct pedestrian access to a bus terminal which is suggested as a replacement of the existing terminal at Barney Circle. See Exhibit 4.

A playground can be provided in the area inside of the southwest quadrant to replace some of the park area occupied by the interchange. See Exhibit 5.

At the interchange the freeway will dip from one level above surface grade to one level below and continue north between 11th and 12th Streets. Ramp connections will be provided between the East Route and existing



TYPICAL VIEW SHOWING FREEWAY IN CUT WITH RAMP CONNECTIONS

streets to serve East Capitol Street Bridge traffic until improvements to the bridge approach streets have been made. Future plans for the East Capitol Mall and improvements to bridge approach streets should provide for connections to the East Route to serve traffic generated by such improvements.

The profile will change to one level above grade south of G Street N.E. and the freeway will pass over the Northeast Section of the North Route with connections to provide for movements to and from the west. See Sheet 6. Ramps will connect with West Virginia Avenue which will be improved as far north as Corcoran Street to accommodate the increased traffic. A grade separation will be provided for northbound traffic at Corcoran and West Virginia Avenue and Corcoran Street will be improved to a connection with Mount Olivet Road.

Center Route

The Center Route will begin at an interchange with the Southwest Section in the vicinity of 1st and F Streets S.W. and extend north as a 6-lane depressed roadway under both branches of the Pennsylvania Railroad. See Sheet 7. The freeway will pass through The Mall at depressed grade and continue north on the west side of 2nd Street N.W. It will swing to the west near Massachusetts Avenue to a north and south alignment between 3rd and 4th Streets N.W.

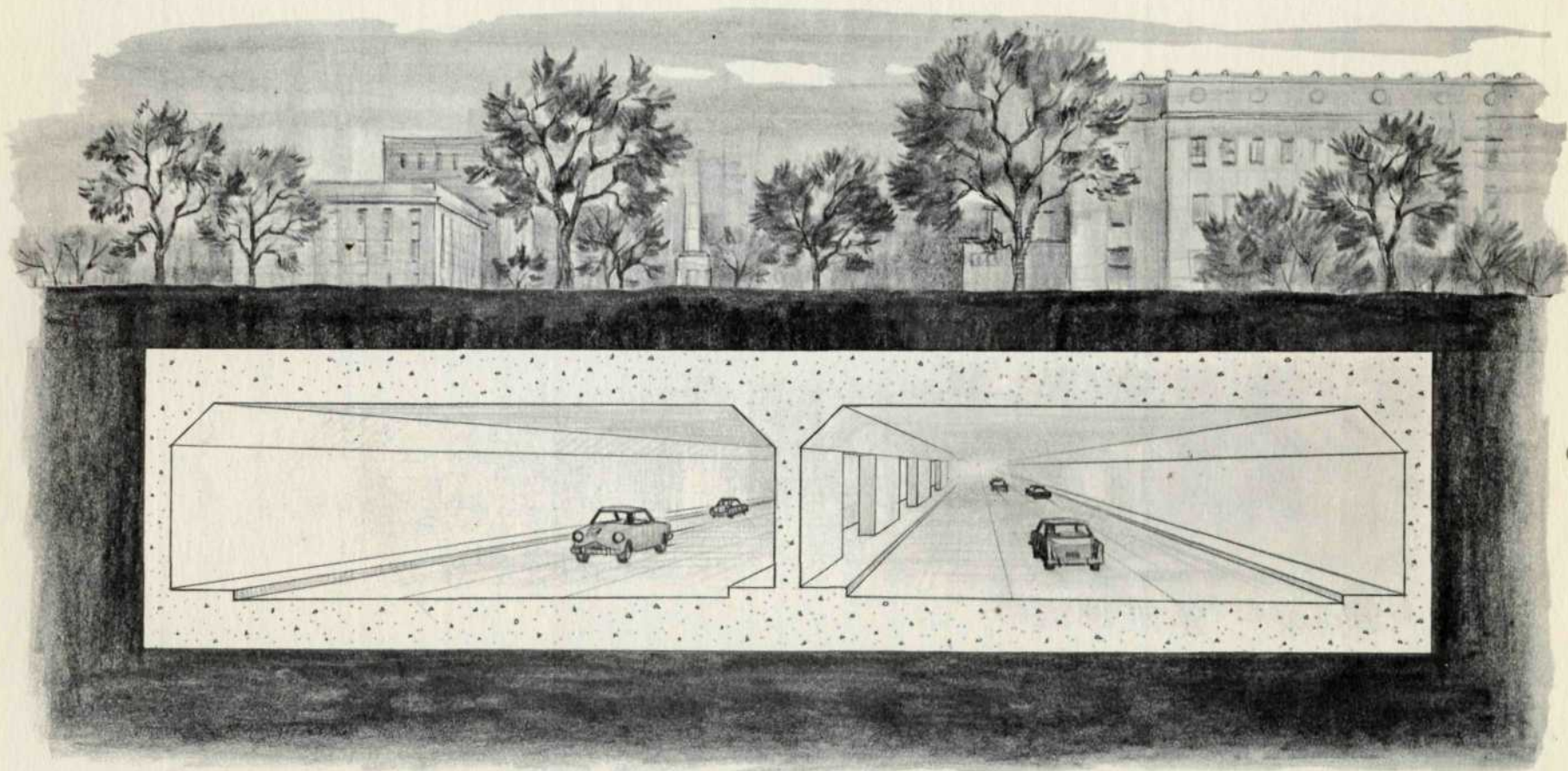
The Center Route will connect with the Northwest Section at Interchange A between 1st Street N.W. and New Jersey Avenue north of O Street.

Structures will be provided at cross streets to carry surface traffic over the freeway and ramps will provide for movement between surface streets at such major arteries as Independence Avenue, Constitution Avenue, Massachusetts Avenue, and New York Avenue. See Exhibit 6.

An alternate alignment to provide for a covered section through The Mall is shown on Sheet 7A. A typical covered section is shown in Exhibit 7. Estimates of cost for the alternate alignment are given in Appendix A.

South Route—Southwest Section

The Southwest Section will begin at the north portal of the 6-lane covered section under Lincoln Memorial Circle and extend southeasterly through



VIEW SHOWING TYPICAL CUT AND COVER SECTION



VIEW OF PROPOSED WASHINGTON CHANNEL BRIDGE AND FREEWAY CONNECTIONS TO HIGHWAY BRIDGES—LOOKING SOUTH

Potomac Park as a 4-lane facility. See Sheet 8. The profile will be approximately at the existing grade of Ohio Drive to connect with the existing Highway Bridge and the proposed new Highway Bridge in the vicinity of Jefferson Memorial.

After passing the Highway Bridges, the freeway will continue east through East Potomac Park as an 8-lane facility and over a new 8-lane 2-way bridge over Washington Channel and Maine Avenue. See Exhibit 8. Between Maine Avenue and South Capitol Street, the Southwest Section of the Inner Loop System will consist of the long-discussed Southwest Freeway forming the north boundary of Project Area B of the Redevelopment Land Agency. The Southwest Freeway will be integrated with the 10th Street Mall as proposed to be developed in Webb & Knapp's plan for Project Area C. Suitable ramps to handle the traffic destined for this section will be provided.

The Southwest Section will connect to the Center Route* at Interchange D in the vicinity of 1st Street S.W. which will provide for movements between the Center Route and sections of the Inner Loop System both east and west of the interchange. In addition, connections will be provided between South Capitol Street and the Southwest Freeway and between South Capitol Street and the Center Route. The northbound movement from South Capitol Street to the Center Route, however, will be made via Canal Street to a ramp at 1st and D Streets S.W.

Alternate Route via Independence Avenue

An alternate route has been developed for that part of the Southwest Section between Lincoln Memorial and the Southwest Freeway at Maine Avenue. See Sheet 8A.

The Independence Avenue route would extend easterly from the covered section under Lincoln Memorial Circle on approximately the existing alignment of Independence Avenue to an interchange at the south end of 17th Street where grade separation structures would provide connections between 17th Street and the freeway. A new bridge over a portion of the Tidal Basin would be required.

From this interchange, the freeway would extend southeasterly along the north side of the Tidal Basin and pass under 14th Street and the Penn-

sylvania Railroad tracks on an alignment paralleling Maine Avenue. Connections would be made to the Southwest Freeway at Maine Avenue and 12th Street S.W.

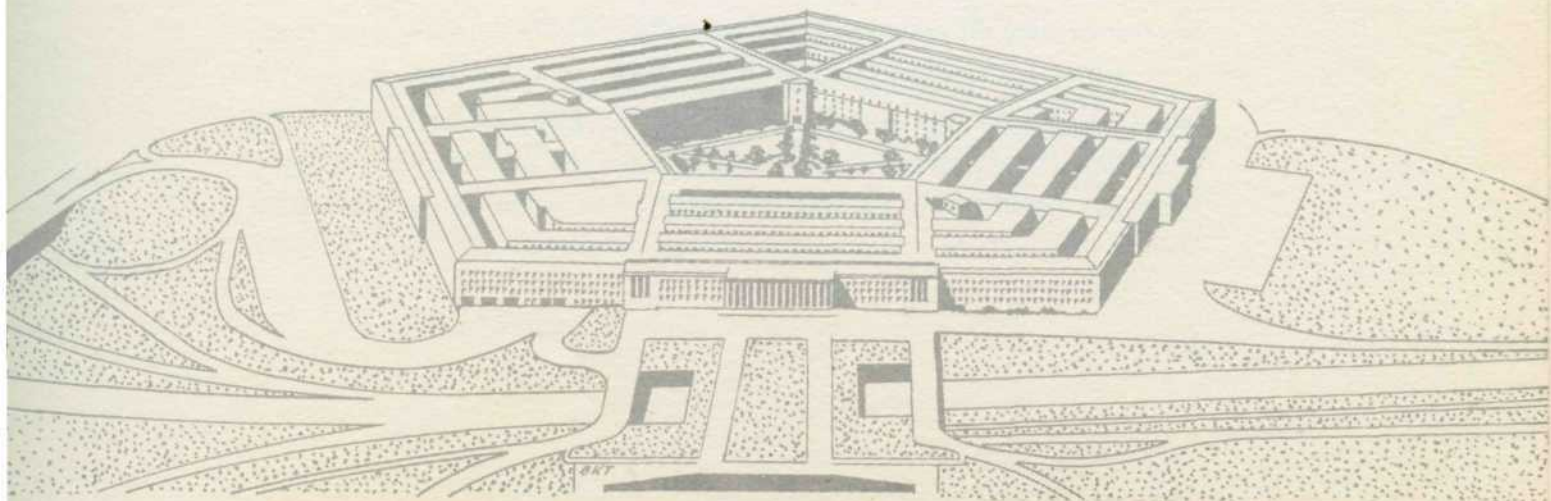
Fifteenth Street traffic would overpass the freeway to provide for movement to Highway Bridge and the Jefferson Memorial area as well as to and from Hains Point. A new 6-lane 2-way bridge over Washington Channel and a 6-lane roadway across East Potomac Park would connect the Highway Bridges with the Southwest Freeway.

South Route—Southeast Section

The Southeast Section of the Inner Loop System will extend east from South Capitol Street on a 6-lane elevated structure over the railroad yards and New Jersey Avenue, and cross to the north side of Virginia Avenue at 2nd Street S.E. See Sheet 9. The freeway will extend southeasterly parallel to Virginia Avenue to K Street where it will swing east on a fill section one level above street surface and connect with the East Route at Interchange C, previously described.

The freeway will continue easterly as a 4-lane facility on fill and terminate at grade at the approaches to John Philip Sousa Bridge.

Service drives will be provided flanking the freeway between 2nd and 7th Streets S.E. to provide access to and from the freeway. The existing roadway on Virginia Avenue will be used for eastbound traffic and a new westbound roadway will be constructed on the north side of the freeway. A pair of ramps will be provided in the vicinity of 13th and 14th Streets S.E. for traffic terminating in that area.





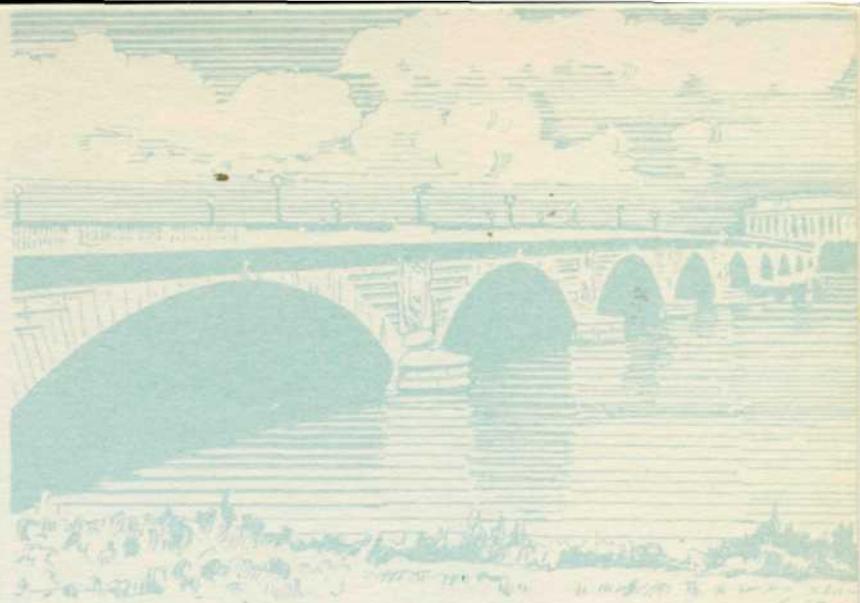
DESIGN STANDARDS

The design of the Inner Loop System was based on the standards for the National System of Interstate Highways. In a few instances it has been necessary to modify these standards because of physical obstacles, but in all essential respects, these high standards have been met.

It is anticipated that an average speed of 40 miles per hour will prevail during most hours of the day. A design speed of 50 miles per hour has been adopted for the main freeway, however, so that higher-than-average speeds will not be unsafe. All sections of the system will be fully grade-separated, with no left turns from main roadways, no traffic control signals, and no pedestrians on the traveled roadways.

