

D. S. Johnson

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Comparison of
ALTERNATE LOCATIONS
for the
EAST - WEST EXPRESSWAY
from Broad Street in Hartford
to Overbrook Road in West Hartford

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CONNECTICUT HIGHWAY DEPARTMENT
in cooperation with
U.S. BUREAU OF PUBLIC ROADS
March 1954

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A L T E R N A T E L O C A T I O N S
for the
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PART I

I N T R O D U C T I O N

Earlier Studies

In 1945 the Connecticut Highway Department published a report of an engineering study for Expressways in the Hartford Metropolitan Area. This report presented a general plan for expressway construction in the Hartford - New Britain area, including an east-west expressway through Hartford and West Hartford and an expressway from the center of New Britain easterly to the expressway south of Hartford. The Hartford - West Hartford route followed the axis of the heavy traffic flow between the centers of those communities on a line between Capitol and Farmington Avenues in Hartford and the Boulevard and Farmington Avenue in West Hartford. At Trout Brook in West Hartford it curved south and then southwest to Corbin Corner.

Subsequent studies by the Hartford Flood Commission in 1946 and the Hartford Engineering Department in 1947 proposed routings which, although differing in location in the center of Hartford, agreed substantially with the State location west from the central area. A joint study by the Engineering Departments of Hartford and West Hartford in 1949, and revised in 1950, proposed a radical departure from the 1947 plan of the Hartford Engineering Department with a routing south through Pope Park, following the South Branch of the Park River to Flatbush Avenue in Hartford and curving west through West Hartford to Corbin Corner. A spur curving back to the north and west from Pope Park, terminating at Sisson

Avenue in Hartford, was proposed to accommodate the heavy traffic flow between the centers of Hartford and West Hartford.

In 1949 a report was published by Mr. Robert Moses, which reviewed all the earlier locations and recommended a location differing from the others through the Central Business District of Hartford but concurring in the Highway Department location west of the railroad depot. The report went further to state "that the route along the South Branch of the Park River, proposed in the Hartford - West Hartford engineers' study, fails to serve adequately suburban traffic."

Purpose and Scope

There has been a general acceptance of the Highway Department location for the East-West Expressway easterly from Broad Street in Hartford and westerly from Overbrook Road in West Hartford. In January 1950 the City and Town Councils of Hartford and West Hartford, respectively, passed resolutions expressing a preference for the Park River - Flatbush Avenue routing between Broad Street in Hartford and Overbrook Road in West Hartford.

In consideration of these expressions of preference the Highway Department undertook the following comparative study of the relative merits of the Hartford - West Hartford and State proposals for the East-West Expressway between Broad Street in Hartford and Overbrook Road in West Hartford.

PART II

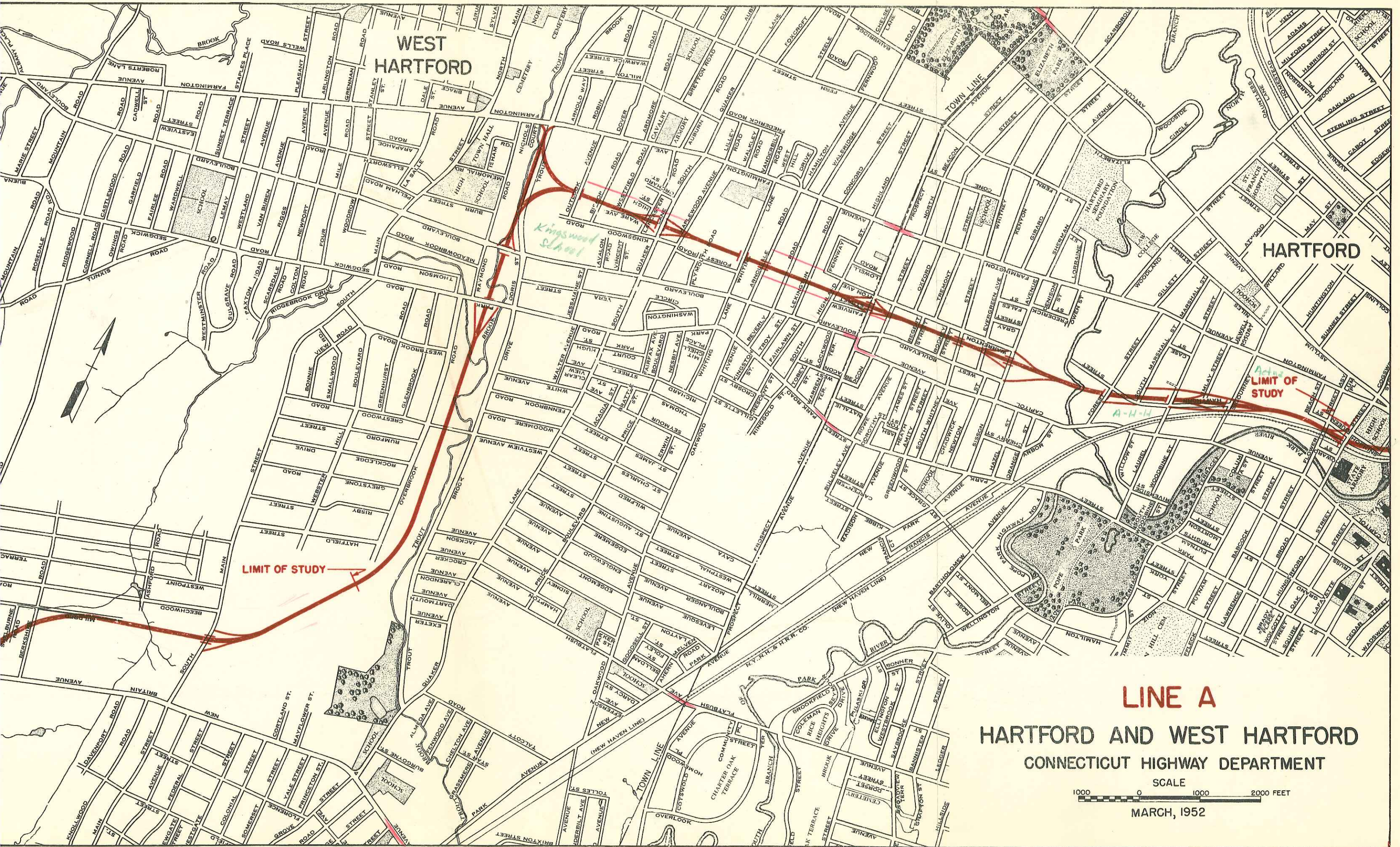
DESCRIPTION OF ALTERNATE ROUTES

Location

In the following pages the Department proposal is shown as "Line A" on Figure 1, and the Hartford - West Hartford proposal is shown as "Line B" on Figure 2. The limits of the study, which are common to both lines, are indicated at Broad Street in Hartford and Overbrook Road in West Hartford. Hereinafter the lines will be referred to by the letter designations.

