MIS SUMMARY

8.1 INTEGRATION OF THE MIS AND EIS PROCESSES

The purpose of an MIS is to determine the functional, environmental, construction and financial feasibility of completing a specific roadway improvement project, and to do so in the stages of a project. Through the MIS process, a "short list" of the most feasible alternatives is developed and only the alternatives that are best able to address the identified transportation deficiencies in an environmentally and financially sound manner are advanced for further analysis in the EIS. To this end, several potential alternatives are developed and preliminarily evaluated for their ability to address specified transportation deficiencies in accordance with federal, state and local resource protection objectives. The MIS process allows for the "weeding out" of infeasible and undesirable alternatives prior to committing the time and resources necessary to study them in detail in the NEPA process.

AC Membership

Army Corps of Engineers
CT Historic Preservation Office
CT Office of Policy and Management
CT State Representatives
Dept. of Environmental Protection
Environmental Protection Agency
Federal Highway Administration
New London Water Department
Southeast CT Council of Governments
Town of East Lyme
Town of Montville
Town of Salem
Town of Waterford

The Route 82/85/11 corridor AC was formed to assist in developing and narrowing a range of alternatives to address the needs in the study area. At the outset of the MIS process, the AC was established to provide input, guidance and direction regarding corridor-specific issues and concerns. The AC membership includes state legislators, state and federal agency representatives (including the environmental permitting agencies), municipal planning and engineering staff and concerned members of the public.

The AC held its first meeting in November 1997 and continued to meet periodically throughout the course of the study.

The strong public interest and desire for a resolution to the on-going, traffic-related issues experienced in the Route 82/85/11 corridor has resulted in the concurrent completion of both the MIS and EIS. By analyzing elements of the MIS and the EIS simultaneously, an overall picture of the effectiveness of each alternative in alleviating the identified traffic problems within the corridor can be developed. Originally established as an advisory group for the MIS process, the group remained intact and functioning as a joint MIS/EIS advisory group following the decision to combine the two studies.

8.1.1 Advisory Committee Role in Establishing Project Alternatives

Citizens living in the Route 82/85/11 corridor area have long sought improvements in transportation for their hometowns. The communities of Salem, Montville, East Lyme and Waterford have depicted numerous problems with Route 85. Traffic congestion, particularly during peak seasons, and frequent and, often, tragic rates of accidents on Routes 82 and 85 plague these communities.

As part of the MIS process, ConnDOT solicited representatives of the affected communities, their local representatives and the regional planning agency to join an AC. The response by prospective AC members has been extensive. Representatives of the corridor communities were joined on the AC by representatives of state and federal resource and policy agencies. The primary role of the AC has been to provide advice to ConnDOT and FHWA on local concerns with the performance of the road and on the various alternatives under consideration for transportation improvement.

From November 1997 to September 1998, there were 8 meetings of the AC. Held in each town on a rotating basis, the AC meetings lasted approximately two hours; were open to the public; and followed progressive agendas to proceed through the MIS/EIS processes. Detailed minutes of each meeting were prepared and AC members provided review and comments on many components of this MIS/EIS.

8.1.2 Summary of Advisory Committee Meetings

November 12, 1997

The first meeting of the AC was held in the Salem Town Hall. The roles and responsibilities of the AC were described as advisory to the ConnDOT and FHWA decisions on improvements in the Route 82/85/11 corridor. It was explained that ConnDOT was undertaking an MIS to study alternatives to improve transportation efficiency and safety in the corridor. The MIS would take approximately 18 months to complete. Because the corridor had been the subject of an EIS and some preliminary engineering within the past ten years, ConnDOT would seek to use as much existing information as possible.

As part of this first meeting, each member of the AC was asked to share their opinions of the existing traffic conditions in the corridor. There was a strong sentiment from many local members of the AC to complete Route 11 rather than to widen Route 85. Representatives from Salem were the strongest supporters for completing Route 11. In fact, a local group of supporters for the completion of Route 11 were organized and stayed active in the process. AC members from regulatory agencies, ConnDOT and FHWA emphasized the need to have objective and updated information on traffic conditions, as well as the natural and built environment. Many members of the AC felt that the corridor issues were well understood and that the 18-month schedule for MIS completion was too long.

December 11, 1997

The second AC meeting was also held in the Salem Town Hall. Information on the previously studied alternatives, including the widening and new location options, were distributed to the committee. AC members continued to express concern about the length of time projected to complete the MIS. An accelerated and integrated MIS /EIS process was recommended.

Two speakers from ConnDOT provided presentations on transportation funding and roadway design standards. The ConnDOT speaker explained that Route 11 is classified as a highway (freeway with controlled access) and that, for design purposes, ConnDOT typically uses minimum AASHTO standards or higher. Route 11/82/85 is also part of the NHS. The AC discussed the need to explore flexibility in design standards and sought solutions which would provide a least environmentally damaging alternative while at the same time not sacrificing safety.