Typical cross sections for the main roads show either two, three or four lanes in each direction divided by center malls varying in width from 4 feet to 11 feet. All of the lanes will be 12 feet in width with one foot added where barrier curbs are used. The outer lane will be flanked with a hard surfaced 7-foot shoulder in retaining wall sections and a 10-foot stabilized shoulder in open cut or fill sections. See Sheets 10, 11, 12, and 13.

For the most part the freeways will lie below the grade of existing streets. A sufficient number of these streets will be carried over the freeway to accommodate all anticipated surface traffic. Where possible, these roadways will be bordered by landscaped side slopes on a maximum grade of 2 horizontal to 1 vertical. See Exhibit 9. Where required by high land cost or restrictive physical conditions, the roadways will lie between walls set back from the traveled lanes a sufficient distance to impose no psychological hazard on motorists.



Ramps have been designed for safe and comfortable operation at 30 miles per hour after leaving the freeway. These ramps have been connected to the main freeway with tapered acceleration lanes 500 feet in length and deceleration lanes 250 feet long.

The following tabulation shows the applicable geometric design criteria:

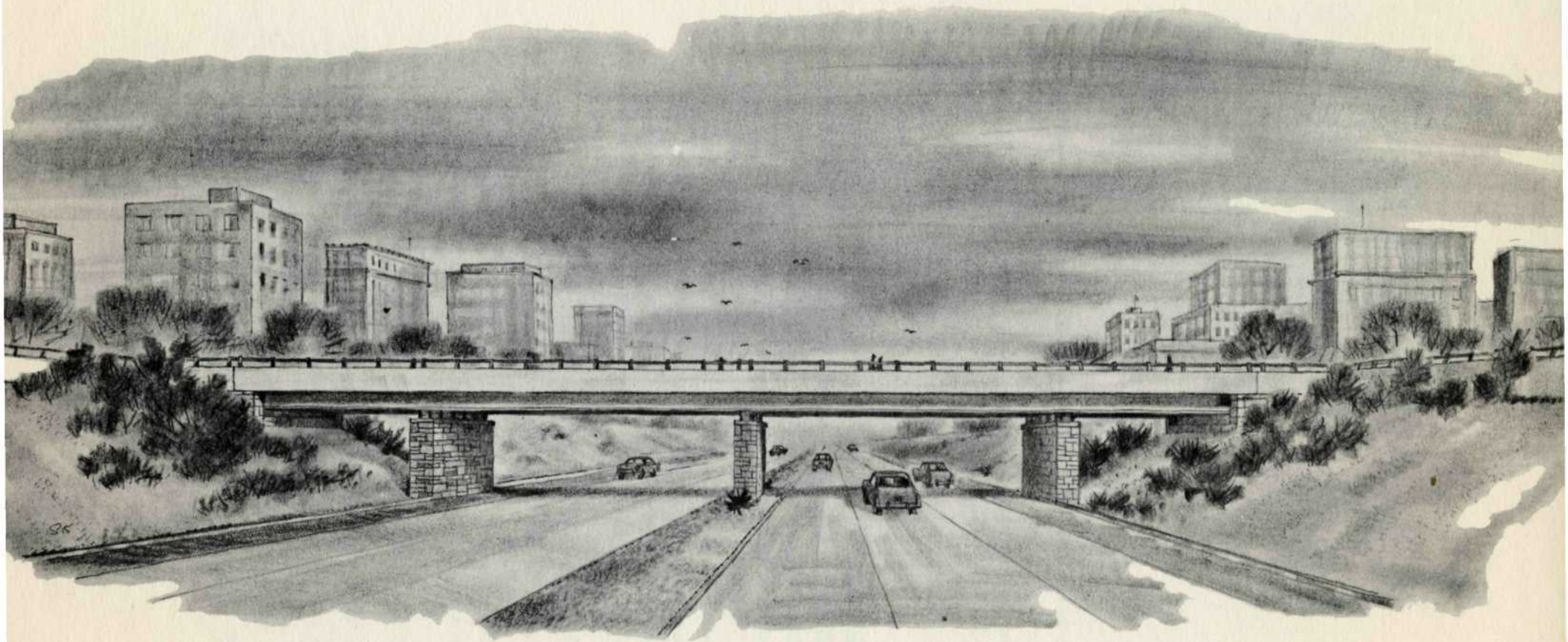
Horizontal Control

Minimum radii	
Main roadway	955 feet (6°)
Connecting roadways at	
directional interchanges	500 feet
Loop ramps	230 feet
Minimum distance between reverse curves...	300 feet
Stopping sight distance.....	400 feet

Vertical Control

Maximum grade	
Main roadway	3.0 percent
Ramps and connecting roadways.....	5.0 percent
Minimum grade	0.3 percent
Vertical clearance over railroads.....	26.0 feet
Vertical clearance under structures.....	14.5 feet
Stopping sight distance.....	400 feet

The above criteria have been adhered to throughout the project with a few minor exceptions where a substantial economy was realized or where a physical obstruction indicated that the practical solution would be a slight deviation from standards. These locations are few and have in no way impaired the safety or overall efficiency of the facility.



TYPICAL VIEW OF FREEWAY IN OPEN CUT

ESTIMATE OF COST

The total estimated cost of the Inner Loop System is \$272,667,000. The length in miles and total costs by routes or sections of routes are shown herewith, while a breakdown of these costs by items is given in Appendix A.

Major subdivisions of project costs are construction, contingencies, engineering, and rights-of-way.

SUMMARY OF ESTIMATE OF COST

Route or Section	Miles in Length	Construction	Contingencies and Engineering	Rights-of-Way	Total
West	2.47	\$26,163,000	\$6,542,000	\$19,946,000	\$52,651,000
Northwest	2.13	23,050,000	5,763,000	20,366,000	49,179,000
Northeast	2.86	21,850,000	5,463,000	17,995,000	45,308,000
East	2.90	14,469,000	3,618,000	8,664,000	26,751,000
Center	1.70	18,751,000	4,689,000	12,382,000	35,822,000
Southwest	3.36	26,443,000	6,612,000	1,290,000	34,345,000
Southeast	2.19	15,875,000	3,970,000	8,766,000	28,611,000
Total . . .	17.61	\$146,601,000	\$36,657,000	\$89,409,000	\$272,667,000
ALTERNATES					
Center	1.72	\$22,607,000	\$5,653,000	\$14,237,000	\$42,497,000
Southwest	3.16	32,674,000	8,170,000	1,353,000	42,197,000

Construction Costs

Construction costs are based on the design standards described heretofore which have been incorporated to provide facilities of adequate capacity for the safe and efficient handling of the predicted volumes of traffic. These costs are based on an analysis of conditions, study of availability of local materials, current bid prices, and contractors and suppliers costs on work of similar character. On certain items, prices have been fixed after consultation with local contractors experienced on projects of the type involved.

Experience on similar highway projects has proven that separate contracts for the demolition or relocation of existing buildings should be let prior to awarding actual construction contracts. Later, contractors are not impeded or delayed in the prosecution of their work since they have a clear

site available throughout the entire length of each project. In some instances sites are available where existing buildings can be moved a few hundred feet and placed on new foundations. In other locations, buildings are of such low value that it will be more economical to demolish them.

The item for clearing rights-of-way is based upon prevailing prices.

After demolition, a time lapse prior to the start of actual construction may make it necessary to fill existing cellars under buildings which have been razed or moved. The cost of this work has been included herein.

A number of utilities will be encountered during construction of the Inner Loop System. These include sanitary and storm sewers, water supply systems, mass transportation facilities, gas mains, underground electric systems, telephone and telegraph lines, and railroads.

In most instances, the freeways have been so located as to minimize the amount of interference with utilities but, in certain locations, extensive changes will need to be made. The estimates presented herein include ample allowances for such changes to publicly-owned facilities only. These estimates are based upon a study of existing plans and field reconnaissance in each instance.

In order to maintain traffic on existing highways, transit routes, and railroad lines, special consideration must be given to coordinating the construction program. It has been found in other instances that detailed plans for this item must be worked out well in advance because of the length of time the particular facility may be affected.

The estimate for this item, therefore, includes such facilities as temporary bridges and signs, special lights, temporary roadways, leasing of rights-of-way, et cetera, and is based upon the cost of work of a similar character performed in other localities. All of the foregoing is included in the Summary of Estimates of Cost as Construction.

Contingencies

A contingency item amounting to 15 percent of the estimated construction cost has been included to cover miscellaneous small items not included otherwise and to take care of any unforeseen construction costs inherent in a project of this kind within an urban area.

Engineering Costs

Engineering costs include items for preliminary and detailed surveys; the preparation of complete construction plans, specifications, and contract documents; general supervision of construction; detailed inspection of materials and workmanship; bid analysis and contract awards; preparation of construction estimates; and the coordination of all construction and material contracts. This item is figured at 10 percent of the construction cost.

Right-of-Way Costs

Right-of-way costs form a large part of the total project cost, and these will vary according to the character of the properties traversed. In estimating these costs, a field survey of each route was made and assessment records were secured.

The estimates of right-of-way costs are based upon currently assessed valuations for both land and buildings, to which appropriate factors have been applied to bring the estimates to actual present day values. Tabulations showing property required for rights-of-way in each square are on file with the District of Columbia Department of Highways.

Costs incidental to the acquisition of rights-of-way include engineering, legal and administrative costs. These items cover the preparation of surveys, property plats, appraisals, searching of records, court costs, moving of tenants and other expenses. A total estimated to amount to 10 percent of the actual value has been included.





TRAFFIC VOLUME STUDIES

Importance of Estimates

The volume of traffic on the proposed Inner Loop System will increase during the life of the freeways. It is important to know the amount of traffic for some target year in order to preclude the possibility that the freeways will be either over-designed or under-designed. Estimates of traffic, therefore, were made for the year 1980.

Origin-Destination Survey

The Washington Metropolitan Transportation Study Area is comprised of approximately 200 square miles with a 1948 population of approximately 1,175,600. In addition to the City of Washington, the study area also contains the cities of Alexandria and Falls Church, Virginia, Arlington County and portions of Fairfax County, Virginia, and Montgomery and Prince Georges Counties in Maryland. The study was a personal interview type of origin-destination traffic survey. This survey was conducted in the summer and fall of 1948 by the Planning Section of the District of Columbia Department of Highways under the joint sponsorship of the Highway Departments of Virginia, Maryland and the District of Columbia. As a highway study eligible for Federal aid, it was carried out in cooperation with the U. S. Bureau of Public Roads, Department of Commerce.

In order to obtain complete information on traffic movements the area was divided into 9 sectors which were subdivided into 65 districts and further subdivided into 287 zones. The zones were also divided into sub-zones but for this analysis the zone was used as the smallest subdivision except for special studies.

The basic procedure of the study was designed to obtain detailed information concerning the travel on an average weekday by persons living in the Washington Metropolitan Area. It also revealed the characteristics of travel generated elsewhere, but which involves use of highways within the study area. In general the method followed the sampling technique developed by the Bureau of the Census, with certain modifications to adapt it to an urban traffic study.

The origin-destination study was divided into two phases:

1. Internal Survey
 - (a) Selection of samples for homes, trucks, and taxicabs
 - (b) Home interviews
 - (c) Truck interviews
 - (d) Taxicab interviews
2. External Survey
 - (a) Traffic counts
 - (b) Roadside interviews

A total of 16,648 samples were selected on the basis of 5 percent of all dwelling units listed in accredited sources of information, supplemented in certain areas by field information. Interviews were completed at approximately 94 percent of the units selected in the sample. Approximately 66 percent of these interviews were made in the District of Columbia, 19 percent in Virginia and 15 percent in Maryland.

In the case of both taxicabs and trucks, a 10 percent sample was used. The required data on travel habits were drawn from these internal survey interviews.

Information on travel inside the cordon by persons entering from points beyond its limits was obtained by an external survey. This was made concurrently with the internal survey. The method consisted of stopping and interviewing as many vehicle operators as possible without causing serious congestion. Interviews were conducted at 34 stations established for this purpose along the cordon line around the periphery of the survey area. The stations were situated so as to intercept traffic on all important county roads and interstate trunk highways serving the Metropolitan Area. Approximately two-thirds of all vehicles passing the survey stations on an average 24-hour summer day were interviewed. The basic facts on origin-destination collected in the external survey were supplemented by volume counts which classified traffic by type of vehicle and direction.

The origin-destination survey was fully described, with summarized data, in a report published in 1950 by the various agencies that conducted the survey. Since copies of that report were widely distributed and are still available, this report will not give details presented in the survey report.

Methods of Allocating Traffic

In allocating traffic to the freeways, private automobiles and commercial vehicles were separated so as to know the number of each type of vehicle that would be served. Traffic was assigned to specific points of access to estimate probable usage of each ramp as an aid in designing the freeway. The estimated traffic for 1980 is shown alongside each ramp on the strip maps. Traffic was assigned to the different sections of the freeway system by making a detailed analysis of zone-to-zone and external station-to-zone movements. Based on experience with other similar highways in the Washington area, it was assumed that of the vehicles moving between any two zones, the proportion attracted to the freeway system would increase in relation to time savings.

All trips between a pair of zones were allocated to the freeway system when its use would result in time savings of 8 minutes or more. Smaller proportions of the total number of trips were allocated for relatively smaller time savings, while no allocations to the freeways were made for trips losing 2 minutes or more. The allocation curve used is very similar to the one shown on page 32 of the Highway Research Board Bulletin 61 in Mr. Darel L. Trueblood's study of Shirley Highway traffic movements.

In using this method, present travel time over the best surface route was estimated and compared with the probable time using surface streets to the nearest access ramp serving the freeway system, thence over this facility to the egress ramp nearest the zone of destination, and thence over surface streets to the destination.

Population

One of the most important factors to consider when predicting future traffic increases is population growth, including possible redistribution of population. The estimate of 1948 population and population distribution within the Washington Metropolitan Area was based on reports of the U. S. Census Bureau, as well as on data prepared by the National Capital Planning Commission. There were approximately 1,175,600 persons within the survey area in 1948. Of these, 778,000 were in the District of Columbia, 206,100 in Maryland counties, and the remaining 191,500 in Virginia.