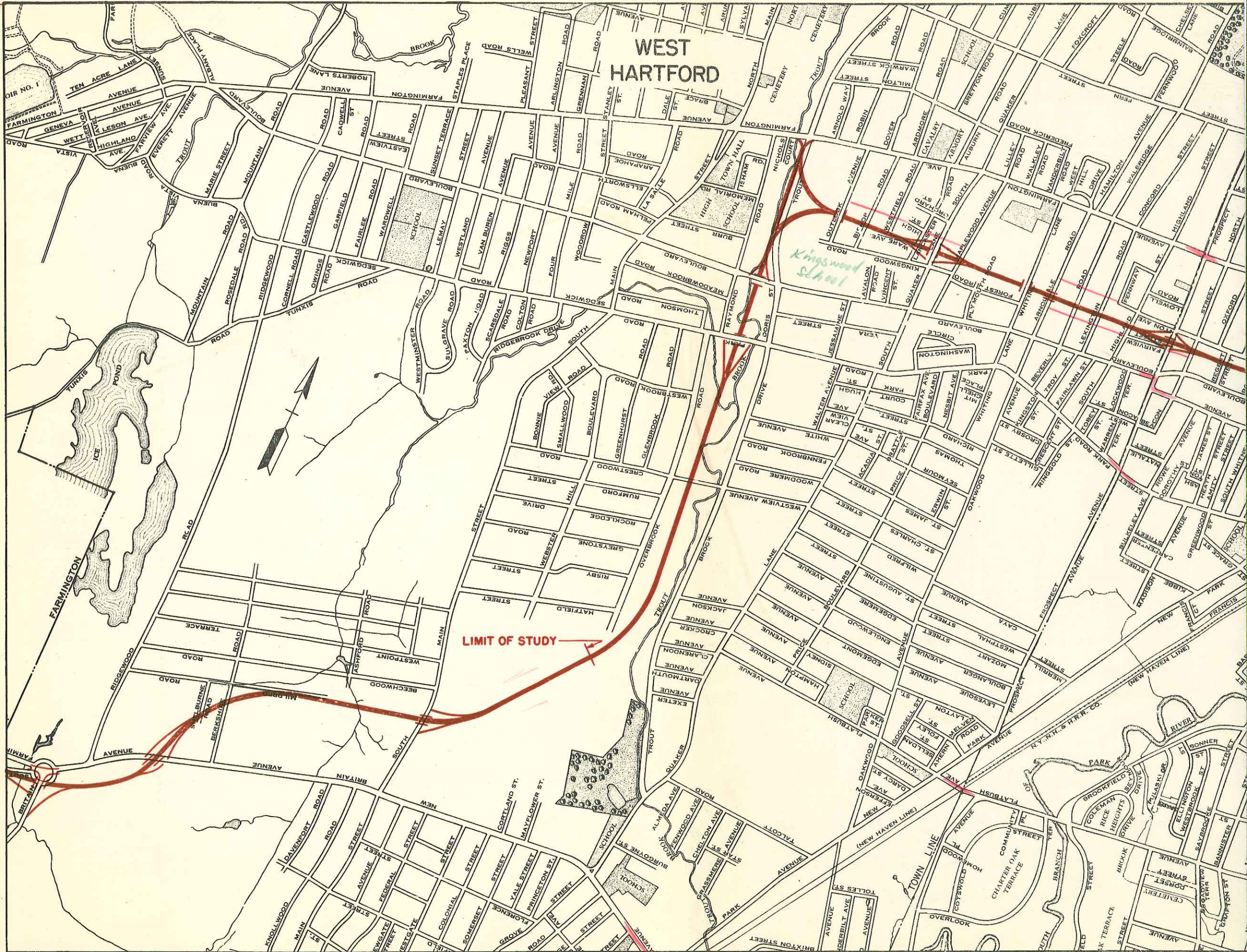
Line A heads directly west from Broad Street toward the center of West Hartford. Ramps are provided at the principal cross streets which will distribute and collect traffic to and from the east-west arterial streets. Just west of Outlook Avenue an interchange provides connection to the ramps at Farmington Avenue and the Boulevard. The main line turns south and follows the Trout Brook valley to the end of Overbrook Road, the westerly limit of the study.

Line B diverges from Line A just west of Broad Street, overpassing the railroad on a long skew bridge. It then follows the winding course of the Park River, part of which would be enclosed in a conduit. A substantial portion of Pope Park is used for the mainline expressway and an interchange between it and a spur expressway, the latter recrossing the railroad to connect with Sisson Avenue. Ramps connect directly with the Capitol Avenue and Park Street arterials rather than to distributing