This second AC meeting also addressed key issues and goals. The AC was active in providing key issues, including:

- sustaining quality of life and existing town character;
- providing safe and efficient transportation;
- providing safety on local roads by separating through trips from local trips;
- having a transportation system which promotes economic development;
- having a transportation system which promotes sound land use;
- preserving wetlands, wildlife habitat and open space; and
- protecting water supply reservoir/watershed lands.

AC members also discussed the preferred alignment from the previous EIS. Many communities' AC members felt that the C/D alignment from the previous EIS was the best to complete Route 11.

It was agreed that the first public information meeting would be held in January.

February 26, 1998

This meeting was held in Waterford. AC members were notified during this third meeting that ConnDOT had revised the scope and schedule of the MIS. As a result of the strong public support, the study process was expedited. It was decided to combine the MIS with the preparation of the EIS.

A governor's interagency task force was appointed to speed the MIS/EIS process. The new schedule would reduce the process by almost two years.

Project consultants provided progress reports on constraint mapping and transportation. Traffic counts for the project were completed in January and February. Traffic forecasting would be undertaken through use of a statewide computer model. AC members were provided with travel time data and information on accidents.

A draft of the EIS Purpose and Need was discussed with the AC. The key points of the Purpose and Need include:

- System linkage
- Existing and future capacity problems
- Unsafe conditions and high accident locations
- Roadway functions and use
- Growth and development
- National Highway System
- Compatibility with local plans

Representatives of the ACOE and EPA attended this third AC meeting. They advised that adding non-transportation issues to the EIS purpose and need statement typically means more project alternatives. AC members suggested including the development of a "greenway" as part of the purpose and need. A "greenway" was generally described as a corridor of open space. It was agreed that a "greenway" was a good project element to have but was not part of the primary transportation purpose and needs of the project.

A draft of the alternatives to be studied in the EIS were distributed and included:

- No build
- Transportation systems management

- Mass transit
- New construction - widening
- New construction - new roadway on C/D from the previous EIS

AC members discussed alternatives; regulatory agency representatives recommended carrying a range of alternatives in the EIS process.

Following a discussion of previously studied alternatives, it was agreed to prepare a history of Route 11 alternatives and the reasons for elimination from further study. This paper would be presented to the regulatory agencies to attempt to obtain their concurrence on the focused range of alternatives mentioned above.

March 26, 1998

The fourth meeting of the AC was held in East Lyme. It included extensive discussion on traffic forecasts and alternative transportation improvement concepts. Project consultants provided information on future levels of service on an unimproved Route 85 following expected growth of 1.5% per year. Without improvements, the Route 82/85 corridor will experience failing levels of service in the planning year 2020. It was explained that ConnDOT's statewide model incorporates concerns such as summer peak traffic, developments in southeast Connecticut and possible diversions to other routes in traffic forecasts.

Representatives of FHWA provided information on roadway design standards following questions from AC members. The NHS designation of Routes 82, 85 and 11 means that AASHTO design standards must be followed. Flexibility in design occurs during the design phase of a project, not in the MIS/EIS phase. AC members expressed interest in having a new arterial roadway as an alternative design for the C/D alignment. FHWA felt that the design of the roadway depends upon the function and need for the road.

At this point, ConnDOT was proposing only looking at four variations of alignments on the C/D alternative from the past EIS. This reflected suggestions from the AC that this project has a long history and that there is not a need to study any additional routes on new location. Several AC members requested that a four-lane arterial on new location be one of the alternatives for the C/D alignment.

ConnDOT pointed out that they will be meeting with state and federal regulatory agencies to present arguments that alternatives on new location other than the C/D alignment have been previously studied and should be eliminated from further study in this MIS/EIS. The interagency meeting would also establish coordination for the Section 404 process for the ACOE wetland permitting. The ACOE establishes a Basis Project Purpose and then agrees to the alternatives that should be considered. AC members wanted a broad project purpose to reflect quality of life issues and wanted the C/D alignment as the only new location option considered.

May 7, 1998

This meeting of the AC, the fifth, was in Montville. The meeting was held in the afternoon instead of the evening to facilitate attendance by representatives from federal regulatory agencies who travel from out of state. The AC was informed of on-going field studies to evaluate the natural environment and data collection to document impacts of proposed alternatives. Comments from regulatory agencies regarding limiting the project's purpose and need to transportation-related issues and increasing the range of alternatives on new location beyond the C/D alignment were provided to the AC.

Several local members of the AC debated the reasoning of having a transportation related project's purpose and broadening alternatives beyond the C/D alignment. Representatives of the ACOE and EPA believed that a range of alternatives needed to be studied, although additional alternatives may be eliminated later in the EIS process. DEP emphasized that the MIS/EIS needs to follow a process where a broad range of alternatives are evaluated. EPA mentioned that, based on field observation and examination of area maps, alignments located west of C/D may offer routes which can avoid more impacts to wetlands. It was mentioned that the regulatory agencies were reviewing additional information about the corridor to determine a final set of alternatives that should be studied in the EIS.

ConnDOT mentioned to the AC that because of the accelerated schedule, work must commence on the range of alternatives agreed to by the regulatory agencies.