In 1948 the National Capital Planning Commission prepared a population spot map on which it showed the distribution of predicted population for the Metropolitan Area in the year 1980. Information from this spot map was adjusted to reflect information in the 1950 U. S. Census Bureau report, as well as in various estimates of 1954 population.

The following table shows estimated 1948 and 1980 population by political subdivisions within the study area.

	1948	1980
District of Columbia	778,000	900,000
Montgomery County, Maryland* . .	106,000	252,500
Prince Georges County, Maryland*	100,100	243,700
Arlington County, Virginia	119,700	210,500
Fairfax County, Virginia*	10,300	61,500
Alexandria, Virginia*	56,100	75,800
Falls Church, Virginia	5,400	10,200
Total	1,175,600	1,754,200

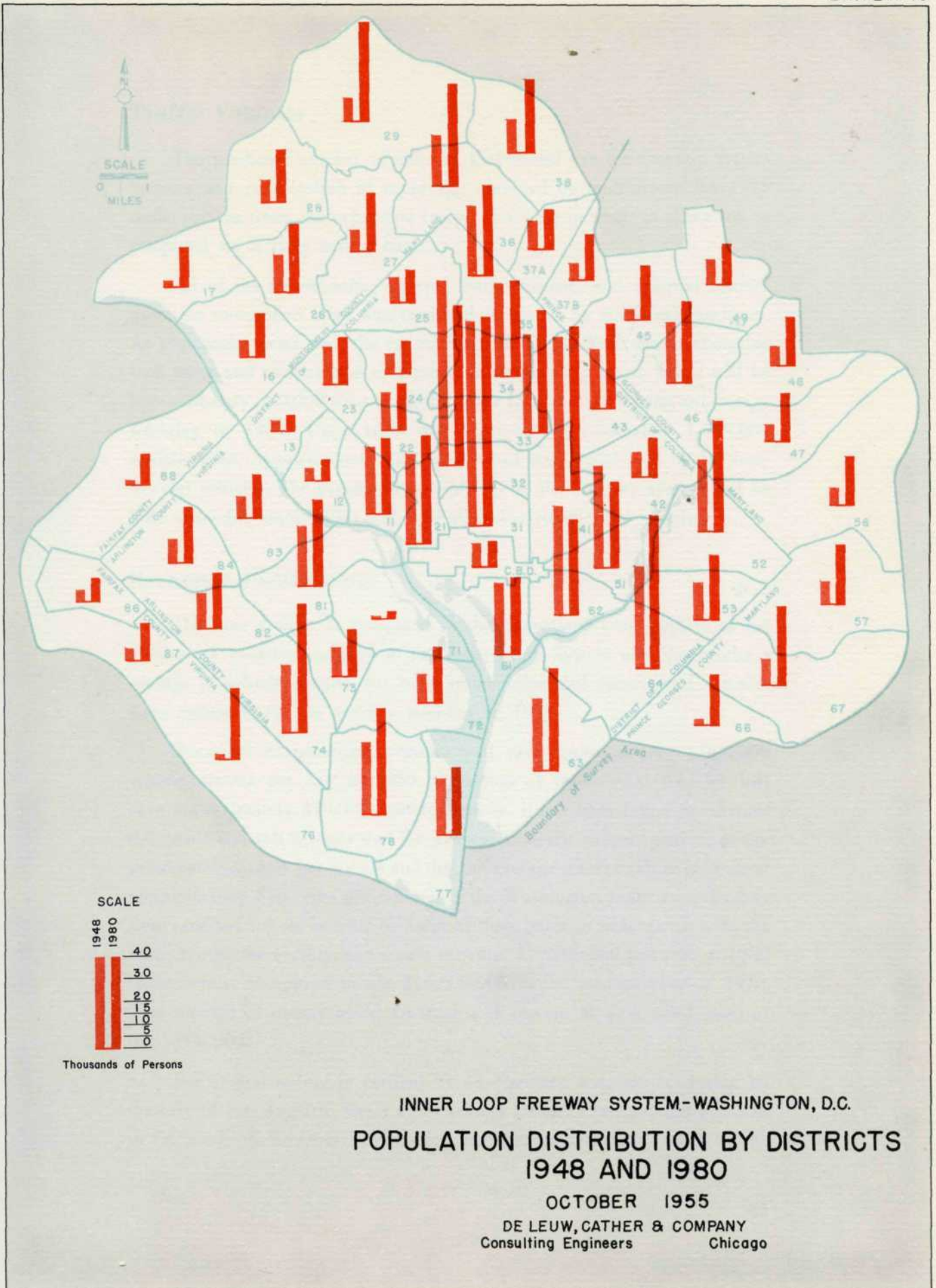
*Portions of these political subdivisions outside of the survey area are excluded from these population figures.

Exhibit 10 shows estimated 1948 and 1980 populations for the 65 districts within the survey area. It is apparent from this exhibit that increases will occur principally in the suburban areas of Virginia and Maryland, with only slight increases in the District of Columbia.

Expansion Factors

The population expansion factor for each of the 65 districts was obtained by dividing the 1980 estimated population by the 1948 population. An additional factor of 1.56 was used to adjust for anticipated increase in number of motor vehicles per capita. In 1948 there were approximately 213 vehicles per 1,000 people in the Washington Metropolitan Area. The number of vehicles per 1,000 population increased to 268 in 1954 and it is expected to increase further to 333 in 1980.

By combining the factors for population and for vehicles per 1,000 people, we obtained a traffic expansion factor for each district. For vehicles traveling between any two districts, the average of the two district factors was used, except that judgment was applied in determining expansion factors for trips to and from zones in the central business district.



Traffic Volumes

The predicted number of vehicles that would use the freeway system between any combination of zones was obtained by multiplying the 1948 traffic volume times the expansion factor, times the percentage allocation as computed on a time saving basis.

All of the zone-to-zone, external station-to-zone, and external station-to-station movements were analyzed and tabulated by statistical machines. As previously mentioned, the estimated traffic for 1980 is shown alongside each ramp and each section of main road on the strip maps. There will be approximately 580,000 trips using the Inner Loop System during an average weekday in 1980. These trips will represent approximately 1,318,000 vehicle-miles. Approximately 12.6 percent of this travel will be by commercial vehicles. The average length of trip on the freeway system will be 2.24 miles for automobiles and 2.49 miles for commercial vehicles.

Economic Justification

The time savings as computed in the allocations were applied to the number of vehicles assigned to the Inner Loop System and the resultant savings in vehicle-minutes for both automobiles and commercial vehicles were estimated for an average weekday in 1980.

Operators of passenger vehicles will save approximately 1,900,000 vehicle-minutes per day in 1980. Operators of commercial vehicles will save approximately 270,000 vehicle-minutes. It has been found on various toll roads and toll bridges that the average motorist values his time at approximately 2 cents per minute and that the average trucker values his time at approximately 5½ cents per minute. If the Washington Inner Loop System were credited for its benefits to users at these rates in accordance with the time savings, the facility would save its users \$19,300,000 per year at 1980 traffic levels, or approximately \$16,600,000 in the median year of 1970. That amount of money could amortize a 3 percent 40-year bond issue of \$385,000,000.

The annual saving is verified by an economic analysis conducted by the City of Los Angeles, Street and Parkway Design Division, and reported in "A Study of Freeway System Benefits—September, 1954." This study,

which was based on savings per vehicle-mile rather than per vehicle-minute, may be summarized as follows:

Average Benefit Per Vehicle-Mile

Classification of Vehicle	Average Benefit per Vehicle-Mile
Passenger cars	3.73 cents
Trucks	9.93
Pickups	4.66
Weighted average vehicle	4.16

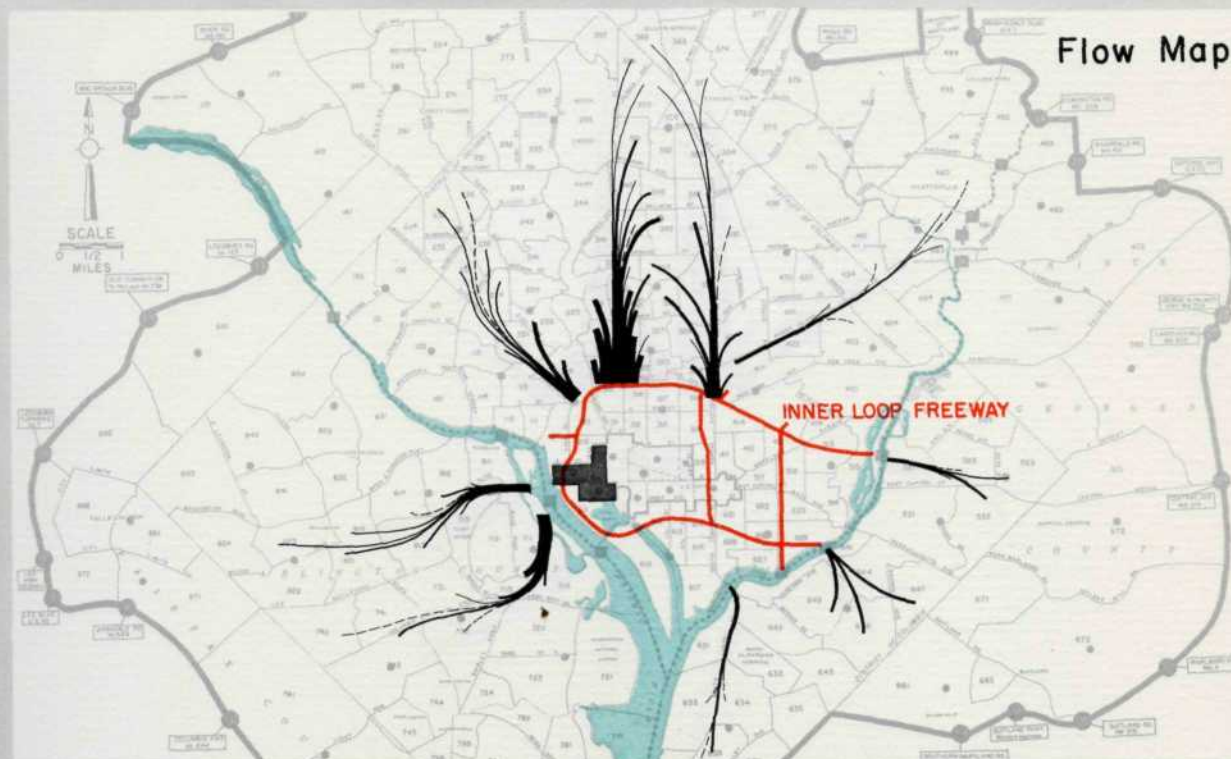
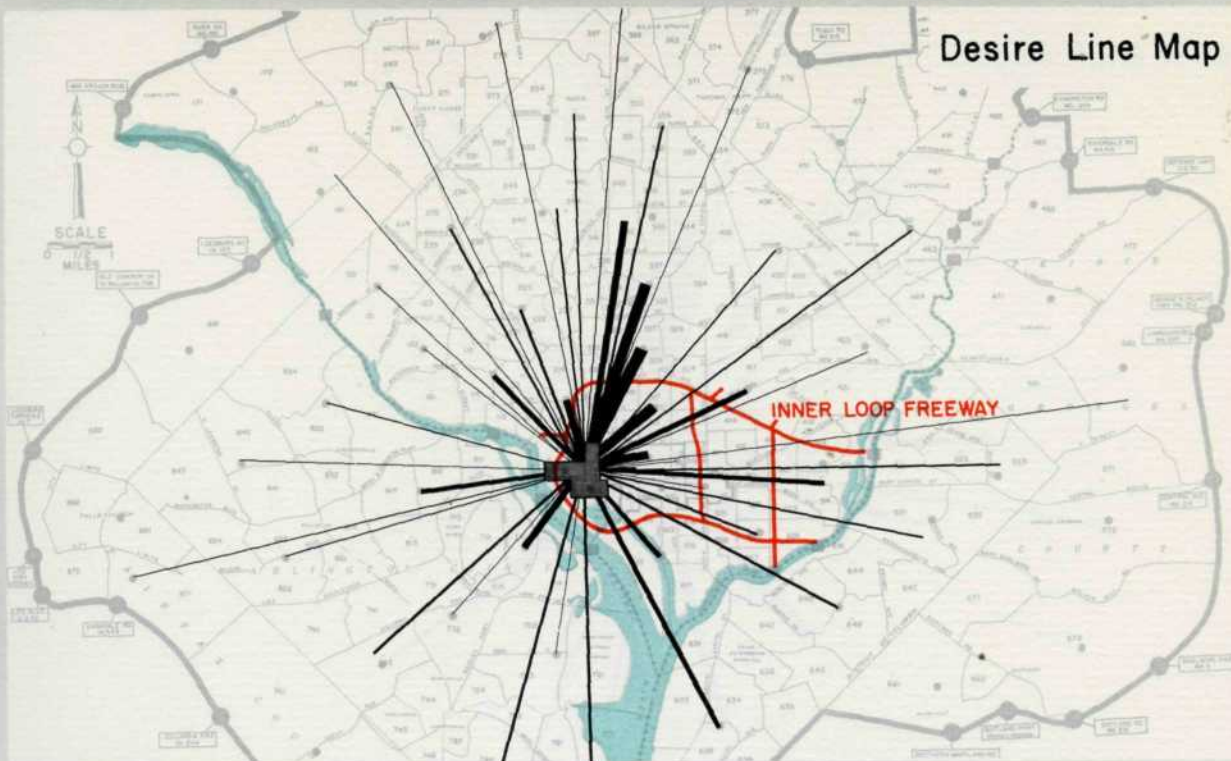
The saving to passenger car operators of 3.73 cents per mile can be further itemized as follows:

Basis of Savings	Savings per Vehicle-Mile
Gasoline	*0.33 cents
Maintenance costs	0.24
Accidents	0.56
Time	2.60
Total	<u>3.73 cents</u>

Based on the weighted average vehicle saving of 4.16 cents per vehicle-mile and the 1,318,000 vehicle-miles per average day in 1980, the 1980 annual benefits would be approximately \$20,000,000. This agrees very closely with the estimated \$19,300,000 saving based on time saving benefits.