LINE A
HARTFORD AND WEST HARTFORD
CONNECTICUT HIGHWAY DEPARTMENT

SCALE
 1000 0 1000 2000 FEET
 MARCH, 1952



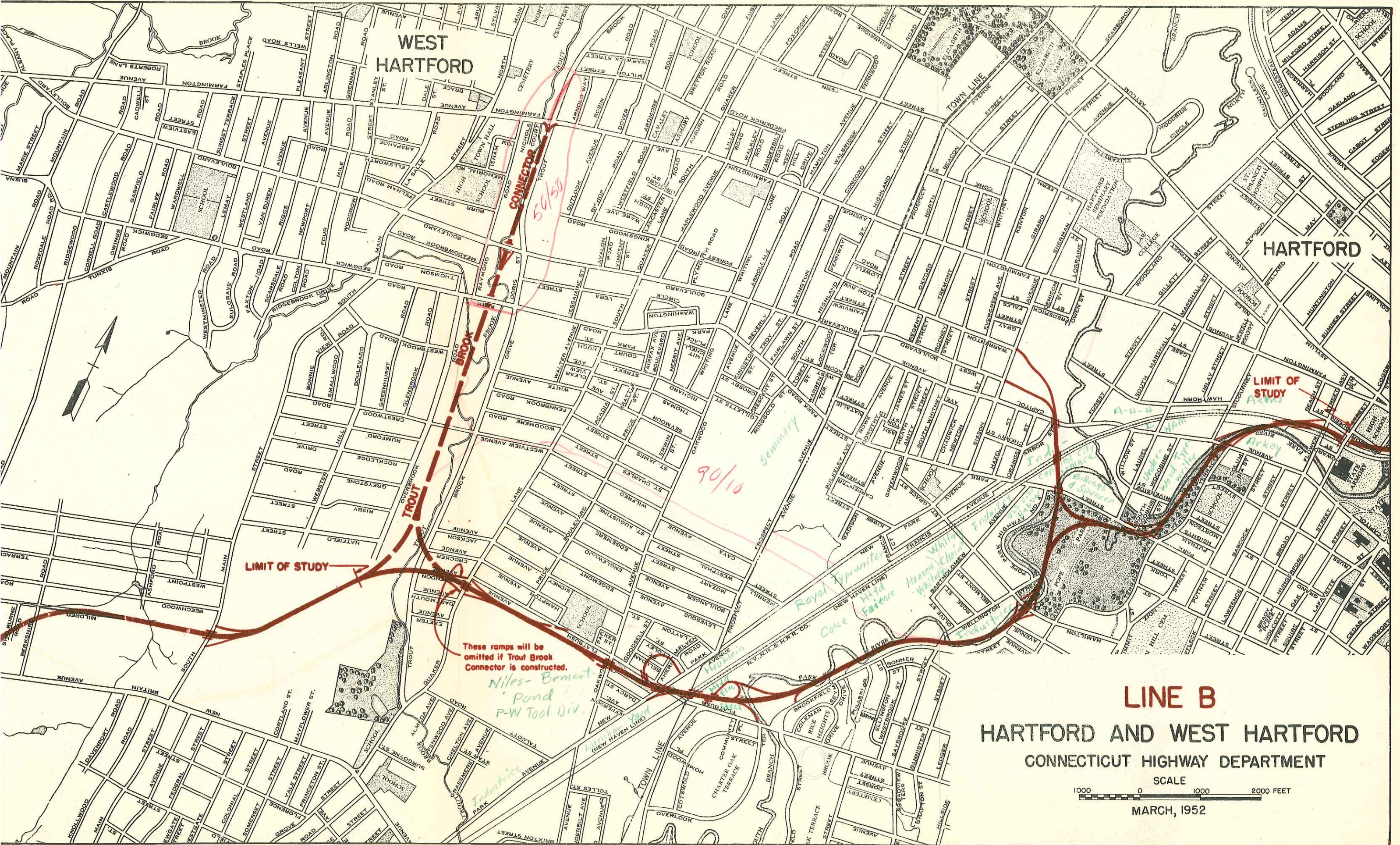
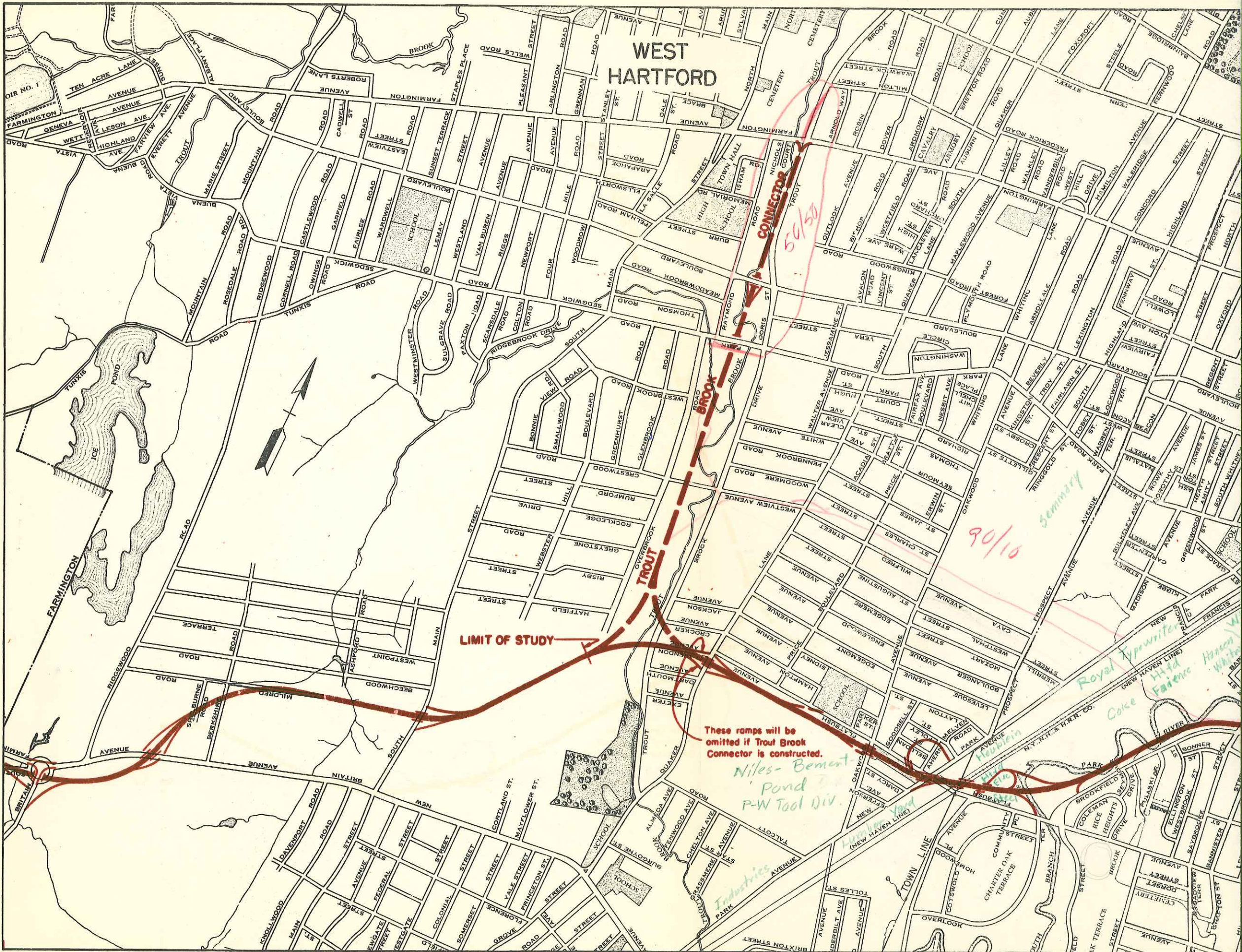


Figure 2



WEST HARTFORD

LIMIT OF STUDY

These ramps will be omitted if Trout Brook Connector is constructed.

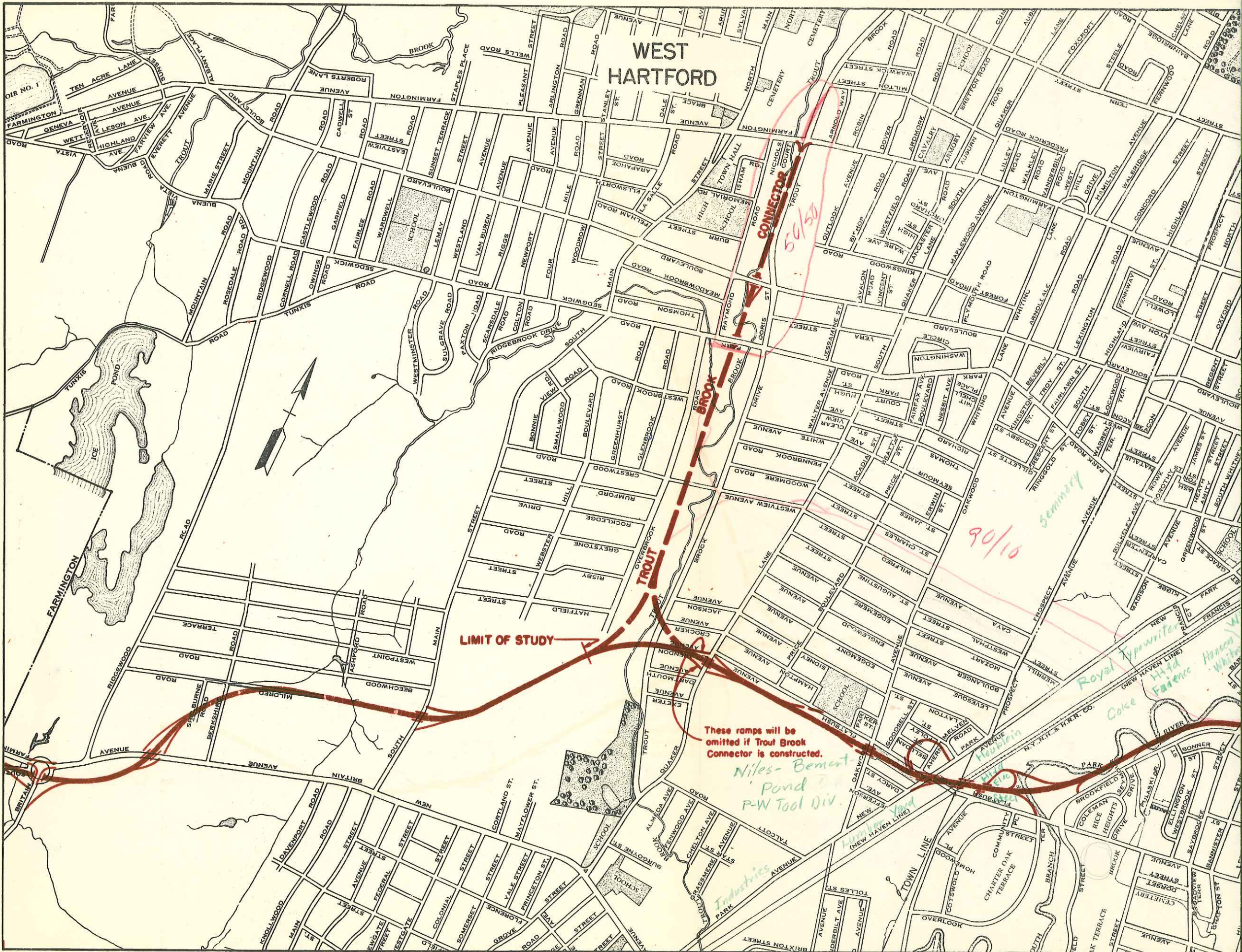
Niles-Bement Pond P-W Tool Div.