June 25, 1998

The sixth meeting of the AC, held in Salem, drew the largest public attendance to date. ConnDOT informed the AC that the federal regulatory agencies have agreed on alternatives to be studied and maps of the proposed alternatives were distributed for discussion.

The range of build alternatives included widening Route 85; upgrading Route 85; a partial build extending from the current terminus of Route 11 south to Route 85; two options within the previous C/D alignment; and two new alternatives west of the C/D alignment. To measure minimum and maximum impacts, each alternative on new location would be considered as a two-lane and four-lane roadway. Several local members of the AC were concerned that new alternatives were introduced. Several also felt that a two-lane option was not feasible given traffic growth.

Project consultants gave briefings on the alternatives to be studied and some observations on important natural resources. The DEIS was being prepared and publication was still scheduled for the fall of 1998.

The public comment period at the end of the AC meeting was extended. Numerous comments were made regarding the adverse impacts of the various alternatives.

August 20, 1998

The seventh meeting of the AC, held in Waterford, also drew a large public attendance. ConnDOT informed the AC that significant portions of the DEIS had been prepared and were currently being reviewed. The AC would be actively engaged in review of the preliminary DEIS. Copies of the document would be provided to the AC and a review meeting was established. A second public information meeting was scheduled for September. Publication of the DEIS was targeted for October 1998 and a Public Hearing on the DEIS is tentatively scheduled for November.

Several AC members wanted to see an arterial roadway on new location evaluated as one of the options in the upcoming DEIS. ConnDOT stated that an arterial option could be applied as a refinement later in the process once a preferred alignment is selected. ConnDOT agreed to incorporate the concept of an arterial as an option to the limited access highway in the forthcoming DEIS.

Several members of the public expressed concerns about the adverse impacts of the various alternatives.

September 15, 1998

The eighth meeting of the AC was held in the Town of Waterford. This AC meeting closely followed a Public Information Meeting on the Route 82/85/11 MIS/EIS held on September 10 in East Lyme. The public information meeting was an open house format that was attended by over 100 people. ConnDOT and project consultants provided information at six project stations depicting graphics and other data about project issues and alternatives.

The purpose of this AC meeting was to discuss preliminary sections of the DEIS. Early in the meeting, an overview of the MIS/EIS process was summarized, including how the public hearing and comment process works after the DEIS is published. No AC meeting was scheduled, however, it was agreed that a meeting should be held sometime after the DEIS is published during the public comment period.

The AC members in attendance provided comments on the preliminary DEIS copies they had received prior to the meeting. AC comments focused on the following issues: there should be only six points, not seven, in the project purpose and need statement; the document seemed to favor the widening alternative; more evaluation of “human impacts” is needed; the no build does not necessarily mean no impact; stormwater impacts need to be re-evaluated; the innovative design approach should be applied after the preferred alternative is chosen; and right-of-way costs should be included.

Several members of the public spoke on various issues, including the project purpose and need, mass transit alternative, energy consumption, endangered species, cost-benefit analysis, and emergency evacuation.

8.2 MIS FINANCIAL ANALYSIS OF THE ALTERNATIVES

A primary purpose for conducting an MIS is to ensure a sound investment by evaluating the direct and indirect costs associated with each potential alternative. Ultimately, it must be demonstrated that the alternative selected has economic and financial merit in accordance with its anticipated benefits. An analysis of benefit versus cost has, therefore, been undertaken for a number of the alternatives under consideration.

8.2.1 BENEFIT-COST ANALYSIS

The benefit-cost analysis compares user benefits with the cost of implementing transportation improvements. Benefits may be realized in terms of less time spent in the vehicle, lower vehicle operation costs, and fewer accidents. The costs for this analysis are derived from capital cost of construction, maintenance and highway operation. A benefit-cost analysis includes determination of the ratio of benefits from reduced highway user costs to costs required to produce the benefits. By improving a transportation facility, the user costs such as fuel consumption, emissions, and accident costs are reduced. Therefore, improvements such as constructing a bypass, adding lanes or even widening shoulders provide tangible benefits to the user of the transportation system. A benefit-cost analysis compares these user benefits to the total cost including construction, maintenance and operation.

The accepted guideline for estimating the economic effects of transportation improvements on highway users is *A Manual on User Benefit Analysis of Highway and Bus-Transit Improvements* (AASHTO, 1977). To prepare this benefit-cost analysis, the MicroBENCOST software was used. MicroBENCOST is a benefit-cost analysis program developed by the Texas Transportation Institute for the National Cooperative Highway Research Program 7-12 and is based on the guidelines established in the aforementioned publication.

The input to the MicroBENCOST program consisted of user defined and default data. The program's default values were reviewed and left unmodified except for the accident cost values, which were updated to reflect current values obtained from the National Safety Council. The default values included the value of time, operating costs per vehicle, number of accidents per 100 million vehicle-miles, composition of automobile fleet, traffic distribution by hour of the day, and pavement condition. The accident cost values were changed from $1,111,000 to $2,890,000 per fatal accident, $24,900 to $34,100 per injury accident and $2,140 to $6,400 per property damage only accident. These values were changed since they were the only default values not consistent with the National Safety Council averages. The default values for accident rates are found on Figure 8-1.