The computations above do not take into account the intangible benefits of greater driving ease for users of the freeways; the time savings and other benefits to those continuing to use the surface streets, including patrons of transit buses, who will experience lessened congestion; nor the benefits to property owners, businessmen, and all other taxpayers by assuring the continued accessibility of the central area, thereby protecting it against loss in value.





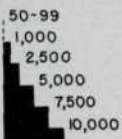
Base Map courtesy of District of Columbia Department of Highways

INNER LOOP FREEWAY SYSTEM- WASHINGTON, D.C.

**MASS TRANSIT TRIP DESIRE LINES AND
POTENTIAL EXPRESS BUS PATRONAGE
TO DESTINATION AREA A**

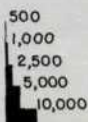
OCTOBER 1955

**DE LEUW, CATHER & COMPANY
Consulting Engineers Chicago**



Flow Map

Number of Passengers



Desire Line Map

Number of Passengers

Note: The flow bands represent 24-hour average daily traffic based on the 1948 origin-destination survey



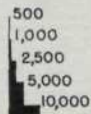
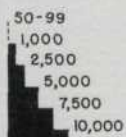
Base Map courtesy of District of Columbia Department of Highways

INNER LOOP FREEWAY SYSTEM-WASHINGTON, D.C.

**MASS TRANSIT TRIP DESIRE LINES AND
POTENTIAL EXPRESS BUS PATRONAGE
TO DESTINATION AREA B**

OCTOBER 1955

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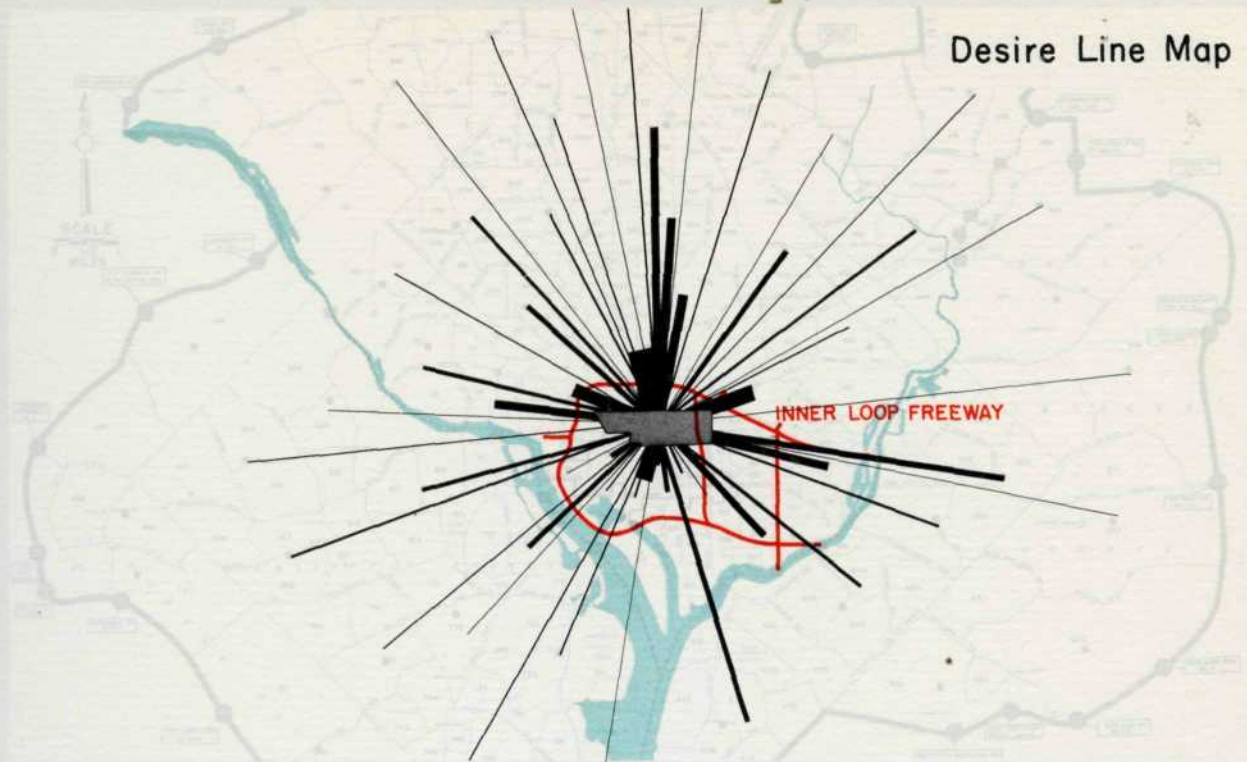
Flow Map

Desire Line Map

Number of Passengers

Number of Passengers

Note: The flow bands represent 24-hour average daily traffic based on the 1948 origin-destination survey.



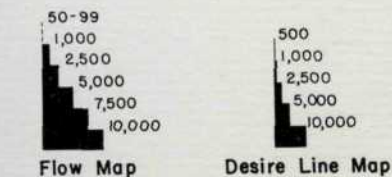
Base Map - courtesy of District of Columbia Department of Highways

INNER LOOP FREEWAY SYSTEM-WASHINGTON, D.C.

**MASS TRANSIT TRIP DESIRE LINES AND
POTENTIAL EXPRESS BUS PATRONAGE
TO DESTINATION AREA F**

OCTOBER 1955

DE LEUW, CATHER & COMPANY
Consulting Engineers Chicago



Note: The flow bands represent 24-hour average daily traffic based on the 1948 origin-destination survey.



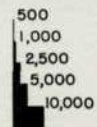
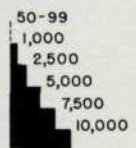
Base Map courtesy of District of Columbia Department of Highway

INNER LOOP FREEWAY SYSTEM - WASHINGTON, D. C.

**MASS TRANSIT TRIP DESIRE LINES AND
POTENTIAL EXPRESS BUS PATRONAGE
TO DESTINATION AREA G**

OCTOBER 1955

**DE LEUW, CATHER & COMPANY
Consulting Engineers Chicago**



Note: The flow bands represent 24-hour average daily traffic based on the 1948 origin-destination survey.

COORDINATION WITH TRANSIT MODERNIZATION

The 1948 survey of origins and destinations secured data on transit passenger movements. These were analyzed as a part of the current studies for purposes of this report. Specifically, studies were made of trips to and from six major employment zones plus the principal shopping area, as follows:

Area	Location
A.....	West Mall and Navy Group
B.....	Central Business District
C.....	Federal Triangle
D.....	Independence Avenue Federal Group
E.....	Pentagon Building
F.....	K Street N.W. District
G.....	North Central Area (North of N Street N.W.)

The pattern of trips to and from the four largest traffic generators is shown in Exhibits 11 to 14. It will be noted that most of the heavier movements are at right angles to the routes of the Inner Loop System rather than tangential. The loop freeways will not be useful for bus operation, therefore, except in isolated instances. The operation will consist of a small number of express bus trips from certain residential areas to the larger employment areas, at starting and quitting times, rather than trunk line service.

Buses making such express runs will use the ramps provided for general use. Since no stops will be made by these buses along the freeway routes, no special facilities need be planned.

With the flexibility accorded by bus operation it is not necessary at this time to plan for bus service in detail. The following examples, however, will illustrate heavy movements of transit passengers at the time of the 1948 survey. If these movements are still substantial when the freeways are ready for use, they should be served by express bus routes using portions of the Inner Loop System.

South on 16th Street N.W. to freeway; freeway to Constitution Avenue; Constitution Avenue to West Mall Federal Buildings.

South on North Capitol Street; Center Route freeway system to E Street N.W.; E Street N.W. to central business district.

South on 16th Street N.W. to freeway; east and south on freeway to 3rd Street N.W. and Constitution Avenue; Constitution Avenue to Federal Triangle.

South on 16th Street N.W. to freeway; east, south and west on freeway to 6th Street S.W.; 6th Street S.W. to Independence Avenue.

South on North Capitol Street; south and west on Center Route and Southwest Section of freeway system to Highway Bridge; Pentagon network of highways to Pentagon Building.

Construction of the Inner Loop System will not require abandonment or reconstruction of a major length of any streetcar track presently operated. If all parts of the present rail system are still in use at the time the freeways are built, however, rail and underground power distribution facilities will have to be installed on cross street structures as shown by Table 1 to serve the routes indicated.

It may prove desirable to operate many routes with buses, successively, as construction of the freeways proceeds in stages. This will reduce the expense of installing temporary facilities to maintain rail transit service during construction.

Proposed one-way operation to facilitate movement to and from freeway ramps will affect transit routes on certain streets. Locations where this will occur and the streetcar and bus routes affected are shown by Tables 2 and 3. If streetcar operation is discontinued on 8th Street S.E. south of South Carolina Avenue, 7th and 8th Streets may become a pair of one-way streets from South Carolina Avenue to M Street S.E.

It will be necessary, because of physical limitations, to close certain minor streets now crossing the route of the proposed freeways. In a few instances, buses presently operate on these streets. The places where this situation exists, and the bus routes affected, are shown by Table 4.

A proposed transit transfer terminal, shown in Exhibit 4, will serve passengers from east of the Anacostia River. These passengers will transfer from feeder routes to trunk line service at this new terminal, proposed to be built near the intersection of 13th Street S.E. and Pennsylvania Avenue.

TABLE 1
STREETCAR LINES WHICH CROSS ROUTE
OF PROPOSED FREEWAY

Crosses Freeway on Street	Route Number	Route or Section of Freeway Crossed	Remarks
Pennsylvania Avenue N.W.	80, 20, 30, 31*, and 33*	West	
Connecticut Avenue N.W.	40, 42, 45*, and 49*	West	
14th Street N.W.	50, 54, and 53*	Northwest	
11th Street N.W.	60, 63*, and 67*	Northwest	
7th Street N.W.	70, 72, and 74	Northwest	
New Jersey Avenue N.W.	90 and 91*	Northwest	
N. Capitol Street.	80	North	
New York Avenue N.E.	82 and 85*	Northeast	
Florida Avenue N.E.	92	Northeast	Relocation necessary—eastbound only—due to relocation of street
8th Street N.E.	92	Northeast	Northbound only
D Street N.E.	42 and 45*	East	Eastbound only
C Street N.E.	42 and 45*	East	Westbound only
E. Capitol Street	40 and 45*	East	
Pennsylvania Avenue S.E.	30 and 90	East	Relocation necessary because of change in terminal at east end of line
7th Street S.W.	72, 74, and 67*	Southwest	
New Jersey Avenue N.W.	90 and 91*	Center	Relocation necessary between M and O Streets
New York Avenue N.W.	82 and 85*	Center	
G Street N.W.	80, 42 and 45*	Center	
D Street N.W.	40	Center	Westbound only
Indiana Avenue N.W.	40	Center	Eastbound only
Pennsylvania Avenue N.W.	20 and 54	Center	
Independence Avenue S.W.	30	Center	
2nd Street S.W.	70, 33*, 53*, and 63*	Center	Relocation necessary—northbound only

Route numbers marked () are rush hour routes only

TABLE 2
BUS ROUTES WHICH WILL NEED TO BE RELOCATED
TO CONFORM TO PROPOSED ONE-WAY STREETS

On Street	Bus Route Numbers*	Proposed Direction of Street	Proposed One-Way Between Streets**
P Street N.W.	G-2	Westbound	20th and 22nd Streets N.W.
18th Street N.W.	1-2	Southbound	Florida and New Hampshire Avenue N.W.
9th St. N.W.	J-3*, Y-9*, and F-2	Northbound	Rhode Island and Florida Avenue N.W.
9th Street N.W.	E-1*, F-1*, F-3*, F-9*, J-3*, Y-9*, F-2, F-4, and V-2	Southbound	New York Avenue and The Mall
13th Street N.E.	B-2	Northbound	B Street N.E. and Florida Avenue N.E.
17th Street N.E.	B-2	Northbound	Pennsylvania Avenue S.E. and Florida Avenue N.E.
15th Street S.E.	B-2	Southbound	South Carolina S.E. and L Street S.E.
4th Street S.E.	A-4, A-6, A-8, A-1*, and A-3	Southbound	North Carolina S.E. and M Street S.E.
11th Street S.W.	V-6	Northbound	D and E Streets S.W.

Route numbers marked () are rush hour bus routes only
 **Does not include portions of streets that are presently one-way

TABLE 3
STREETCAR ROUTES WHICH WILL NEED TO BE RELOCATED
TO CONFORM TO PROPOSED ONE-WAY STREETS

On Street	Proposed Direction of Street	Proposed One-Way Between Streets**	Route and Blocks Affected
9th Street N.W.	Southbound	New York Avenue and The Mall	60—2 blocks between E and G Streets N.W. 63* and 67*—4 blocks between Pennsylvania and G. Street N.W.
13th Street N.E.	Northbound	Constitution Avenue and Florida Avenue	42 and 45*—1 block between C and D Streets N.E.
15th Street N.E.	Southbound	F Street N.E. and L Street S.E.	40 and 45*—½ block between East Capitol Street and entrance to car barn

Route numbers marked () are rush hour streetcar routes only
 **Does not include portions of streets that are presently one-way

TABLE 4
BUS ROUTES WHICH WILL NEED TO BE RELOCATED
DUE TO STREETS BEING CLOSED AT FREEWAY

Street Closed	Between Streets	Bus Route Numbers*
E Street N.W.	23rd and 25th Streets N.W.	R-6
21st Street N.W.	Q and R Street N.W.	L-4 (northbound only)
Q Street N.W.	5th and 1st Street N.W.	X-3*
P and 3rd Street N.W.	New Jersey Avenue and R Street N.W.	G-2
Virginia and Potomac Ave. and K Street S.E.	G, 13th, K and 8th Street S. E.	A-1*, A-3*, A-4, A-6, A-8, V-6, W-6 and W-8
11th Street S.W.	Maine Ave and D Street S.W.	Y-6
23rd Street and Ohio Drive S.W.	Lincoln Memorial Area	R-4
2nd and Canal Streets S.W.	2nd and 1st Street S. W.	A-1*, A-3*, A-5*, A-9*, A-2, A-4, A-6, and A-8

Bus route numbers marked () are rush hour routes only

INNER LOOP SYSTEM FOR THE INTERIM PERIOD

The assignment requires the consultant to: "Prepare drawings showing which sections of the Inner Loop can function below the ultimate design standards, how they will operate and for what period of time." It is the considered opinion of the consultant that it would be highly undesirable to attempt construction of the Inner Loop System in the recommended location by progressive improvements from surface one-way streets or comparable standards to a full limited access design.