90/10 Summary

Royal Apartments
Hick Hill
Coke Factory

Industries Park

Huntington



and collecting cross streets. Line B continues southwesterly along the undeveloped valley of the South Branch of the Park River to Flatbush Avenue. Here it turns west and combines with a railroad grade crossing elimination of Flatbush Avenue. It then continues west through the northern portion of the Niles-Bement-Pond property and joins the route of Line A at the point designated as the westerly limit of the study.

The Trout Brook Connector, shown as a dashed line on Figure 2, traverses the Trout Brook Valley, between Line B and Farmington Avenue, in West Hartford. This connector was added to Line B to provide a third alternate proposal for comparison in this study. Hereinafter this alternate will be referred to as "Line B with the Trout Brook Connector."

Type of Facility

Either Line A or B would be modern six lane expressways with a median strip separating the opposing streams of traffic. Access would be limited to the ramp connections and all cross streets would be grade separated. In some locations grade limitations would necessitate the severing of local streets. In such cases connecting service roads would be constructed, where practicable, to continue circulation on the local system. Pedestrians would not be permitted on the expressway with the exception of the Flatbush Avenue railroad crossing section on Line B where pedestrian walks would be provided.

Length

Line A is 4.0 miles long between the limits of the study. The interchange and spur to Farmington Avenue add 0.6 mile for a total length of 4.6 miles. Line B is 3.6 miles long between the limits of the study.

The Pope Park interchange and spur to Sisson Avenue add 1.1 miles for a total of 4.7 miles. If the Trout Brook connector and interchange are added to Line B this additional 2.0 miles gives a total length of 6.7 miles.

Curvature

Except for the interchange near West Hartford center, Line A is nearly straight with no curve sharper than 5° . Line B follows a reversing curved alignment from Broad Street to a point 0.5 mile south of Hamilton Street. This almost continuous series of 8° curves would restrict the majority of drivers to about 40 m.p.h. in this 1.8 miles section. South and west of this point, although still curving, the sharpest curve is 5° .

Gradient

Complete profiles have not been prepared for either line but grades on either would comply with Highway Department expressway standards and would not differ sufficiently to affect the comparison of the lines.

PART III

TRAFFIC SERVICE

Basic Assumptions

The relative traffic service afforded by Lines A and B cannot be compared without taking into consideration other planned facilities which will alter the present traffic pattern. The following assumptions have been made in estimating the traffic which will be diverted to either line:

1. The expressway system from Broad Street east through the Hartford business center and connecting with the north-south riverfront expressway system and the Connecticut River bridges will be completed before construction west of Broad Street.
2. The expressway will be completed west of the limit of this study to Schoolhouse Corner in Farmington.
3. The New Britain expressway will be completed with consequent diversion of through traffic now on Route 6 as well as New Britain - Hartford traffic now on Hartford and West Hartford streets. This expressway will be part of Interstate Route 6.
4. The 1970 traffic volumes on the expressway will be double the 1950 volumes. Further development of vehicle storage facilities in the Hartford business district, as now planned or projected, and redevelopment of fringe areas to permit continued expansion of the business district will be necessary if this traffic expansion is to be realized.

Present Street System

In 1949 and 1950 average speeds on the more important streets of Hartford and West Hartford were determined by measuring the time for trips in both directions during peak and off-peak hours. In general,

average speeds increased with the distance away from the center of Hartford. For example, on four of the important east-west arteries, the following average speeds were measured:

AVERAGE SPEED ON EAST-WEST ARTERIES

<u>Section</u>		<u>East-West Artery (m.p.h.)</u>			
		<u>Asylum St. & Av.</u>	<u>Farming-ton Av.</u>	<u>Capitol Av. & Blvd.</u>	<u>Park St. & Rd.</u>
<u>From</u>	<u>To</u>				
Hartford					
Main St.	Broad St.	10	--	13	13
Broad St.	Sigourney St. ¹ / ₁	21	10	10	14
Sigourney St. ¹ / ₁	Sisson Av. ² / ₂	17	13	18	20
Sisson Av. ² / ₂	Prospect Av.	23	20	17	20
West Hartford					
Prospect Av.	Quaker Lane ³ / ₃	27	22	24	20
Quaker Lane ³ / ₃	Main St.	30	23	26	29

- ¹/₁ Laurel St. instead of Sigourney St. on Park St.
- ²/₂ Woodland St. instead of Sisson Av. on Asylum Av.
- ³/₃ Steele Rd. instead of Quaker Lane on Asylum Av.

With average speeds of 25 to 30 miles per hour observed on uncongested streets it is evident that there is some degree of congestion on the above arteries as far west as Quaker Lane, excepting Asylum Avenue. The average speed for New Park Avenue is 24 miles per hour for its entire length between Park Street in Hartford and New Britain Avenue in West Hartford. New Britain Avenue is congested in spots with the following average speeds recorded:

AVERAGE SPEED ON NEW BRITAIN AVENUE

	<u>Section</u>	<u>M.P.H.</u>
Hartford	Washington St. to Broad St.	16
	Broad St. to White St.	22
	White St. to Newington Av.	15
	Newington Av. to South St.	25
West Htfd.	South St. to Quaker La. South	16
	Quaker La. South to So. Main St.	25

The traffic volumes recorded along these same streets confirm the speed measurements of congestion.

Origin of Traffic

Traffic counts and origin and destination surveys made since the report in 1945 on Expressways in the Metropolitan Area confirm the relative importance of traffic generators in the area with West Hartford by far the most important generator to the west of Hartford.

Assignment of Traffic

In 1950 and 1951 traffic volumes were recorded at strategic locations on the arterial streets. By combining these traffic volumes with the percentage distributions of traffic obtained in the origin and destination surveys, the traffic divertible to the alternate lines was developed. The assignment of traffic to Lines A, B and B with the Trout Brook Connector was made on the following basis:

1. Speeds on expressway between ramps and interchanges would average 45 miles per hour except where limited by curvature to an average of 40 miles per hour.
2. Speeds on expressway interchanges at Trout Brook on Line A and in Pope Park on Line B would average 35 miles per hour.
3. Speeds on expressway ramps would average 20 miles per hour.
4. Speeds on city streets would be as determined by measurements made in 1950.
5. Percentage diversion to the expressway would vary with the relative trip time via the expressway compared with that via existing streets as determined by recent studies of expressway facilities.

Figure 3 on the following page shows graphically the estimated volume of traffic that would use each line in 1970. The steps in the three profiles occur at the interchange and ramp locations along the