Data inputs included area type and roadway functional class, project construction cost, average annual daily traffic (AADT), grade, curvature, percent trucks, segment lengths, speed limits, lane and shoulder widths, median width, number of lanes, and access control. For the cross streets, AADT, access control, number of lanes, speed and median width were entered. All twelve alternatives were analyzed over a twenty-year period from the year 2000 to 2020.

The first group of alternatives analyzed was the four-lane and two-lane full build expressways on new alignment. For these alternatives, the data for an extended Route 11 was compared against the existing conditions on Route 85, which runs parallel to the new alignment. Alternatives 92PD, $E_{(4)}$, $F_{(4)}$ and $G_{(4)}$ are all four-lane full build highways on new alignment with similar user benefits. The construction costs vary for these four projects based on the different alignments. Alternatives $E_{(2)}$, $F_{(2)}$ and $G_{(2)}$ are two-lane full build highways on new alignment. As in the four lane alignments, the user benefits are similar, however the construction costs differ greatly.

The second group of alternatives analyzed involved widening a portion of Routes 82 and 85. Alternatives $H_{(4)}$ and $H_{(2)}$ are partial build highways, with the first portion on new alignment and the second portion along a widened Route 85, and Alternatives $W_{(4)}$, $W_{(4)}$m and $W_{(2)}$ are differing alternatives for the widening of Routes 82 and 85.

The results for the alternatives as compared to the no build alternative are found in Table 8-1. Although the no build alternative has a corresponding benefit and cost, in this analysis it represents the zero benefit, zero cost case as a basis for comparing the other alternatives. Within the table, the term discounted refers to the time value of money. Over a period of time, money can be assumed to earn a certain amount of interest. If a transportation project is implemented, the agencies supporting the project lose the opportunity to invest the money elsewhere. The discount rate used for these calculations is 5%, therefore, the value of the benefits or costs in future years must be discounted 5% for each year to equate the amounts to today's dollar values. Figure 8-2 demonstrates the range of benefit-cost ratios.

Highway Segment Accidents per 100 Million Vehicle-Miles

		AADT				
Road Type	Accident Type	0-1999	2000-3999	4000-7999	8000-15999	16000+
4 Lane Limited Access	Fatal	1.58	1.58	1.58	1.19	1.19
	Injury	24.3	24.3	24.3	24.3	24.3
	Property Damage	39.0	39.0	39.0	40.0	40.0
2 Lane	Fatal	4.0	4.0	4.0	2.8	2.8
	Injury	82.5	82.5	90.8	107.3	107.3
	Property Damage	99.0	99.0	100.0	130.0	130.0
4 Lane Unlimited Access	Fatal	4.0	4.0	4.0	2.4	2.4
	Injury	82.5	93.5	110.0	112.8	126.5
	Property Damage	89.0	98.0	106.0	115.0	101.0