The eventual development of the Inner Loop as a limited access highway is certain to disrupt streets in its vicinity during the construction period. If these streets have previously been improved, thereby drawing traffic to them, there will be a substantial increase in the cost of construction, including the cost of temporary facilities to handle traffic. On the other hand, if the interim program provides surface streets with appropriate improvements at a distance of at least three or four blocks from the alignment of the future freeways, the construction of the latter will proceed with little disruption of traffic and with minimum expense for temporary traffic facilities.

Also of importance in this regard is the fact that the Inner Loop System will serve only a portion of the traffic now on the surface streets. There will always be need for additional routes to serve motorists making short trips or trips between points not conveniently served by the Inner Loop System. This traffic, if concentrated on streets adjacent to the freeways, would seriously reduce the capacity of ramps to and from the express roadways. Improved streets provided for the interim period, therefore, will continue to serve indefinitely, if properly located, without abandonment of any capital investment after completion of the Inner Loop System.

Exhibit 15 shows the proposed first stage of construction of the Inner Loop System to freeway standards, together with a recommended belt of one-way and two-way streets to serve while and after subsequent stages of construction are planned and financed. This belt of streets should be improved through street widening, channelization, parking restrictions, lighting, adequate traffic signal control, and other standard traffic engineering techniques.

STAGE CONSTRUCTION

The successful performance of the large amount of construction work necessary to complete the entire Inner Loop System requires that a carefully planned program of construction be developed. The length of time required to complete the entire project depends upon:

1. Development of a realistic construction schedule;
2. Availability of funds;
3. Acquisition of rights-of-way, and
4. Maintenance of traffic during construction.

The present budget is not adequate for a project of this magnitude and it is evident that if the Inner Loop is to be completed in the foreseeable future, additional funds must be made available.

We estimate that without considering the financial problem and with expeditious handling, the entire system could be completed in from 12 to 15 years. Stages 1 to 4, which are most urgently needed, could be finished in approximately 7 years.

We have no way of knowing at this time what funds will be made available to the District for construction of the Inner Loop or when these funds will be made available. We have not, therefore, considered the financial problem in setting up our recommended stage construction program but rather have based our recommendations on traffic requirements.

The Inner Loop has been divided into nine stages. These are shown on the map in the pocket in the back of the report. Summaries of each stage and reasons for the recommended sequence are given in the following paragraphs.

Stage 1

This stage includes that part of the South Route from Lincoln Memorial to the access ramps at 4th Street S.E., the Center Route as far north as Independence Avenue, and the approaches to the proposed Constitution Avenue Bridge.

Completion of the work included in this stage will provide for the distribution of traffic crossing the Potomac River on the new Constitution



Avenue and Highway Bridges wishing to terminate in the central business and government district. It will also provide an improved route for traffic crossing the Potomac in the Highway Corridor destined for Maryland over South Capitol Street, Eleventh Street and Sousa Bridges.

Stage 2

It is recommended that Stage 2 include completion of the South Route to provide freeway connections with the Anacostia River bridges and the proposed Anacostia Freeway. Stage 2 also includes that part of the East Route south of Independence Avenue with ramps connecting to Independence Avenue to accommodate traffic crossing the Anacostia River on the new East Capitol Street Bridge. Interchange C would be constructed in this stage.

Stages 3 and 4

Stages 3 and 4 will complete the Center Route to Interchange A and the North Route through the interchange to connect with New York Avenue and Florida Avenue at the existing railroad underpass. Completion of work under these two stages will provide a route through the central area for the heavy truck traffic now using New York Avenue and 3rd Street N.W. It will also provide a freeway route for through traffic between the Highway Corridor and Federal Highways 1 and 50 in Maryland.

The heavy volumes of traffic on North Capitol Street and Rhode Island Avenue will have access to the Center Route over the ramps provided for this purpose in Interchange A.

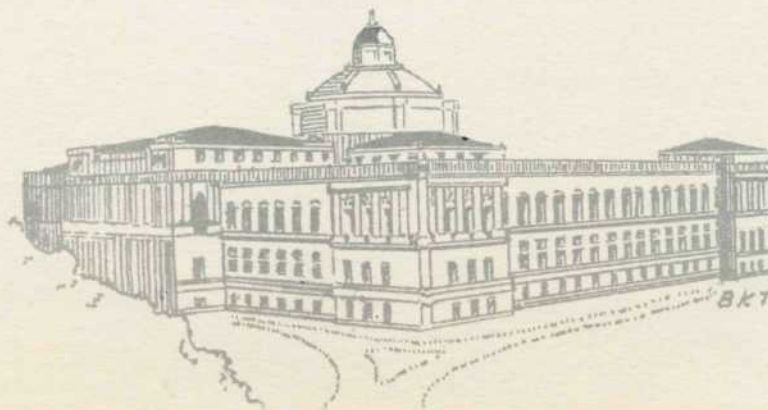
The summary given above divides the Inner Loop into 9 stages. A more detailed schedule should be prepared for each stage taking into consideration the availability of funds, construction material and labor, and engineering services for the preparation of contract plans. The detailed schedule should also provide for proper timing in the award of contracts so that almost simultaneous completion of the work within any one stage will result in a useable section of freeway being opened to traffic.

Before award of contracts in any stage of construction, routes should be determined to take care of traffic during construction and any work required under the contracts should be specified therein. Also, in preparing a more detailed construction schedule, it is extremely important that all agencies having an interest in urban renewal work be consulted so that freeway plans and actual construction are compatible with the plans for redevelopment of the area.

The following table gives estimated length of two-way freeway in each stage, and the estimated cost divided between construction, contingencies and engineering, rights-of-way, and total.

SUMMARY OF ESTIMATE OF COST BY STAGES OF CONSTRUCTION

Stage	Length in Miles	Construction	Contingencies and Engineering	Rights-of- Way	Total
1	4.12	\$ 32,517,000	\$ 8,131,000	\$ 2,453,000	\$ 43,101,000
2	2.82	18,875,000	4,720,000	11,433,000	35,028,000
3	1.05	13,024,000	3,257,000	8,956,000	25,237,000
4	1.31	12,127,000	3,032,000	10,793,000	25,952,000
5	1.55	16,173,000	4,044,000	12,499,000	32,716,000
6	0.62	3,003,000	751,000	5,226,000	8,980,000
7	1.96	25,258,000	6,315,000	18,315,000	49,888,000
8	2.48	18,196,000	4,550,000	12,499,000	35,245,000
9	1.70	7,428,000	1,857,000	7,235,000	16,520,000
Total	17.61	\$146,601,000	\$36,657,000	\$89,409,000	\$272,667,000



PARKING STRUCTURES OVER FREEWAYS

The consultants were directed to investigate and report on the various aspects involved in incorporating parking structures in the highway facility.

One consideration would be economics. Preliminary plans were prepared, therefore, and estimates of cost made for such structures. It was found that the first level of parking—that is, the one at the level of existing streets—would cost approximately \$15.00 per square foot more to provide above a freeway than it would on the surface adjacent to the freeway. A single level of parking, therefore, would involve the abnormally high cost of \$4,500 per car space, and even for a multi-level structure it would be more economical to buy land for a site if it could be bought for \$15.00 per square foot or less.

Another consideration should be the effect of such parking structures on the safety and efficiency of operation on the freeways.

From the standpoint of safety, roofing over long sections of freeway would require motorists to operate first in bright sunshine at approximately 3000 foot-candles of illumination and then in artificial light which could not be provided practicably at a level above 15 foot-candles. While the human eye can adjust to either level, given sufficient time, it cannot change rapidly enough to meet such problems safely at freeway speeds. Moreover, the time required for adjustment increases materially if there are a series of changes in light intensity, as there would be, for example, with garages built over the freeways in alternate blocks.

The freeway system has been given as many access and egress ramps as could be provided at reasonable cost, and without deviating from the design standards necessary for safety and capacity. It would not be physically feasible, therefore, to provide additional ramps to serve the parking garages exclusively. Vehicles leaving the freeways and wanting to park in one of the structures would have to use a ramp with other traffic and then seek an entrance to the garage on a public street. In the meantime, surface

traffic having no interest in the freeway would be drawn to the same public street by the presence of the garage. The resulting congestion could cause traffic to back up on the freeway ramps and quickly block the entire facility.

It is recommended that parking garages not be built as a part of the freeways. Rather, such structures should be kept far enough away from them to permit the surface streets between to afford a cushioning effect.



APPENDIX A
ESTIMATES OF COST

INDEX TO ESTIMATES

	<i>Page</i>
Summary	67
West Route	68
North Route	70
Northwest Section	70
Northeast Section	72
East Route	74
Center Route	76
South Route	78
Southwest Section	78
Southeast Section	80
Alternates	82
Center Route	82
Southwest Section	84

SUMMARY OF ESTIMATE OF COST

Route or Section	Construction	Contingencies and Engineering	Rights-of-Way	Total
West	\$ 26,163,000	\$ 6,542,000	\$19,946,000	\$ 52,651,000
Northwest	23,050,000	5,763,000	20,366,000	49,179,000
Northeast	21,850,000	5,463,000	17,995,000	45,308,000
East	14,469,000	3,618,000	8,664,000	26,751,000
Center	18,751,000	4,689,000	12,382,000	35,822,000
Southwest	26,443,000	6,612,000	1,290,000	34,345,000
Southeast	15,875,000	3,970,000	8,766,000	28,611,000
Total	\$146,601,000	\$36,657,000	\$89,409,000	\$272,667,000
Alternates				
Center	\$ 22,607,000	\$ 5,653,000	\$14,237,000	\$ 42,497,000
Southwest	32,674,000	8,170,000	1,353,000	42,197,000

SUMMARY OF ESTIMATE OF COST BY STAGES OF CONSTRUCTION

Stage	Construction	Contingencies and Engineering	Rights-of-Way	Total
1	\$ 32,517,000	\$ 8,131,000	\$ 2,453,000	\$ 43,101,000
2	18,875,000	4,720,000	11,433,000	35,028,000
3	13,024,000	3,257,000	8,956,000	25,237,000
4	12,127,000	3,032,000	10,793,000	25,952,000
5	16,173,000	4,044,000	12,499,000	32,716,000
6	3,003,000	751,000	5,226,000	8,980,000
7	25,258,000	6,315,000	18,315,000	49,888,000
8	18,196,000	4,550,000	12,499,000	35,245,000
9	7,428,000	1,857,000	7,235,000	16,520,000
Total	\$146,601,000	\$36,657,000	\$89,409,000	\$272,667,000

ESTIMATE OF COST

WEST ROUTE

LINCOLN MEMORIAL TO 18TH AND T STREETS N.W.

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
GRADING AND DRAINAGE					
1	Clearing Right-of-Way	L.S.	\$ —	—	\$ 942,000
2	Unclassified Excavation	C.Y.	2.00	865,000	1,730,000
3	Rock Excavation	C.Y.	5.00	160,000	800,000
4	Hard Surface Excavation	C.Y.	5.00	26,000	130,000
5	Embankment (Material from Excavation) .	C.Y.	1.00	—	—
6	Embankment (Material from Borrow) ...	C.Y.	3.00	—	—
7	Soils Stabilization	L.S.	—	—	10,000
8	Protecting Existing Buildings	L.S.	—	—	345,000
9	Freeway Drainage	L.S.	—	—	159,000
10	Special Pumping Stations	L.S.	—	—	7,000
	Sub-Total—Grading and Drainage				\$ 4,123,000
SURFACING					
11	Cement Concrete Pavement	S.Y.	\$ 6.50	85,000	\$ 552,500
12	Base Course for Cement Concrete Pavement	S.Y.	1.50	85,000	127,500
13	Bituminous Concrete Pavement	S.Y.	1.50	23,000	34,500
14	Base Course for Bituminous Concrete Pavement	S.Y.	5.00	23,000	115,000
15	Stabilized Shoulder	S.Y.	3.00	13,000	39,000
	Sub-Total—Surfacing				\$ 868,500
MISCELLANEOUS CONSTRUCTION					
16	Maintenance of Traffic	L.S.	\$ —	—	\$ 375,000
17	Barrier Type Curb	L.F.	3.00	38,000	114,000
18	Concrete Curb	L.F.	2.00	12,000	24,000
19	Mountable Type Curb	L.F.	2.50	14,400	36,000
20	Sidewalk and Safety Walk	S.Y.	4.00	13,500	54,000
21	Beam Type Guard Rail	L.F.	4.00	—	—
22	Fencing	L.F.	3.50	8,000	28,000
23	Landscaping	S.Y.	2.50	66,000	165,000
24	Special Planting	L.S.	—	—	18,000
25	Freeway Lighting	L.S.	—	—	475,000
	Sub-Total—Miscellaneous Construction				\$ 1,289,000
RETAINING WALLS					
26	Retaining Walls (Excavation Shored) ...	S.Y.	\$ 150.00	22,300	\$ 3,345,000
27	Retaining Walls (Excavation not Shored)	S.Y.	110.00	—	—
28	Stone Facing on Retaining Walls	S.Y.	54.00	22,300	1,204,200
	Sub-Total—Retaining Walls				\$ 4,549,200

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
STRUCTURES					
29-1	Virginia Ave., 24th St. and F St. N.W. (1)	L.S.	\$ —	—	\$ 726,000
29-2	G St. N.W. (2)	L.S.	—	—	145,000
29-3	Ramp (3)	L.S.	—	—	40,000
29-4	G St. N.W. (4)	L.S.	—	—	74,000
29-5	I St. N.W. (5)	L.S.	—	—	172,000
29-6	Cut and Cover Section—Sta. 47+70 to 52+20	L.F.	4,000.00	450	1,800,000
29-7	Cut and Cover Section—Whitehurst Eastbound Sta. 4+60 to 14+00	L.F.	2,400.00	940	2,256,000
29-8	Cut and Cover Section—Whitehurst Eastbound Sta. 20+20 to 23+50	L.F.	1,300.00	330	429,000
29-9	Cut and Cover Section—Whitehurst Westbound Sta. 4+30 to 10+70	L.F.	1,800.00	640	1,152,000
29-10	Cut and Cover Section—Whitehurst Westbound Sta. 17+00 to 20+30	L.F.	1,300.00	330	429,000
29-11	25th St. N.W. (6)	L.S.	—	—	94,000
29-12	22nd St. N.W. (7)	L.S.	—	—	521,000
29-13	I St. N.W. (8)	L.S.	—	—	295,000
29-14	New Hampshire Ave., 21st St. and M St. N.W. (9)	L.S.	—	—	1,488,000
29-15	N St. N.W. (10)	L.S.	—	—	158,000
29-16	P St. N.W. (11)	L.S.	—	—	136,000
29-17	Massachusetts Ave. N.W. (12)	L.S.	—	—	239,000
29-18	Q St. N.W. (13)	L.S.	—	—	154,000
29-19	Special Retaining Wall Section—Sta. 90+00 to 98+00	L.F.	2,500.00	800	2,000,000
29-20	R St. N.W. (14)	L.S.	—	—	179,000
29-21	Connecticut Ave. N.W. (15)	L.S.	—	—	454,000
29-22	20th St. and S St. N.W. (16)	L.S.	—	—	390,000
29-23	19th St. N.W. (17)	L.S.	—	—	177,000
29-24	18th St. and T St. N.W. (18)	L.S.	—	—	704,000
	Sub-Total—Structures				\$14,212,000
PUBLIC UTILITIES					
30	Sewer Relocation	L.S.	—	—	\$ 1,001,000
31	Water Main Relocation	L.S.	—	—	120,000
	Sub-Total—Public Utilities				\$ 1,121,000
	Total Construction Cost				\$26,162,700

Note:—Numbers in parentheses refer to structure numbers on Plan and Profile Sheets.