1970 TRAFFIC PROFILE

FOR ALTERNATE LOCATIONS

1978 ADT
Smith Report
Pg. 18

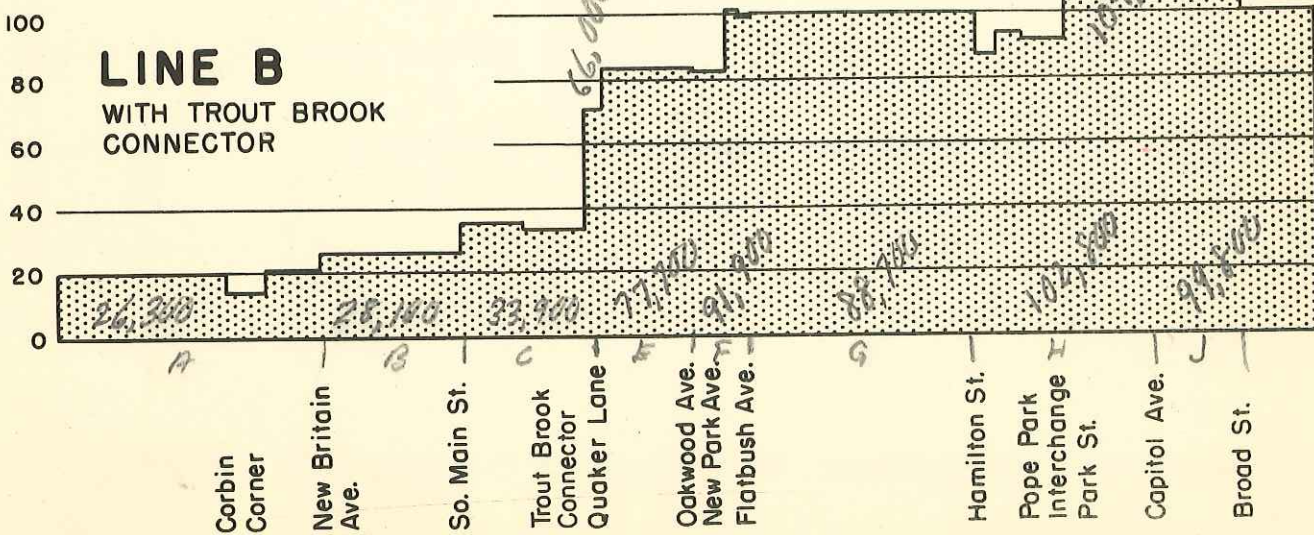
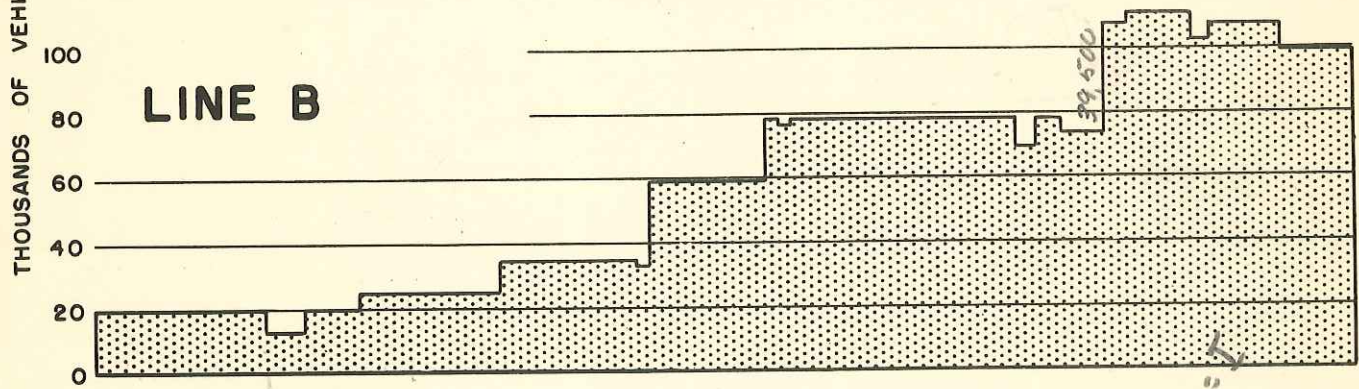
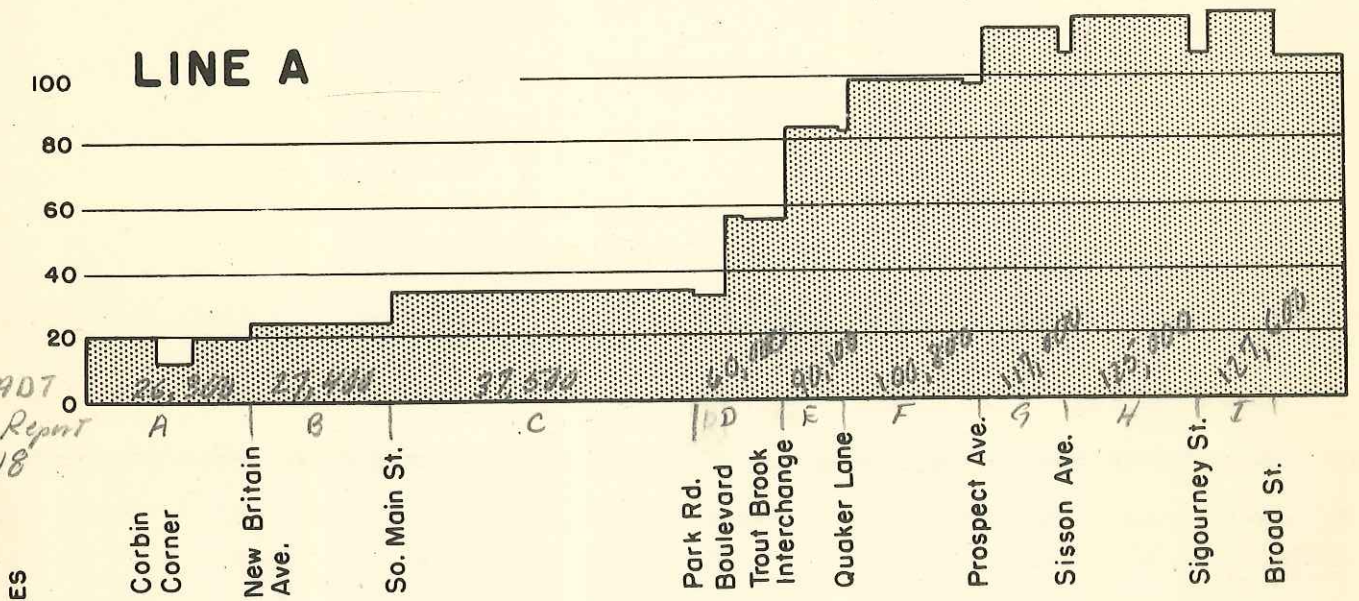


Figure 3

expressway.

Line A portrays relatively uniform steps as the volume builds up from the west to the east (left to right). This indicates good location of line and ramps with respect to the traffic demand. The steeper rises at the Boulevard and the Trout Brook interchange are caused by the heavy traffic movements that would use these access points to and from the center of West Hartford.

Line B portrays irregular steps, with abrupt changes occurring at Quaker Lane and the Pope Park interchange, as the volume builds up from the west to the east. These abrupt changes are caused by the heavy traffic movements that would use these access points to and from the center of West Hartford.

Line B with the Trout Brook Connector portrays irregular steps, with an abrupt change occurring at the Trout Brook Connector, as the volume builds up from the west to the east. This abrupt change is caused by the heavy traffic movements that would use this connector to and from the center of West Hartford.

Thus, the profiles, repeatedly, point up the need for serving the important traffic movement between the centers of Hartford and West Hartford. Reference back to Figures 1 and 2 shows that Line A is in-direction to serve this traffic, whereas, Line B is greatly out-of-direction to serve it. With Line B some of this traffic would use the Quaker Lane and Sisson Avenue ramps. The 39,500 vehicles in 1970 that would use the latter would create extreme congestion at the ramp terminals and on the local street system influenced by the ramps during peak hour movements between the centers of Hartford and West Hartford. The addition

of the Trout Brook Connector to Line B would alleviate the condition at Sisson Avenue, as shown in the profile, but would add greatly to the distance of travel for the Hartford - West Hartford traffic.