Accident Costs

Fatal Accident	$2,890,000
Injury Accident	$34,100
Property Damage Only	$6,400

Intersection / Interchange Accidents per 100 Million Vehicles

	2 Way Stop	Signal	Diamond
Fatal	.92	.45	.28
Injury	16.5	21.6	2.4
Property Damage	25.2	52.0	4.2

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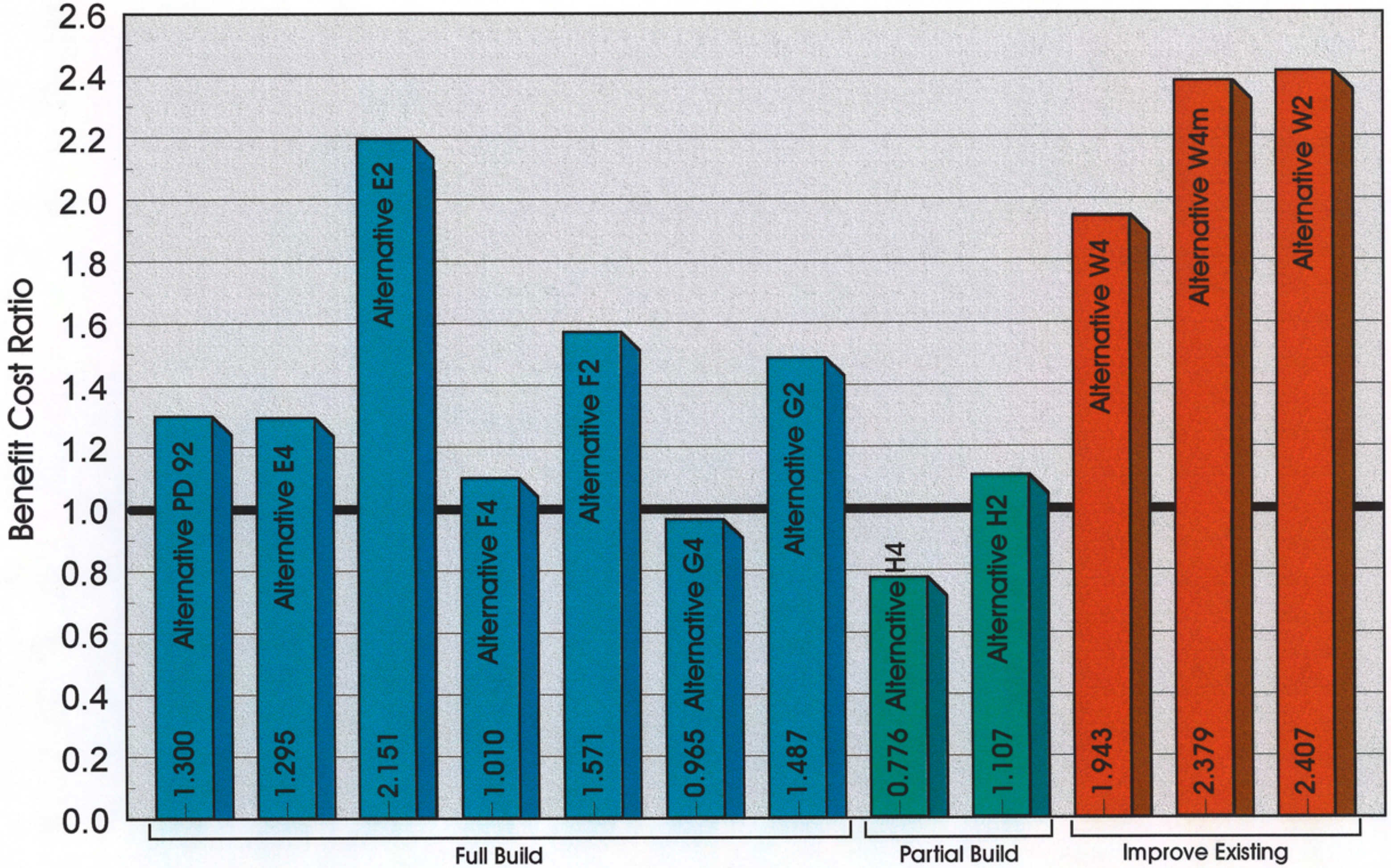
BENEFIT-COST ANALYSIS - ACCIDENT RATES AND COSTS

Figure 8-1

TABLE 8-1
BENEFIT-COST ANALYSIS RESULTS

ALTERNATIVE	DISCOUNTED CONSTRUCTION COST	DISCOUNTED SALVAGE VALUE	DISCOUNTED INCREASE MAINTENANCE AND REHABILITATION	TOTAL DISCOUNTED USER BENEFIT		BENEFIT-COST RATIO		INTERNAL RATE OF RETURN		NET PRESENT VALUE	
				BENEFITS	RANK	RATIO	RANK	IRR	RANK	NPV	RANK
$W_{(4)}$	$38,667,000	$12,449,000	$974,000	$52,835,000	10	1.943	4	10.75%	4	$25,643,000	8
$W_{(4)}$m	$31,238,000	$10,057,000	$974,000	$52,697,000	11	2.379	2	13.49%	2	$30,542,000	6
$W_{(2)}$	$29,524,000	$9,505,000	$974,000	$50,520,000	12	2.407	1	13.73%	1	$29,527,000	7
92PD	$243,905,000	$78,786,000	$2,459,000	$217,822,000	1	1.3	7	6.69%	7	$50,245,000	4
$E_{(4)}$	$243,524,000	$78,663,000	$2,459,000	$216,740,000	4	1.295	8	6.67%	8	$49,420,000	5
$E_{(2)}$	$144,571,000	$46,700,000	$2,459,000	$215,798,000	7	2.151	3	11.35%	3	$115,467,000	1
$F_{(4)}$	$314,476,000	$101,582,000	$2,459,000	$217,606,000	2	1.01	10	5.06%	10	$2,253,000	10
$F_{(2)}$	$200,095,000	$64,635,000	$2,459,000	$216,669,000	5	1.571	5	8.20%	5	$78,749,000	2
$G_{(4)}$	$328,857,000	$106,228,000	$2,459,000	$217,173,000	3	0.965	11	4.80%	11	-$7,916,000	11
$G_{(2)}$	$211,143,000	$68,204,000	$2,459,000	$216,233,000	6	1.487	6	7.73%	6	$70,835,000	3
$H_{(4)}$	$108,571,000	$35,071,000	$2,299,000	$58,812,000	8	0.776	12	3.65%	12	-$16,987,000	12
$H_{(2)}$	$74,857,000	$24,180,000	$2,299,000	$58,642,000	9	1.107	9	5.64%	9	$5,666,000	9

Note: Discount Rate = 5%



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BENEFIT COST ANALYSIS - BENEFIT COST RATIOS

Figure 8-2

The discounted user benefits are the sum of the savings in time costs, accident costs, and vehicle operation costs discounted to the present time. The construction cost includes construction, preliminary engineering and contingencies discounted to the present time. The salvage value is the worth of the investment after the twenty-year study period discounted to the present time. Net present value is the discounted user benefits minus the discounted construction cost. One of the many criteria for project selection is a positive net present value, signifying that the benefits outweigh the costs. The benefit-cost ratio is the discounted user benefits divided by discounted construction cost plus maintenance cost minus salvage value. The criterion for project selection is a benefit-cost ratio greater than 1.0.