SUMMARY

Total Estimated Construction Cost	\$26,163,000
Contingencies	3,925,000
Engineering	2,617,000
	<u>\$32,705,000</u>
Rights-of-Way	19,946,000
Total—West Route	\$52,651,000

ESTIMATE OF COST

NORTHWEST SECTION OF NORTH ROUTE

18TH AND T STREETS N.W. TO NORTH CAPITOL STREET

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
GRADING AND DRAINAGE					
1	Clearing Right-of-Way	L.S.	\$ —	—	\$ 1,267,000
2	Unclassified Excavation	C.Y.	2.00	1,350,000	2,700,000
3	Rock Excavation	C.Y.	5.00	100,000	500,000
4	Hard Surface Excavation	C.Y.	5.00	27,000	135,000
5	Embankment (Material from Excavation) .	C.Y.	1.00	175,000	175,000
6	Embankment (Material from Borrow)	C.Y.	3.00	—	—
7	Soils Stabilization	L.S.	—	—	25,000
8	Protecting Existing Buildings	L.S.	—	—	175,000
9	Freeway Drainage	L.S.	—	—	161,000
10	Special Pumping Stations	L.S.	—	—	99,000
	Sub-Total—Grading and Drainage				\$ 5,237,000
SURFACING					
11	Cement Concrete Pavement	S.Y.	\$ 6.50	120,000	\$ 780,000
12	Base Course for Cement Concrete Pavement	S.Y.	1.50	120,000	180,000
13	Bituminous Concrete Pavement	S.Y.	1.50	50,000	75,000
14	Base Course for Bituminous Concrete Pavement	S.Y.	5.00	50,000	250,000
15	Stabilized Shoulder	S.Y.	3.00	13,000	39,000
	Sub-Total—Surfacing				\$ 1,324,000
MISCELLANEOUS CONSTRUCTION					
16	Maintenance of Traffic	L.S.	\$ —	—	\$ 325,000
17	Barrier Type Curb	L.F.	3.00	41,000	123,000
18	Concrete Curb	L.F.	2.00	9,000	18,000
19	Mountable Type Curb	L.F.	2.50	33,000	82,500
20	Sidewalk and Safety Walk	S.Y.	4.00	15,000	60,000
21	Beam Type Guard Rail	L.F.	4.00	7,000	28,000
22	Fencing	L.F.	3.50	14,000	49,000
23	Landscaping	S.Y.	2.50	127,000	317,500
24	Special Planting	L.S.	—	—	25,000
25	Freeway Lighting	L.S.	—	—	406,000
	Sub-Total—Miscellaneous Construction				\$ 1,434,000
RETAINING WALLS					
26	Retaining Walls (Excavation Shored)	S.Y.	\$ 150.00	23,200	\$ 3,480,000
27	Retaining Walls (Excavation not Shored)	S.Y.	110.00	5,200	572,000
28	Stone Facing on Retaining Walls	S.Y.	54.00	28,400	1,533,600
	Sub-Total—Retaining Walls				\$ 5,585,600

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
STRUCTURES					
29-1	17th St. N.W.....	(19) L.S.	—	—	\$ 176,000
29-2	New Hampshire Ave. N.W.....	(20) L.S.	—	—	290,000
29-3	16th St. N.W. (Southbound).....	(21) L.S.	—	—	148,000
29-4	16th St. N.W. (Northbound).....	(22) L.S.	—	—	279,000
29-5	15th St. N.W.	(23) L.S.	—	—	380,000
29-6	14th St. N.W.	(24) L.S.	—	—	352,000
29-7	13th St. N.W.....	(25) L.S.	—	—	166,000
29-8	11th St. N.W.....	(26) L.S.	—	—	237,000
29-9	Vermont Ave., 10th St. and T St. N.W. (27)	L.S.	—	—	937,000
29-10	9th St. N.W.	(28) L.S.	—	—	420,000
29-11	8th St., 7th St. and S St. N.W.....	(29) L.S.	—	—	810,000
29-12	Rhode Island Ave. N.W.....	(30) L.S.	—	—	262,000
29-13	6th St. and R St. N.W.....	(31) L.S.	—	—	529,000
29-14	5th St. N.W.	(32) L.S.	—	—	232,000
29-15	New Jersey Ave. N.W.....	(33) L.S.	—	—	770,000
29-16	Interchange A.....	(34) L.S.	—	—	97,000
29-17	Interchange A.....	(35) L.S.	—	—	55,000
29-18	Interchange A.....	(36) L.S.	—	—	83,000
29-19	Interchange A.....	(37) L.S.	—	—	525,000
29-20	Westbound and 1st St. N.W.....	(38) L.S.	—	—	116,000
29-21	Eastbound and 1st St. N.W.	(39) L.S.	—	—	201,000
29-22	Ramp	(40) L.S.	—	—	160,000
	Sub-Total—Structures				\$ 7,225,000
PUBLIC UTILITIES					
30	Sewer Relocation	L.S.	—	—	\$ 2,114,000
31	Water Main Relocation	L.S.	—	—	130,000
	Sub-Total—Public Utilities				\$ 2,244,000
	Total Construction Cost				\$23,049,600

Note:—Numbers in parentheses refer to structure numbers on Plan and Profile Sheets.

SUMMARY

Total Estimated Construction Cost.....	\$23,050,000
Contingencies	3,458,000
Engineering	2,305,000
	<u>\$28,813,000</u>
Rights-of-Way	20,366,000
Total—Northwest Section	\$49,179,000

ESTIMATE OF COST

NORTHEAST SECTION OF NORTH ROUTE

NORTH CAPITOL STREET TO BENNING ROAD

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
GRADING AND DRAINAGE					
1	Clearing Right-of-Way	L.S.	\$ —	—	\$ 1,038,000
2	Unclassified Excavation	C.Y.	2.00	430,000	860,000
3	Rock Excavation	C.Y.	5.00	—	—
4	Hard Surface Excavation	C.Y.	5.00	35,000	175,000
5	Embankment (Material from Excavation)	C.Y.	1.00	410,000	410,000
6	Embankment (Material from Borrow) ...	C.Y.	3.00	380,000	1,140,000
7	Soils Stabilization	L.S.	—	—	60,000
8	Protecting Existing Buildings	L.S.	—	—	120,000
9	Freeway Drainage	L.S.	—	—	172,000
10	Special Pumping Stations	L.S.	—	—	—
	Sub-Total—Grading and Drainage				\$ 3,975,000
SURFACING					
11	Cement Concrete Pavement	S.Y.	\$ 6.50	84,500	\$ 549,250
12	Base Course for Cement Concrete Pavement	S.Y.	1.50	84,500	126,750
13	Bituminous Concrete Pavement	S.Y.	1.50	37,600	56,400
14	Base Course for Bituminous Concrete Pavement	S.Y.	5.00	37,600	188,000
15	Stabilized Shoulder	S.Y.	3.00	24,000	72,000
	Sub-Total—Surfacing				\$ 992,400
MISCELLANEOUS CONSTRUCTION					
16	Maintenance of Traffic	L.S.	\$ —	—	\$ 200,000
17	Barrier Type Curb	L.F.	3.00	33,500	100,500
18	Concrete Curb	L.F.	2.00	8,000	16,000
19	Mountable Type Curb	L.F.	2.50	15,600	39,000
20	Sidewalk and Safety Walk	S.Y.	4.00	10,500	42,000
21	Beam Type Guard Rail	L.F.	4.00	15,500	62,000
22	Fencing	L.F.	3.50	14,000	49,000
23	Landscaping	S.Y.	2.50	125,000	312,500
24	Special Planting	L.S.	—	—	15,000
25	Freeway Lighting	L.S.	—	—	655,000
	Sub-Total—Miscellaneous Construction				\$ 1,491,000
RETAINING WALLS					
26	Retaining Walls (Excavation Shored) ...	S.Y.	\$ 150.00	9,500	\$ 1,425,000
27	Retaining Walls (Excavation not Shored)	S.Y.	110.00	10,300	1,133,000
28	Stone Facing on Retaining Walls	S.Y.	54.00	19,800	1,069,200
	Sub-Total—Retaining Walls				\$ 3,627,200

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
STRUCTURES					
29-1	Elevated Structure—Sta. 94+50 to 126+00 (Incl. Ramp Structures)	L.S.	—	—	\$ 6,938,000
29-2	6th St. N.E. (41)	L.S.	—	—	389,000
29-3	8th St. N.E. (42)	L.S.	—	—	248,000
29-4	9th St. N.E. (43)	L.S.	—	—	207,000
29-5	10th St. N.E. (44)	L.S.	—	—	258,000
29-6	Westbound at 12th St. and K St. N.E. (45)	L.S.	—	—	338,000
29-7	Eastbound at K St. N.E. (46)	L.S.	—	—	295,000
29-8	Eastbound at 12th St. N.E. (47)	L.S.	—	—	113,000
29-9	13th St. N.E. (48)	L.S.	—	—	169,000
29-10	Elevated Structure—Sta. 171+70 to 179+00	L.S.	—	—	870,000
29-11	17th St. N.E. (49)	L.S.	—	—	165,000
29-12	19th St. N.E. (50)	L.S.	—	—	125,000
29-13	21st St. N.E. (51)	L.S.	—	—	139,000
29-14	Westbound at 24th St. N.E. (52)	L.S.	—	—	114,000
29-15	Eastbound at 24th St. N.E. (53)	L.S.	—	—	102,000
29-16	Westbound at Benning Road N.E. (54)	L.S.	—	—	534,000
29-17	Westbound at 26th St. N.E. (55)	L.S.	—	—	111,000
29-18	Eastbound at Oklahoma Ave. N.E. (56)	L.S.	—	—	140,000
	Sub-Total—Structures				\$11,255,000
PUBLIC UTILITIES					
30	Sewer Relocation	L.S.	—	—	\$ 494,000
31	Water Main Relocation	L.S.	—	—	15,000
	Sub-Total—Public Utilities				\$ 509,000
	Total Construction Cost				\$21,849,600

Note:—Numbers in parentheses refer to structure numbers on Plan and Profile Sheets.

SUMMARY

Total Estimated Construction Cost	\$21,850,000
Contingencies	3,278,000
Engineering	2,185,000
	<u>\$27,313,000</u>
Rights-of-Way	17,995,000
Total—Northeast Section	\$45,308,000

ESTIMATE OF COST

EAST ROUTE

ANACOSTIA RIVER TO MOUNT OLIVET ROAD

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
GRADING AND DRAINAGE					
1	Clearing Right-of-Way	L.S.	\$ —	—	\$ 519,000
2	Unclassified Excavation	C.Y.	2.00	600,000	1,200,000
3	Rock Excavation	C.Y.	5.00	—	—
4	Hard Surface Excavation	C.Y.	5.00	23,000	115,000
5	Embankment (Material from Excavation)	C.Y.	1.00	295,000	295,000
6	Embankment (Material from Borrow)...	C.Y.	3.00	—	—
7	Soils Stabilization	L.S.	—	—	35,000
8	Protecting Existing Buildings	L.S.	—	—	65,000
9	Freeway Drainage	L.S.	—	—	274,000
10	Special Pumping Stations	L.S.	—	—	—
	Sub-Total—Grading and Drainage.....				\$ 2,503,000
SURFACING					
11	Cement Concrete Pavement	S.Y.	\$ 6.50	69,500	\$ 451,750
12	Base Course for Cement Concrete Pavement	S.Y.	1.50	69,500	104,250
13	Bituminous Concrete Pavement	S.Y.	1.50	77,000	115,500
14	Base Course for Bituminous Concrete Pavement	S.Y.	5.00	77,000	385,000
15	Stabilized Shoulder	S.Y.	3.00	20,000	60,000
	Sub-Total—Surfacing				\$ 1,116,500
MISCELLANEOUS CONSTRUCTION					
16	Maintenance of Traffic	L.S.	\$ —	—	\$ 200,000
17	Barrier Type Curb	L.F.	3.00	32,000	96,000
18	Concrete Curb	L.F.	2.00	10,000	20,000
19	Mountable Type Curb	L.F.	2.50	16,600	41,500
20	Sidewalk and Safety Walk	S.Y.	4.00	7,500	30,000
21	Beam Type Guard Rail	L.F.	4.00	6,500	26,000
22	Fencing	L.F.	3.50	13,000	45,500
23	Landscaping	S.Y.	2.50	81,000	202,500
24	Special Planting	L.S.	—	—	25,000
25	Freeway Lighting	L.S.	—	—	369,000
	Sub-Total—Miscellaneous Construction.....				\$ 1,055,500
RETAINING WALLS					
26	Retaining Walls (Excavation Shored)...	S.Y.	\$ 150.00	15,000	\$ 2,250,000
27	Retaining Walls (Excavation not Shored)	S.Y.	110.00	3,400	374,000
28	Stone Facing on Retaining Walls.....	S.Y.	54.00	18,400	993,600
	Sub-Total—Retaining Walls				\$ 3,617,600