Congestion Relief

The relief of congestion on present streets bears a direct relationship to the number of vehicles diverted to the expressway, provided ramps are properly located to collect and distribute the traffic without creating additional congestion. With the expressway, however, some travel is necessary on existing streets by vehicles going to and coming from the ramp connections. The "before and after expressway" daily vehicle miles of travel for divertible vehicles in 1970 are shown for each line in the following table:

DAILY VEHICLE MILES OF TRAVEL FOR DIVERTIBLE VEHICLES IN 1970

<u>Line</u>	<u>Without Expressway</u>	<u>With Expressway</u>	
	<u>Existing Streets</u>	<u>Existing Streets</u>	<u>Expressway</u>
A	587,000	166,000	478,000
B	527,000	183,000	438,000
B with Trout Brook Connector	550,000	140,000	540,000

The net relief to existing streets would be the difference between the daily vehicle miles of travel on existing streets without an expressway and with an expressway, as shown in the following table:

DAILY VEHICLE MILES OF TRAVEL FOR DIVERTIBLE VEHICLES
ON EXISTING STREETS IN 1970

<u>Line</u>	<u>Without Expressway</u>	<u>With Expressway</u>	<u>Net Decrease</u>
A	587,000	166,000	421,000
B	527,000	183,000	344,000
B with Trout Brook Connector	550,000	140,000	410,000

In 1970 Line A would remove from the street systems of Hartford and West Hartford 77,000 more daily vehicle miles of travel than would Line B and 11,000 more daily vehicle miles of travel than would Line B with the Trout Brook Connector.

Distance and Time Savings

Comparing the distance and time for vehicles diverted to the expressway with that on existing streets between the same points the total savings for each line were computed. In most cases travel via the expressway was longer than via existing streets, because of out-of-direction travel to and from the ramps, and distance savings resulted in a negative quantity. Using the conservative values of \$17 per 365 vehicle miles and \$5 per 365 vehicle minutes, as detailed in the appendix, the following annual values were computed for each line:

DISTANCE AND TIME SAVINGS IN 1970

<u>Line</u>	<u>Distance (Daily Vehicle Miles)</u>	<u>Time (Daily Vehicle Minutes)</u>	<u>Annual Savings in Dollars</u>		
			<u>Distance</u>	<u>Time</u>	<u>Total</u>
A	- 57,000	758,000	- 970,000	3,790,000	2,820,000
B	- 94,000	627,000	-1,600,000	3,140,000	1,540,000
B with Trout Brook Connector	-130,000	658,000	-2,210,000	3,290,000	1,080,000

These figures show that Line A will provide the greatest time savings and least distance loss and therefore the greatest total dollar savings. Line B provides the least time savings, an intermediate distance loss, and an intermediate total dollar savings. Line B with the Trout Brook Connector shows an intermediate time savings but the greatest distance loss and the least total dollar savings.

Accident Savings

A study was made of the accident records on the major streets in Hartford and West Hartford for the year 1949. The following accidents were reported during the year:

Total Accidents	1946
Fatalities	7
Personal Injuries	796
Property Damage	\$322,575

In the same year there were 482,700 average daily vehicle miles of travel over these streets. Expressed at the rate per 100 million vehicle miles of travel there were:

Total Accidents	1105
Fatalities	4.0
Personal Injuries	450
Property Damage	\$183,000

On existing Connecticut expressways during the four years 1946-1949 the rates per 100 million vehicle miles of travel were:

Total Accidents	240
Fatalities	1.3
Personal Injuries	140
Property Damage	\$ 77,600

Reducing these figures to dollar values, using average values of the National Safety Council, the following rates are obtained:

	<u>Hartford and West Hartford Streets</u>	<u>Connecticut Expressways</u>
Fatalities	(4.0 x \$20,000) \$ 80,000	(1.3 x \$20,000) \$ 26,000
Personal Injuries	(450 x \$300) 135,000	(140 x \$300) 42,000
Property Damage	183,000	77,600
Total (per 100 million vehicle miles)	\$398,000	\$145,600

Applying these rates to the daily vehicle miles of travel on expressway or existing streets previously developed, the annual savings in accident costs and in number of fatalities for the year 1970 are:

<u>Line</u>	<u>Annual Accident Savings in Dollars</u>	<u>Annual Savings in Number of Fatalities</u>
A	\$360,000	3.9
B	270,000	2.9
B with Trout Brook Connector	310,000	3.4

The annual difference in fatalities saved seems small. However, if a 30 year period* is considered, Line A would save 30 more lives than Line B, and 15 more than Line B with the Trout Brook Connector. In this same period of time the monetary value of accident savings on Line A would be \$2,700,000 greater than on Line B and \$1,500,000 greater than on Line B with the Trout Brook Connector.

*Taking into consideration the earliest possible completion date for the expressway, and the capacity of the expressway and the local street system in the vicinity of the interchanges, it is believed that traffic conditions for the year 1970 will approximate the average year of a 30 year comparison period following completion of construction.

PART IV

DIRECT COSTS

Right of way and construction costs for the three alternate plans are based on 1953 prices and are shown in the following table:

ALTERNATE RIGHT OF WAY AND CONSTRUCTION COSTS

Line	Section		1953 Prices		
	From	To	Right of Way	Construction	Total
A					
	Broad St.	Sisson Ave.	\$2,560,000	\$ 1,900,000	\$ 4,460,000
	Sisson Ave.	Town Line	1,470,000	990,000	2,460,000
	Town Line	Overbrook Rd.	3,920,000	3,980,000	7,900,000
	Sub-Total		\$7,950,000	\$ 6,870,000	\$14,820,000
	Utility relocation and restoration costs				210,000
	Right of way demolition costs and legal fees				800,000
	Engineering				570,000
	Contingencies				1,900,000
	Total				\$18,300,000
B					
	Broad St.	Sisson Ave.	\$1,250,000	\$ 9,630,000	\$10,880,000
	Pope Park	Town Line	500,000	2,630,000	3,130,000
	Town Line	Overbrook Rd.	1,500,000	1,860,000	3,360,000
	Sub-Total		\$3,250,000	\$14,120,000	\$17,370,000
	Utility relocation and restoration costs				90,000
	Right of way demolition costs and legal fees				330,000
	Engineering				1,140,000
	Contingencies				2,140,000
	Total				\$21,070,000
B with Trout Brook Connector					
	Line B		\$3,250,000	\$14,120,000	\$17,370,000
	Trout Trook Connector		140,000	2,340,000	2,480,000
	Sub-Total		\$3,390,000	\$16,460,000	\$19,850,000
	Utility relocation and restoration costs				110,000
	Right of way demolition costs and legal fees				340,000
	Engineering				1,330,000
	Contingencies				2,440,000
	Total				\$24,070,000

No financing costs are included in the above figures.

Right of Way

In Hartford the right of way for Line A would cost \$2,280,000 more than for Line B. In West Hartford it would cost \$2,420,000 more than for Line B and \$2,280,000 more than for Line B with the Trout Brook Connector.

Construction

Extremely costly construction on Line B more than outweighs its cheaper right of way. This is particularly true for the section between Broad Street and Sisson Avenue. The latter point would be a logical and useful break point between development stages. The bare construction cost of this section is estimated at \$7,730,000 more on Line B which is about 0.4 mile longer than Line A. The additional length, which for much of the traffic is circuitous, does not begin to account for the difference in construction cost. The \$7,730,000 difference is largely due to the cost of structures, such as, enclosing the Park River in a conduit for 1,600 feet to about 400' south of Capitol Avenue, a viaduct from Capitol Avenue to Park Street as well as extensive retaining walls.

Line B exceeds Line A, from Broad Street to the Overbrook Road common point, by \$7,250,000 in construction cost. If the Trout Brook Connector is included the difference in construction cost is raised to \$9,590,000.