Table 8-2 and Figure 8-3 show the dollar value and percentage of project benefits from each of the components, time savings, vehicle operation cost savings, and accident reduction. As the table indicates, delay savings contribute the most to user benefit in the full build scenarios with 52%. Delay savings is also the substantial portion of the partial build and the widening alternatives, with 67%, and 81% respectively. The projects with the greatest benefits are the seven full build alternatives. All of these projects have approximately $113,000,000 in delay savings, approximately $56,000,000 in reduced vehicle operating cost, and just under $48,000,000 in reduced accident cost for a total benefit of approximately $217,000,000.

The criterion for project selection is a benefit-cost ratio greater than 1.0 or a positive net present value. Of the projects analyzed, the Alternatives $G_{(4)}$ and $H_{(4)}$ have a benefit-cost ratio less than 1.0 and a negative net present value. Therefore, any of the remaining alternatives could be logically chosen for implementation. According to the analysis, the projects with the highest benefit-cost ratio are the two-lane widening alternative ($W_{(2)}$), with a benefit-cost ratio of 2.407; the modified four-lane widening alternative ($W_{(4)}$m), with a benefit-cost ratio of 2.379; and a two-lane full build alternative, $E_{(2)}$, with a benefit-cost ratio of 2.151. Alternative $E_{(2)}$ is the project with the highest net present value at $115,467,000; Alternatives $F_{(2)}$ and $G_{(2)}$ follow closely at $78,749,000 and $70,835,000, respectively.

It is important to note that these values do not include environmental or social impacts. All three categories of impact, environmental, social and economical, must be weighed in determining a recommended action. Along with benefits to the users of the highway, investment in transportation can provide benefits to the community and state in which construction takes place by providing jobs and encouraging growth in the area. In order to measure these economic impacts, the following economic benefit analysis was performed.

TABLE 8-2
COMPARISON OF COST SAVINGS BY ALTERNATIVE

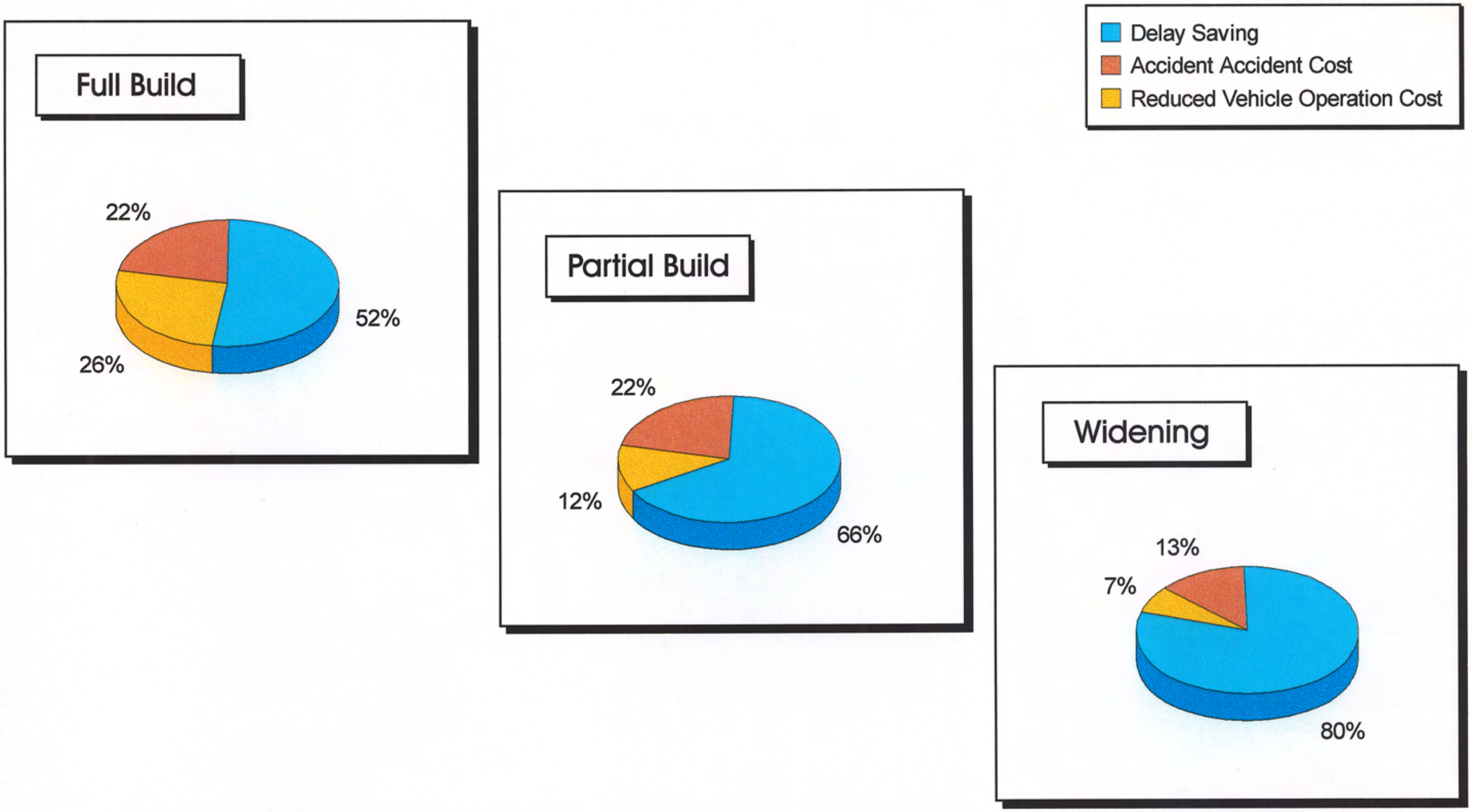
Alternatives	Delay Savings		Reduced Vehicle Operating Cost		Reduced Accident Cost	
	Savings	Rank	Savings	Rank	Savings	Rank
$W_{(4)}$	$42,894,970	8	$3,331,920	12	$6,608,160	10
$W_{(4)}m$	$42,626,910	9	$3,462,190	11	$6,608,160	10
$W_{(2)}$	$38,416,750	12	$5,494,950	10	$6,608,160	10
92PD	$113,627,200	1	$56,287,700	1	$47,907,450	1
$E_{(4)}$	$113,117,930	4	$55,820,910	7	$47,800,900	7
$E_{(2)}$	$113,525,340	2	$56,194,320	3	$47,886,130	3
$F_{(4)}$	$113,321,600	3	$56,007,590	5	$47,843,500	5
$F_{(2)}$	$112,158,210	7	$55,838,010	6	$47,801,750	6
$G_{(4)}$	$112,569,850	5	$56,212,000	2	$47,886,970	2
$G_{(2)}$	$112,364,020	6	$56,024,990	4	$47,844,350	4
$H_{(4)}$	$38,833,360	10	$7,069,610	9	$12,909,260	8
$H_{(2)}$	$38,662,020	11	$7,070,430	8	$12,909,260	8