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
STRUCTURES					
29-1	Southbound at O St. S.E. (57)	L.S.	—	—	\$ 163,000
29-2	N St. S.E. (58)	L.S.	—	—	255,000
29-3	Pennsylvania Ave. S.E. (59)	L.S.	—	—	425,000
29-4	South Carolina Ave. S.E. (60)	L.S.	—	—	243,000
29-5	C St. S.E. (61)	L.S.	—	—	197,000
29-6	Independence Ave. S.E. (62)	L.S.	—	—	130,000
29-7	East Capitol St. S.E. (63)	L.S.	—	—	134,000
29-8	East Capitol St. N.E. (64)	L.S.	—	—	132,000
29-9	Constitution Ave. N.E. (65)	L.S.	—	—	129,000
29-10	C St. N.E. (66)	L.S.	—	—	189,000
29-11	D St. N.E. (67)	L.S.	—	—	147,000
29-12	Maryland Ave. N.E. (68)	L.S.	—	—	267,000
29-13	G St. N.E. (69)	L.S.	—	—	161,000
29-14	Elevated Structure—Sta. 200+70 to 204+40	L.S.	—	—	438,000
29-15	Elevated Structure—Southbound from West Virginia Ave. Sta. 0+00 to 20+00	L.S.	—	—	827,000
29-16	Elevated Structure—Southeastbound Sta. 204+40 to 210+50	L.S.	—	—	315,000
29-17	Elevated Structure—Northwestbound Sta. 204+40 to 217+60	L.S.	—	—	716,000
29-18	Elevated Structure Northbound to West Virginia Ave. Sta. 0+00 to 8+00	L.S.	—	—	330,000
29-19	Elevated Structure—Northbound over West Virginia Ave. (Southbound) Sta. 24+10 to 30+70	L.S.	—	—	243,000
	Sub-Total—Structures				\$ 5,441,000
PUBLIC UTILITIES					
30	Sewer Relocation	L.S.	—	—	\$ 715,000
31	Water Main Relocation	L.S.	—	—	20,000
	Sub-Total—Public Utilities				\$ 735,000
	Total Construction Cost				\$14,468,600

Note: Estimate for entire Interchange C is included in estimate for Southeast Section of South Route. Numbers in parentheses refer to structure numbers on Plan and Profile Sheets.

SUMMARY

Total Estimated Construction Cost	\$14,469,000
Contingencies	2,171,000
Engineering	1,447,000
	<u>\$18,087,000</u>
Rights-of-Way	8,664,000
Total—East Route	\$26,751,000

ESTIMATE OF COST

CENTER ROUTE

SOUTHWEST SECTION TO NORTHWEST SECTION

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
GRADING AND DRAINAGE					
1	Clearing Right-of-Way	L.S.	\$ —	—	\$ 713,000
2	Unclassified Excavation	C.Y.	2.00	1,150,000	2,300,000
3	Rock Excavation	C.Y.	5.00	—	—
4	Hard Surface Excavation	C.Y.	5.00	26,000	130,000
5	Embankment (Material from Excavation)	C.Y.	1.00	—	—
6	Embankment (Material from Borrow) ...	C.Y.	3.00	—	—
7	Soils Stabilization	L.S.	—	—	60,000
8	Protecting Existing Buildings	L.S.	—	—	40,000
9	Freeway Drainage	L.S.	—	—	246,000
10	Special Pumping Stations	L.S.	—	—	119,000
	Sub-Total—Grading and Drainage				\$ 3,608,000
SURFACING					
11	Cement Concrete Pavement	S.Y.	\$ 6.50	72,500	\$ 471,250
12	Base Course for Cement Concrete Pavement	S.Y.	1.50	72,500	108,750
13	Bituminous Concrete Pavement	S.Y.	1.50	34,600	51,900
14	Base Course for Bituminous Concrete Pavement	S.Y.	5.00	34,600	173,000
15	Stabilized Shoulder	S.Y.	3.00	18,000	54,000
	Sub-Total—Surfacing				\$ 858,900
MISCELLANEOUS CONSTRUCTION					
16	Maintenance of Traffic	L.S.	\$ —	—	\$ 300,000
17	Barrier Type Curb	L.F.	3.00	29,000	87,000
18	Concrete Curb	L.F.	2.00	15,000	30,000
19	Mountable Type Curb	L.F.	2.50	11,000	27,500
20	Sidewalk and Safety Walk	S.Y.	4.00	4,000	16,000
21	Beam Type Guard Rail	L.F.	4.00	2,500	10,000
22	Fencing	L.F.	3.50	14,000	49,000
23	Landscaping	S.Y.	2.50	114,000	285,000
24	Special Planting	L.S.	—	—	20,000
25	Freeway Lighting	L.S.	—	—	502,000
	Sub-Total—Miscellaneous Construction				\$ 1,326,500
RETAINING WALLS					
26	Retaining Walls (Excavation Shored) ...	S.Y.	\$ 150.00	18,200	\$ 2,730,000
27	Retaining Walls (Excavation not Shored)	S.Y.	110.00	—	—
28	Stone Facing on Retaining Walls	S.Y.	54.00	18,200	982,800
	Sub-Total—Retaining Walls				\$ 3,712,800

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
STRUCTURES					
29-1	D St. S.W.	(70) L.S.	\$ —	—	\$ 291,000
29-2	Independence Ave. S.W.	(71) L.S.	—	—	248,000
29-3	Maryland Ave. S.W.	(72) L.S.	—	—	249,000
29-4	Pennsylvania Ave. N.W.	(73) L.S.	—	—	371,000
29-5	Constitution Ave. N.W.	(74) L.S.	—	—	328,000
29-6	C St. N.W.	(75) L.S.	—	—	241,000
29-7	Indiana Ave. N.W.	(76) L.S.	—	—	342,000
29-8	2nd St. N.W.	(77) L.S.	—	—	137,000
29-9	D St. N.W.	(78) L.S.	—	—	168,000
29-10	E St. N.W.	(79) L.S.	—	—	252,000
29-11	F St. N.W.	(80) L.S.	—	—	158,000
29-12	G St. N.W.	(81) L.S.	—	—	213,000
29-13	Massachusetts Ave. N.W.	(82) L.S.	—	—	170,000
29-14	Cut and Cover Section—Sta. 55+40 to 59+40	L.F.	4,000.00	400	1,600,000
29-15	Cut and Cover Section—Ramp from Massachusetts Ave. N.W.	L.F.	1,000.00	410	410,000
29-16	Cut and Cover Section—Ramp to 3rd St. N.W.	L.F.	1,000.00	320	320,000
29-17	K St. N.W.	(83) L.S.	—	—	270,000
29-18	L St. N.W.	(84) L.S.	—	—	166,000
29-19	New York Ave. N.W.	(85) L.S.	—	—	303,000
29-20	M St. N.W.	(86) L.S.	—	—	168,000
29-21	N St. N.W.	(87) L.S.	—	—	190,000
29-22	O St. N.W.	(88) L.S.	—	—	173,000
Sub-Total—Structures					\$ 6,768,000
PUBLIC UTILITIES					
30	Sewer Relocation	L.S.	—	—	\$ 2,390,000
31	Water Main Relocation	L.S.	—	—	86,000
Sub-Total—Public Utilities					\$ 2,476,000
Total Construction Cost					\$18,750,200

Note:—Numbers in parentheses refer to structure numbers on Plan and Profile Sheets.

SUMMARY

Total Estimated Construction Cost	\$18,751,000
Contingencies	2,813,000
Engineering	1,876,000
	<u>\$23,440,000</u>
Rights-of-Way	12,382,000
Total—Center Route	\$35,822,000

ESTIMATE OF COST

SOUTHWEST SECTION OF SOUTH ROUTE

LINCOLN MEMORIAL TO SOUTH CAPITOL STREET

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
STRUCTURES					
29-1	Cut and Cover Section— Sta. 8+10 to 14+10	L.F.	\$4,000.00	600	\$ 2,400,000
29-2	Ramp	(89) L.S.	—	—	216,000
29-3	Tidal Basin Inlet Bridge	(90) L.S.	—	—	461,000
29-4	Highway Bridge Approach	(91) L.S.	—	—	291,000
29-5	Highway Bridge Approach	(92) L.S.	—	—	306,000
29-6	Highway Bridge Approach	(93) L.S.	—	—	197,000
29-7	14th St. Approach	(94) L.S.	—	—	362,000
29-8	Pennsylvania Railroad	(95) L.S.	—	—	676,000
29-9	Washington Channel Bridge	(96) L.S.	—	—	3,445,000
29-10	Elevated Structure— Ramp to 11th St. S.W.	L.S.	—	—	630,000
29-11	9th St. S.W.	(97) L.S.	—	—	334,000
29-12	7th St. S.W.	(98) L.S.	—	—	295,000
29-13	4th St. S.W.	(99) L.S.	—	—	280,000
29-14	Interchange D	(100) L.S.	—	—	226,000
29-15	Pennsylvania Railroad Interchange D	(101) L.S.	—	—	702,000
29-16	Pennsylvania Railroad Interchange D	(102) L.S.	—	—	1,661,000
29-17	Elevated Structure— Sta. 137+00 to 154+00 (Incl. Ramp Structures)	L.S.	—	—	3,157,000
Sub-Total—Structures					\$15,639,000
PUBLIC UTILITIES					
30	Sewer Relocation	L.S.	—	—	\$ 1,766,000
31	Water Main Relocation	L.S.	—	—	25,000
Sub-Total—Public Utilities					\$ 1,791,000
Total Construction Cost					\$26,443,000
RETAINING WALLS					
26	Retaining Walls (Excavation Shored) ...	S.Y.	\$ 300.00	4,100	\$ 1,230,000
27	Retaining Walls (Excavation not Shored)	S.Y.	275.00	6,800	1,870,000
28	Stone Facing on Retaining Walls	S.Y.	54.00	10,900	588,600
Sub-Total—Retaining Walls					\$ 3,688,600

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
GRADING AND DRAINAGE					
1	Clearing Right-of-Way	L.S.	\$ —	—	\$ —
2	Unclassified Excavation	C.Y.	2.00	445,000	890,000
3	Rock Excavation	C.Y.	5.00	—	—
4	Hard Surface Excavation	C.Y.	5.00	57,000	285,000
5	Embankment (Material from Excavation)	C.Y.	1.00	390,000	390,000
6	Embankment (Material from Borrow) ...	C.Y.	3.00	—	—
7	Soils Stabilization	L.S.	—	—	45,000
8	Protecting Existing Buildings	L.S.	—	—	—
9	Freeway Drainage	L.S.	—	—	287,000
10	Special Pumping Stations	L.S.	—	—	60,000
	Sub-Total—Grading and Drainage				\$ 1,957,000
SURFACING					
11	Cement Concrete Pavement	S.Y.	\$ 6.50	116,000	\$ 754,000
12	Base Course for Cement Concrete Pavement	S.Y.	1.50	116,000	174,000
13	Bituminous Concrete Pavement	S.Y.	1.50	76,600	114,900
14	Base Course for Bituminous Concrete Pavement	S.Y.	5.00	76,600	383,000
15	Stabilized Shoulder	S.Y.	3.00	36,000	108,000
	Sub-Total—Surfacing				\$ 1,533,900
MISCELLANEOUS CONSTRUCTION					
16	Maintenance of Traffic	L.S.	\$ —	—	\$ 375,000
17	Barrier Type Curb	L.F.	3.00	68,000	204,000
18	Concrete Curb	L.F.	2.00	13,500	27,000
19	Mountable Type Curb	L.F.	2.50	36,600	91,500
20	Sidewalk and Safety Walk	S.Y.	4.00	19,500	78,000
21	Beam Type Guard Rail	L.F.	4.00	20,500	82,000
22	Fencing	L.F.	3.50	14,000	49,000
23	Landscaping	S.Y.	2.50	136,000	340,000
24	Special Planting	L.S.	—	—	65,000
25	Freeway Lighting	L.S.	—	—	522,000
	Sub-Total—Miscellaneous Construction				\$ 1,833,500

Note:—Numbers in parentheses refer to structure numbers on Plan and Profile Sheets.