Maintenance Cost

Annual maintenance costs, computed at \$4,000 per mile, result in the following:

<u>Line</u>	<u>Annual Maintenance Cost</u>
A	\$18,000
B	19,000
B with Trout Brook Connector	27,000

PART V

EFFECT ON THE COMMUNITY

Traffic Conditions

In Part III, Traffic Service, it was shown that Line A was superior to Line B or Line B with the Trout Brook Connector in decreasing travel on local streets and in saving time and accidents. This is particularly true of the large volume of traffic between the centers of Hartford and West Hartford. Line A provides a direct connection to the center of West Hartford and would remove most of this through traffic from Fern Street, Farmington Avenue, Boulevard and Park Road. Line B serves this traffic at the Quaker Lane and Sisson Avenue ramps. The 39,500 average daily vehicles in 1970 that would use the latter would create serious congestion at the ramp terminals and on the local street system influenced by the ramps during the peak hour movements between the centers of Hartford and West Hartford. Traffic on the residential streets of West Boulevard and Warrenton Avenue, directly opposite the Sisson Avenue ramps, would be increased to the point of complete stagnation. The addition of the Trout Brook Connector improves Line B in this respect but because of the extra distance involved it does not divert as much traffic as Line A.

Displacement of Families, Business and Industry

In February 1951 the following estimate was made of buildings required for right of way and the number of families affected:

<u>Line</u>	U n i t s			
	Residential		Commercial	Industrial
	Houses	Families		
A	269	532	17	1
B	78	214	14	10
B with Trout Brook Connector	80	216	16	10

Of these totals there were in Hartford:

<u>Line</u>	U n i t s			
	Residential		Commercial	Industrial
	Houses	Families		
A	141	352	15	1
B	30	94	9	10
B with Trout Brook Connector	30	94	9	10

and in West Hartford:

<u>Line</u>	U n i t s			
	Residential		Commercial	Industrial
	Houses	Families		
A	128	180	2	--
B	48	120	5	--
B with Trout Brook Connector	50	122	7	--

Reduction in Grand List and Tax Loss

The 1951 assessed valuation of property required for right of way was estimated as follows:

<u>Line</u>	Assessed Valuation of Right of Way	
	Hartford	West Hartford
	A	\$1,669,000
B	789,000	444,000
B with Trout Brook Connector	789,000	493,000

Applying the 1953 tax rates of 38.0 mills in Hartford and 33.5 mills in West Hartford to the assessed valuations the annual tax loss to each community would be:

<u>Line</u>	<u>Annual Tax Loss</u>	
	<u>Hartford</u>	<u>West Hartford</u>
A	\$63,000	\$39,000
B	30,000	15,000
B with Trout Brook Connector	30,000	17,000

Based on experience elsewhere it is felt that this revenue loss will be short-lived. Improved accessibility will retard the obsolescence of existing business property in Hartford and encourage additional investments in both communities.

Utilization of Park Land

Line B occupies a large part of Pope Park with the expressway and a complicated interchange. No value for this public property was included in the estimate of the right of way cost nor does it affect the grand list and tax losses. The value of the park to residents in this thickly populated section of Hartford is intangible but should be considered in the final decision. Its cost of replacement would go beyond making up the additional \$880,000 removed from the Hartford grand list by Line A as compared with Line B.

Street Pattern

Line A severs Flower Street, Evergreen Avenue, Rodney Street, Regent Street and Beacon Street in Hartford. Except for Regent Street, which is only one block long, all of these streets are only a short block from a parallel street providing a crossing of the expressway. In West Hartford, it severs Highland Street, Lexington Road, Beverly Road, Maplewood Avenue, Lancaster Road and Bishop Road. Lexington Road is two blocks and the other streets only one block from a parallel street providing a crossing of the expressway. Service roads will be constructed,

where practicable, to avoid dead end streets.

Line B also severs Flower Street in Hartford. Brookfield Street is relocated east of its present location from Wilson Street to Harbison Avenue. The section of Brookfield Street between Harbison Avenue and Hamilton Street is eliminated. Wellington Street, which is now served only by a footbridge over the Park River is cut. In West Hartford, Seldan and Ahern Streets are cut by the New Park Avenue ramp. Clarendon Avenue is eliminated and streets in the temporary housing development leading from Clarendon Avenue are affected.

Railroad Grade Crossing Eliminations

Both Line A and Line B sever Flower Street, thus eliminating traffic on the railroad grade crossing.

Both Line A and Line B are so laid out that the railroad grade crossing at Sigourney Street can be eliminated. This requires for both lines the construction of a viaduct overpassing the railroad and Capitol Avenue and the extension of Sigourney Street to connect with Park Terrace. The cost of this improvement would be comparable for both lines. Therefore, this improvement was not included in the cost for Line B, and only the cost of the grade separation structure for the expressway at Sigourney Street was included in the cost for Line A.

Line B also eliminates the railroad grade crossing at Flatbush Avenue by providing access to the expressway at Flatbush Avenue and New Park Avenue, eliminating the section of Flatbush Avenue between Newfield Avenue and New Park Avenue. The savings to local traffic in time by eliminating the delays caused by trains would be counterbalanced by the loss of time and distance in using the circuitous ramps necessary to meet grade requirements.

PART VI

RATIO OF BENEFITS TO COSTS

In an economic evaluation of highway improvements thirty years is accepted as a reasonable interval of time for benefits to at least equal costs. Distance savings, time savings, and accident savings were computed for the average year (1970) of the 30 year period in Part III of this report. Costs of right of way, construction and maintenance were tabulated in Part IV for each alternate. It must be kept in mind that, although these direct costs could be computed for any particular section of expressway, the benefits to traffic could not be so segregated. The total trip had to be considered for vehicles on each alternate in order to evaluate distance savings or losses, time savings, and the relationship between distance traveled on expressway and on local streets. Thus, the ratio of benefits to costs will be abnormally high. However, a comparison of the ratios will indicate the relative value of the lines studied.

Average Annual Benefits for Thirty Year Period

The average annual benefits for traffic diverted to the expressway are shown below:

<u>Type of Savings</u>	<u>Line A</u>	<u>Line B</u>	<u>Line B with Trout Brook Connector</u>
Distance	-\$ 970,000	-\$1,600,000	-\$2,210,000
Time	3,790,000	3,140,000	3,290,000
Accident	360,000	270,000	310,000
Total	\$3,180,000	\$1,810,000	\$1,390,000

The above average annual savings are impressive when compared with the temporary annual tax losses to Hartford and West Hartford totaling \$102,000 for Line A, \$45,000 for Line B, and \$47,000 for Line B with the Trout Brook Connector.

Average Annual Costs for Thirty Year Period

Prorating the cost of right of way and construction over a thirty year period to arrive at the average annual cost for these items and adding the annual maintenance cost results in the following:

<u>Item of Cost</u>	<u>Line A</u>	<u>Line B</u>	<u>Line B with Trout Brook Connector</u>
Right of Way and Construction	\$610,000	\$702,000	\$802,000
Maintenance	<u>18,000</u>	<u>19,000</u>	<u>27,000</u>
Total	\$628,000	\$721,000	\$829,000

Benefit-Cost Ratio

The economic worth of the alternate locations can be measured by relating the annual benefits to the annual costs as follows:

<u>Line</u>	<u>Annual Benefits</u>	<u>÷</u>	<u>Annual Costs</u>	<u>=</u>	<u>Ratio</u>
A	\$3,180,000		\$628,000		5.1
B	1,810,000		721,000		2.5
B with Trout Brook Connector	1,390,000		829,000		1.7

Dividing 5.1 by 2.5 and by 1.7 the "value" of Line A can be said to be 2.0 times greater than that of Line B and 3.0 times greater than that of Line B with the Trout Brook Connector. Likewise, dividing 2.5 by 1.7 the "value" of Line B is 1.5 times greater than that of Line B with the Trout Brook Connector.