Note: Discount Rate = 5%

8.2.2 ECONOMIC BENEFIT ANALYSIS

The construction of improved transportation infrastructure results in direct benefits to transportation users, such as auto travelers and shippers, in the form of travel time savings and cost and accident reduction. These direct benefits have traditionally been used in benefit-cost analysis of proposed projects. However, the act of construction or improvement and the long-term transportation savings also affects both the local and state economy.

Major highway improvements provide short-term benefits to an area through the infusion of construction money into the economy. The extent of the construction impact benefits depends on the structure of the local economy and linkages to the construction industry. If the contract for the work is awarded to a company that sources much of the construction materials and labor locally, then substantial local benefits could be expected. If, on the other hand, the contract is awarded to a company that draws construction materials and labor from outside the southeastern Connecticut region (for example Rhode Island), then the benefits to the local economy would be reduced.



Note:
Discount Rate = 5%

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BENEFIT-COST ANALYSIS - USER BENEFITS

Figure 8-3

Major highway improvements can provide long-term economic development benefit. The magnitude of the development benefit will differ depending on the location and the type of highway improvements being considered. Because of time and vehicle operating cost savings, businesses in the corridor become more competitive than in other areas, and are better able to compete for new markets. The effective size of market area may be increased for a given company. Businesses in the corridor may also benefit from increased roadside spending by people drawn from alternative routes from either outside the county or the state. Tourism may be enhanced either within the corridor or the state through the improvement in accessibility to, or through, the area. Disposable income may increase because personal auto users within the corridor benefit from the time and vehicle operating cost savings. Society at large will benefit from a reduction in accident rates, which results from the diversion of traffic onto higher quality roads.

Most of the direct benefits of the highway improvement accrue to businesses in the corridor; however the multiplier effects may also provide real benefits to the rest of the state. Apart from the benefits of highway improvements on local business costs and the enhancement of people's purchasing power through reduced vehicle operating costs, the project will also have a multiplier effect on the local economy. The multiplier effect arises through increased orders for materials and equipment from suppliers by firms that have become more competitive or from businesses that have benefited from the increase in roadside spending.

The benefits of the alternatives are analyzed from the perspective of the State of Connecticut, because the allocation of resources and general benefit is realized at the state level. Benefits that accrue to New London County from other counties within the state are considered a transfer of wealth, and as such are not considered a net benefit to the state of Connecticut. It is the net benefit to the state, the difference between the state's economic performance with and without the highway, that is the most important to measure. The most important impacts of highway construction on the economy were identified and values developed for input into the Regional Economic Models Inc. (REMI) model.