SUMMARY

Total Estimated Construction Cost	\$26,443,000
Contingencies	3,967,000
Engineering	2,645,000
	<u>\$33,055,000</u>
Rights-of-Way	1,290,000
Total—Southwest Section	\$34,345,000

ESTIMATE OF COST

SOUTHEAST SECTION OF SOUTH ROUTE

SOUTH CAPITOL STREET TO SOUSA BRIDGE

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
GRADING AND DRAINAGE					
1	Clearing Right-of-Way	L.S.	\$ —	—	\$ 556,000
2	Unclassified Excavation	C.Y.	2.00	130,000	260,000
3	Rock Excavation	C.Y.	5.00	—	—
4	Hard Surface Excavation	C.Y.	5.00	21,000	105,000
5	Embankment (Material from Excavation) .	C.Y.	1.00	130,000	130,000
6	Embankment (Material from Borrow) ...	C.Y.	3.00	745,000	2,235,000
7	Soil Stabilization	L.S.	—	—	50,000
8	Protecting Existing Buildings	L.S.	—	—	15,000
9	Freeway Drainage	L.S.	—	—	84,000
10	Special Pumping Stations	L.S.	—	—	—
	Sub-Total—Grading and Drainage.....				\$ 3,435,000
SURFACING					
11	Cement Concrete Pavement	S.Y.	\$ 6.50	72,500	\$ 471,250
12	Base Course for Cement Concrete Pavement	S.Y.	1.50	72,500	108,750
13	Bituminous Concrete Pavement.....	S.Y.	1.50	12,600	18,900
14	Base Course for Bituminous Concrete Pavement	S.Y.	5.00	12,600	63,000
15	Stabilized Shoulder	S.Y.	3.00	26,000	78,000
	Sub-Total—Surfacing				\$ 739,900
MISCELLANEOUS CONSTRUCTION					
16	Maintenance of Traffic.....	L.S.	\$ —	—	\$ 125,000
17	Barrier Type Curb.....	L.F.	3.00	28,500	85,500
18	Concrete Curb	L.F.	2.00	4,000	8,000
19	Mountable Type Curb.....	L.F.	2.50	18,000	45,000
20	Sidewalk and Safety Walk.....	S.Y.	4.00	6,000	24,000
21	Beam Type Guard Rail.....	L.F.	4.00	27,000	108,000
22	Fencing	L.F.	3.50	9,000	31,500
23	Landscaping	S.Y.	2.50	120,000	300,000
24	Special Planting	L.S.	—	—	25,000
25	Freeway Lighting	L.S.	—	—	483,000
	Sub-Total—Miscellaneous Construction				\$ 1,235,000
RETAINING WALLS					
26	Retaining Walls (Excavation Shored) ...	S.Y.	\$ 300.00	700	\$ 210,000
27	Retaining Walls (Excavation not Shored)	S.Y.	275.00	4,200	1,155,000
28	Stone Facing on Retaining Walls.....	S.Y.	54.00	4,900	264,600
	Sub-Total—Retaining Walls				\$ 1,629,600

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
STRUCTURES					
29-1	Elevated Structure— Sta. 154+00 to 191+50 (Incl. Ramp Structures)	L.S.	—	—	\$ 4,130,000
29-2	8th St. S.E. (103)	L.S.	—	—	367,000
29-3	G St. S.E. (104)	L.S.	—	—	360,000
29-4	Interchange C (105)	L.S.	—	—	422,000
29-5	Interchange C (106)	L.S.	—	—	206,000
29-6	Interchange C (107)	L.S.	—	—	203,000
29-7	Interchange C (108)	L.S.	—	—	163,000
29-8	Potomac Ave. S.E. (109)	L.S.	—	—	586,000
29-9	13th St. S.E. (110)	L.S.	—	—	223,000
29-10	Interchange C (111)	L.S.	—	—	179,000
29-11	14th St. S.E. (112)	L.S.	—	—	219,000
29-12	15th St. S.E. (113)	L.S.	—	—	196,000
29-13	Pennsylvania Ave. S.E. (Southbound)	(114) L.S.	—	—	207,000
29-14	Interchange C (115)	L.S.	—	—	174,000
29-15	Interchange C (116)	L.S.	—	—	131,000
29-16	Interchange C (117)	L.S.	—	—	104,000
29-17	Interchange C (118)	L.S.	—	—	291,000
29-18	Interchange C (119)	L.S.	—	—	162,000
29-19	M St. S.E. (120)	L.S.	—	—	239,000
29-20	12th St. S.E. and Pennsylvania Railroad	(144) L.S.	—	—	212,000
Sub-Total—Structures					\$ 8,774,000
PUBLIC UTILITIES					
30	Sewer Relocation	L.S.	—	—	\$ 46,000
31	Water Main Relocation	L.S.	—	—	15,000
Sub-Total—Public Utilities					\$ 61,000
Total Construction Cost					\$15,874,500

Note:—Numbers in parentheses refer to structure numbers on Plan and Profile Sheets.

SUMMARY

Total Estimated Construction Cost	\$15,875,000
Contingencies	2,382,000
Engineering	1,588,000
	<u>\$19,845,000</u>
Rights-of-Way	8,766,000
Total—Southeast Section	\$28,611,000

ESTIMATE OF COST

ALTERNATE CENTER ROUTE

SOUTHWEST SECTION TO NORTHWEST SECTION

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
GRADING AND DRAINAGE					
1	Clearing Right-of-Way	L.S.	\$ —	—	\$ 802,000
2	Unclassified Excavation	C.Y.	2.00	1,010,000	2,020,000
3	Rock Excavation	C.Y.	5.00	—	—
4	Hard Surface Excavation	C.Y.	5.00	22,600	113,000
5	Embankment (Material from Excavation) .	C.Y.	1.00	—	—
6	Embankment (Material from Borrow)	C.Y.	3.00	—	—
7	Soil Stabilization	L.S.	—	—	60,000
8	Protecting Existing Buildings	L.S.	—	—	25,000
9	Freeway Drainage	L.S.	—	—	140,000
10	Special Pumping Stations	L.S.	—	—	118,000
	Sub-Total—Grading and Drainage				\$ 3,278,000
SURFACING					
11	Cement Concrete Pavement	S.Y.	\$ 6.50	63,000	\$ 409,500
12	Base Course for Cement Concrete Pavement	S.Y.	1.50	63,000	94,500
13	Bituminous Concrete Pavement	S.Y.	1.50	32,000	48,000
14	Base Course for Bituminous Concrete Pavement	S.Y.	5.00	32,000	160,000
15	Stabilized Shoulder	S.Y.	3.00	14,000	42,000
	Sub-Total—Surfacing				\$ 754,000
MISCELLANEOUS CONSTRUCTION					
16	Maintenance of Traffic	L.S.	\$ —	—	\$ 300,000
17	Barrier Type Curb	L.F.	3.00	33,000	99,000
18	Concrete Curb	L.F.	2.00	12,000	24,000
19	Mountable Type Curb	L.F.	2.50	11,400	28,500
20	Sidewalk and Safety Walk	S.Y.	4.00	7,000	28,000
21	Beam Type Guard Rail	L.F.	4.00	3,500	14,000
22	Fencing	L.F.	3.50	12,000	42,000
23	Landscaping	S.Y.	2.50	95,000	237,500
24	Special Planting	L.S.	—	—	20,000
25	Freeway Lighting	L.S.	—	—	644,000
	Sub-Total—Miscellaneous Construction				\$ 1,437,000
RETAINING WALLS					
26	Retaining Walls (Excavation Shored) ...	S.Y.	\$ 150.00	13,500	\$ 2,025,000
27	Retaining Walls (Excavation not Shored) .	S.Y.	110.00	—	—
28	Stone Facing on Retaining Walls	S.Y.	54.00	13,500	729,000
	Sub-Total—Retaining Walls				\$ 2,754,000

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
STRUCTURES					
29-1	D St. S.W. (121)	L.S.	\$ —	—	\$ 327,000
29-2	Ramp (122)	L.S.	—	—	59,000
29-3	Cut and Cover Section— Sta. 11+70 to 25+50	L.F.	4,000.00	1,380	5,520,000
29-4	Constitution Ave. N.W. (123)	L.S.	—	—	466,000
29-5	2nd St. N.W. (124)	L.S.	—	—	127,000
29-6	Indiana Ave. N.W. (125)	L.S.	—	—	479,000
29-7	D St. N.W. (126)	L.S.	—	—	142,000
29-8	E St. N.W. (127)	L.S.	—	—	272,000
29-9	2nd St. and F St. N.W. (128)	L.S.	—	—	527,000
29-10	G St. N.W. (129)	L.S.	—	—	219,000
29-11	Massachusetts Ave. N.W. (82)	L.S.	—	—	170,000
29-12	Cut and Cover Section— Sta. 55+40 to 59+40	L.F.	4,000.00	400	1,600,000
29-13	Cut and Cover Section— Ramp from Massachusetts Ave. N.W. . .	L.F.	1,000.00	410	410,000
29-14	Cut and Cover Section— Ramp to 3rd St. N.W.	L.F.	1,000.00	320	320,000
29-15	K St. N.W. (83)	L.S.	—	—	270,000
29-16	L St. N.W. (84)	L.S.	—	—	166,000
29-17	New York Ave. N.W. (85)	L.S.	—	—	303,000
29-18	M St. N.W. (86)	L.S.	—	—	168,000
29-19	N St. N.W. (87)	L.S.	—	—	190,000
29-20	O St. N.W. (88)	L.S.	—	—	173,000
	Sub-Total—Structures				\$11,908,000
PUBLIC UTILITIES					
30	Sewer Relocation	L.S.	—	—	\$ 2,390,000
31	Water Main Relocation	L.S.	—	—	86,000
	Sub-Total—Public Utilities				\$ 2,476,000
	Total Construction Cost				\$22,607,000

Note:—Numbers in parentheses refer to structure numbers on Plan and Profile Sheets.

SUMMARY

Total Estimated Construction Cost	\$22,607,000
Contingencies	3,392,000
Engineering	2,261,000
	<u>\$28,260,000</u>
Rights-of-Way	14,237,000
Total—Alternate Center Route	\$42,497,000

ESTIMATE OF COST

ALTERNATE SOUTHWEST SECTION OF SOUTH ROUTE

LINCOLN MEMORIAL TO SOUTH CAPITOL STREET

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
GRADING AND DRAINAGE					
1	Clearing Right-of-Way	L.S.	\$ —	—	\$ —
2	Unclassified Excavation	C.Y.	2.00	470,000	940,000
3	Rock Excavation	C.Y.	5.00	—	—
4	Hard Surface Excavation	C.Y.	5.00	55,000	275,000
5	Embankment (Material from Excavation) .	C.Y.	1.00	470,000	470,000
6	Embankment (Material from Borrow)	C.Y.	3.00	555,000	1,665,000
7	Soils Stabilization	L.S.	—	—	135,000
8	Protecting Existing Buildings	L.S.	—	—	—
9	Freeway Drainage	L.S.	—	—	338,000
10	Special Pumping Stations	L.S.	—	—	95,000
	Sub-Total—Grading and Drainage				\$ 3,918,000
SURFACING					
11	Cement Concrete Pavement	S.Y.	\$ 6.50	133,500	\$ 867,750
12	Base Course for Cement Concrete Pavement	S.Y.	1.50	123,500	185,250
13	Bituminous Concrete Pavement	S.Y.	1.50	85,000	127,500
14	Base Course for Bituminous Concrete Pavement	S.Y.	5.00	80,000	400,000
15	Stabilized Shoulder	S.Y.	3.00	36,000	108,000
	Sub-Total—Surfacing				\$ 1,688,500
MISCELLANEOUS CONSTRUCTION					
16	Maintenance of Traffic	L.S.	\$ —	—	\$ 375,000
17	Barrier Type Curb	L.F.	3.00	75,500	226,500
18	Concrete Curb	L.F.	2.00	21,000	42,000
19	Mountable Type Curb	L.F.	2.50	26,000	65,000
20	Sidewalk and Safety Walk	S.Y.	4.00	19,500	78,000
21	Beam Type Guard Rail	L.F.	4.00	26,000	104,000
22	Fencing	L.F.	3.50	15,000	52,500
23	Landscaping	S.Y.	2.50	200,000	500,000
24	Special Planting	L.S.	—	—	70,000
25	Freeway Lighting	L.S.	—	—	748,000
	Sub-Total—Miscellaneous Construction				\$ 2,261,000
RETAINING WALLS					
26	Retaining Walls (Excavation Shored) ...	S.Y.	\$ 300.00	2,500	\$ 750,000
27	Retaining Walls (Excavation not Shored) .	S.Y.	275.00	12,400	3,410,000
28	Stone Facing on Retaining Walls	S.Y.	54.00	14,900	804,600
	Sub-Total—Retaining Walls				\$ 4,964,600

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Amount</u>
STRUCTURES					
29-1	Cut and Cover Section — Sta. 17+30 to 23+30	L.F.	\$4,000.00	600	\$ 2,400,000
29-2	Interchange E	(130) L.S.	—	—	289,000
29-3	Interchange E	(131) L.S.	—	—	274,000
29-4	Interchange E	(132) L.S.	—	—	395,000
29-5	Tidal Basin Bridge	(133) L.S.	—	—	510,000
29-6	15th St. S.W.	(134) L.S.	—	—	408,000
29-7	14th St. S.W.	(135) L.S.	—	—	382,000
29-8	Pennsylvania Railroad	(136) L.S.	—	—	454,000
29-9	Special Sea Wall	L.F.	410.00	1,600	656,000
29-10	Highway Bridge Approach	(137) L.S.	—	—	327,000
29-11	14th St. Approach	(138) L.S.	—	—	200,000
29-12	Pennsylvania Railroad	(139) L.S.	—	—	453,000
29-13	Washington Channel Bridge	(140) L.S.	—	—	2,884,000
29-14	Elevated Structure—Eastbound Sta. 93+40 to 100+20	L.S.	—	—	700,000
29-15	Elevated Structure— Ramp to 11th St. S.W.	L.S.	—	—	394,000
29-16	Elevated Structure— Ramp to Maine Ave.	L.S.	—	—	184,000
29-17	Westbound at 12th St. and Maine Ave. S.W.	(141) L.S.	—	—	440,000
29-18	9th St. S.W.	(142) L.S.	—	—	334,000
29-19	7th St. S.W.	(143) L.S.	—	—	340,000
29-20	4th St. S.W.	(99) L.S.	—	—	280,000
29-21	Interchange D	(100) L.S.	—	—	226,000
29-22	Pennsylvania Railroad Interchange D	(101) L.S.	—	—	702,000
29-23	Pennsylvania Railroad Interchange D	(102) L.S.	—	—	1,661,000
29-24	Elevated Structure— Sta. 137+00 to 154+00 (Including Ramp Structures)	L.S.	—	—	3,157,000
	Sub-Total—Structures				\$18,050,000
PUBLIC UTILITIES					
30	Sewer Relocation	L.S.	—	—	\$ 1,766,000
31	Water Main Relocation	L.S.	—	—	25,000
	Sub-Total—Public Utilities				\$ 1,791,000
	Total Construction Cost				\$32,673,100

Note:—Numbers in parentheses refer to structure numbers on Plan and Profile Sheets.

SUMMARY

Total Estimated Construction Cost	\$32,674,000
Contingencies	4,902,000
Engineering	3,268,000
	<u>\$40,844,000</u>
Rights-of-Way	1,353,000
Total—Alternate Southwest Section	\$42,197,000