PART VII

SUMMARY AND CONCLUSIONS

1. West Hartford is the principal generator of traffic west of Hartford.
2. Line A traverses a direct line between the centers of Hartford and West Hartford before curving south and west toward Corbin Corner. Line B courses a winding route to the south and west, away from the center of West Hartford, toward Corbin Corner and has a spur back to Sisson Avenue in Hartford. The addition of the Trout Brook Connector links Line B to West Hartford center.
3. The construction length of Line A is 4.6 miles, Line B 4.7 miles and Line B with the Trout Brook Connector 6.7 miles. The distance between Broad Street and Sisson Avenue via Line A is 0.4 mile shorter than via Line B.
4. Line A has one sharp curve at the Trout Brook interchange. Line B has a series of reversing curves for a distance of 1.8 miles that will restrict safe speeds to about 40 miles per hour in this section.
5. Line A would divert a greater total volume of traffic than would either Line B or Line B with the Trout Brook Connector.
6. On Line A the access points would be located at well spaced intervals with respect to collecting and distributing traffic at the principal cross streets. On Line B the 39,500 daily vehicles in 1970 that would

use the Sisson Avenue ramps would cause extreme congestion on the ramps and on the local street system influenced by the ramps during the peak hour movements of traffic between the centers of Hartford and West Hartford. Traffic on the residential streets of West Boulevard and Warrenton Avenue, directly opposite these ramps, would be increased to the point of complete stagnation. The addition of the Trout Brook Connector to Line B would alleviate the condition at Sisson Avenue but would increase greatly the distance of travel for the Hartford - West Hartford traffic.

7. In 1970 the daily vehicle miles of travel on existing streets in Hartford and West Hartford would be reduced by 421,000 with Line A, 344,000 with Line B and 410,000 with Line B with the Trout Brook Connector. Thus, in 1970 Line A would reduce the travel on existing streets in Hartford and West Hartford by 77,000 more daily vehicle miles than would Line B and 11,000 more than would Line B with the Trout Brook Connector.
8. In the thirty year period following construction the annual distance and time savings would amount to \$2,820,000 for Line A, \$1,540,000 for Line B and \$1,080,000 for Line B with the Trout Brook Connector. Thus, these annual benefits for Line A would amount to \$1,280,000 more than for Line B and \$1,740,000 more than for Line B with the Trout Brook Connector.
9. In this same period of time Line A would save 30 (117-87) more lives than would Line B and 15 (117-102) more than would Line B with the Trout Brook Connector. Although money cannot compensate fully for

loss of life, injury, or human suffering, previous experience has indicated a monetary value reflecting the insurable cost of accidents to society. Thus, over the thirty years the total accident savings on Line A would amount to \$2,700,000 (\$10,800,000 - \$8,100,000) over Line B and \$1,500,000 (\$10,800,000 - \$9,300,000) over Line B with the Trout Brook Connector.

10. The total cost of right of way and construction, including provision for utilities, demolition, legal fees, engineering and contingencies, would be \$18,300,000 for Line A, \$21,070,000 for Line B and \$24,070,000 for Line B with the Trout Brook Connector. Thus, the total cost of right of way and construction for Line A would be \$2,770,000 less than for Line B and \$5,770,000 less than for Line B with the Trout Brook Connector.
11. Line A displaces 532 family units, 17 commercial units and 1 industrial unit. Line B displaces 214 family units, 14 commercial units and 10 industrial units. Line B with the Trout Brook Connector displaces 216 family units, 16 commercial units and 10 industrial units. Thus, Line A would displace 318 more family units, 3 more commercial units and 9 less industrial units than would Line B and 316 more family units, 1 more commercial unit and 9 less industrial units than would Line B with the Trout Brook Connector.
12. The annual tax loss to Hartford would be \$63,000 on Line A and \$30,000 on Line B. To West Hartford it would be \$39,000 on Line A, \$15,000 on Line B and \$17,000 on Line B with the Trout Brook Connector. Thus, in Hartford this would amount to \$33,000 more on Line A than on Line B

and in West Hartford it would amount to \$24,000 more on Line A than on Line B and \$22,000 more on Line A than on Line B with the Trout Brook Connector. The tax loss, based on experience elsewhere, would be temporary.

13. Line B would occupy a large part of Pope Park.
14. Line A severs more local streets than Line B, but in most cases a parallel street crossing the expressway is only one block away and at the most only two blocks. Flower Street is the only major cross street severed and it is severed by both lines.
15. Line B would eliminate the railroad grade crossing at Flatbush Avenue. However, the circuitous ramp arrangements necessary to meet the grade requirements, would inconvenience the local users of the crossing.
16. The benefit-to-cost ratio on a thirty year basis is 5.1 for Line A, 2.5 for Line B and 1.7 for Line B with the Trout Brook Connector.
17. The relative value of Line A is 2 times greater than Line B and 3 times greater than Line B with the Trout Brook Connector.

PART VIII

RECOMMENDATION

In order to provide a facility that will afford the greatest relief to traffic congestion and the greatest benefits to the road users and the communities, commensurate with the cost, it is recommended that Line A be adopted for the location of the East-West Expressway from Broad Street in Hartford to Overbrook Road in West Hartford.

A P P E N D I X

MILEAGE ELEMENT COSTS

(Cents per Mile)

<u>Mileage Elements</u>	<u>Passenger Cars</u>	<u>T r u c k s</u>	
		<u>Light & Medium</u>	<u>Heavy & Semitrailers</u>
Gasoline at 25¢/gal.	1.67	--	--
Gasoline at 23¢/gal.	--	2.00	4.25
Oil at 35¢/qt.	0.27	--	--
Oil at 20¢/qt.	--	0.24	0.48
Tires and Tubes	0.30	1.30	2.90
Maintenance	0.79	3.10	4.37
Depreciation	<u>0.95 (2/3)</u>	<u>2.26</u>	<u>6.80</u>
Totals	3.98	8.90	19.30

ANNUAL MILEAGE COSTS PER DAILY VEHICLE MILE

<u>Type</u>	<u>Cents per Mile</u>	<u>Computation</u>	<u>Use</u>
Passenger Cars	3.98	$\frac{3.98 \times 365}{100} = \14.50	\$14
Light and Medium Trucks	8.90	$\frac{8.90 \times 365}{100} = \32.50	\$32
Heavy Trucks & Semitrailers	19.30	$\frac{19.30 \times 365}{100} = \70.50	\$70
Average, if traffic composition is 90% passenger cars, 8% light and medium trucks, 2% heavy trucks and tractor-trucks with semitrailers			\$17

FIXED (TIME) COSTS

(Dollars per Year)

<u>Fixed Elements</u>	<u>Passenger Car for business</u>	<u>T r u c k s</u>	
		<u>Light & Medium</u>	<u>Heavy & Semitrailers</u>
Depreciation	50 (1/3)		
Interest	50	70	280
Registration	7	20	110
Driver's License	3	3	3
Insurance	70	200	320
Storage	60	90	140
Driver's Wages	<u>3600</u>	<u>2500</u>	<u>4200</u>
Totals	3840	2883	5053

ANNUAL TIME COSTS PER DAILY VEHICLE MINUTE

(Based on 50 weeks of 48 hours each)

<u>Type</u>	<u>Cents per minute</u>	<u>Computation</u>	<u>Use</u>
Passenger Cars ($\frac{1}{2}$ business)	1.3	$\frac{1.3 \times 365}{100} = \4.70	\$ 5
Light & Medium Trucks	2.0	$\frac{2.0 \times 365}{100} = \7.30	\$ 7
Heavy Trucks & Semitrailers	3.5	$\frac{3.5 \times 365}{100} = \12.80	\$13
Average, if traffic composition is 90% passenger cars, 8% light and medium trucks, 2% heavy trucks and tractor-trucks with semitrailers			\$ 5