8.2.2.1 *The Economic Model*: A REMI simulation model for the State of Connecticut was used for assessing the economic benefits of the alternatives under consideration. The REMI model has been used extensively throughout the country by government agencies, consulting firms, universities and public utilities for forecasting and policy analysis. The model is used to simulate the economic and demographic impacts of many different types of change including government policy changes, infrastructure investments, environmental regulations, and taxes. The REMI model goes beyond the traditional cost-benefit analysis approach by allowing the user to estimate the impact the reduction in transportation costs and improvement in competitive position will have on local industry. The model also recognizes that the economic impact of the highway improvements can increase or decrease in the future, depending on the future changes in the area business mix.

8.2.2.2 *Model Inputs*: A number of variables must be input into the REMI economic model to calculate the influence of the road improvements. These inputs were adjusted to 1992 dollar values using producer price inflators, in order to be comparable to the model's price levels and output levels. Once the outputs were calculated, the values were readjusted to 1998 dollar values. For the purpose of this analysis, three representative alternatives were chosen. The four-lane full build concept utilizes the inputs for Alternative 92PD; Alternative $E_{(2)}$ serves as the two-lane full build concept; and Alternative $W_{(4)}$ is the demonstrated widening concept.

- Construction, Maintenance and Operating Costs

  In this analysis, construction costs were input from the cost estimates prepared for each alternative. These estimates included all materials, labor, engineering, and utilities required for the project. Right-of-way costs were not included because these costs represent a transfer payment, where nothing is consumed because the land still exists. The construction costs were assumed to occur over a two-year period from 2000 - 2001. Maintenance and operating costs, including such routine events as resurfacing the highway or removing snow, were estimated at $4,310 per lane-mile for expressway (Route 11) and $3,410 per lane-mile for principal arterial (Routes 82 and 85).

- Travel Efficiency Benefits

  The primary long-term source of economic benefits of highway improvements results from the improved travel efficiency that motorists would realize. This efficiency takes the form of time savings, vehicle operating cost savings, and reduction in the number of accidents.

  For the Route 82/8511 study, changes in VMT and Vehicle Hours of Travel (VHT) estimated from the traffic model for the area were used to derive time savings, vehicle operating cost savings and accident savings for each of the alternatives being considered. Any savings that accrue from a specific alternative being considered were allocated to either the state or New London County based on Origin / Destination data for the corridor.

  <u>Travel Time Savings</u> - The improvements will provide time savings to users by providing higher design and capacity facilities than the existing roads, which have variable speeds due to frequent intersections with other roads. A new alignment may also provide a more direct route with associated time savings. For purposes of analysis in the model, the time savings are split into the following three different categories of beneficiary:

- Cars on private business;
- Cars on company business/own account trucks on company business;
- Commercial carrier trucks on company business.

Benefits to cars on private business are not considered to have a direct monetary value, but improve the quality of life of people that travel in the corridor by improving accessibility. Benefits to cars and trucks on company business have to be divided between the industries that operate the vehicles in the corridor. These benefits accrue in the case of business travelers through savings in wages and benefits of the vehicle occupants. These savings are input into the model through a reduction in production costs for these industries. Benefits that accrue to commercial carriers are input directly into that industry rather than being divided between the end users of their services.

Vehicle Operating Cost Savings - Vehicle operating cost savings benefits are divided into the same categories as timesaving benefits and are allocated in the same way in the model, with the exception of the benefits that accrue to cars on private business. Vehicle operating cost savings to cars on private business are input into the model as an increase in the purchasing power of people who travel in the corridor.

Accident Cost Savings - Accident cost savings occur either because the same amount of mileage is traveled on roads of a higher design standard, VMTs are reduced through the construction of a new road, or a combination of the two. Calculation of accident savings requires data on accident rates on each type of roadway categorized by fatality, injury, and property damage only. Changes in accident rates of each type are estimated for each of the alternatives under consideration based on the vehicle miles of travel on each roadway type. The associated values of each accident type are then used to calculate differences in accident costs between the alternatives.

8.2.2.3 *Indicators of Economic Development Impact*: The analysis of economic benefit was conducted by comparing the state's economic performance without the alternatives to its performance with the build alternative in place. The net benefit (the difference between the build and no build) may be attributed to the influence of the highway. In this way, the benefits from this particular improvement can be distinguished from predictions of the rise and fall of the state's economy.

The new construction could yield many different forms of benefit to the state of Connecticut. In order to demonstrate the diverse impacts, several indicators of economic development were chosen. The five indicators of economic development include annual output, value added, personal income, wages, employment, and population. These five indicators are shown for the state of Connecticut in the years 2000, 2010, and 2020 in Table 8-3.

TABLE 8-3
ECONOMIC IMPACTS TO THE STATE OF CONNECTICUT

ROADWAY SEGMENT	SELECTED ANNUAL BENEFITS			CUMULATIVE BENEFITS	DISCOUNTED BENEFITS
	YEAR 2000	YEAR 2010	YEAR 2020		
WIDENING ALTERNATIVES - $W_{(4)}$, $W_{(4)}$m AND $W_{(2)}$					
Annual Output	$32,690,000	$2,280,000	$4,100,000	$98,180,000	$69,450,000
Value Added	$15,490,000	$1,250,000	$2,280,000	$48,860,000	$33,790,000
Personal Income	$14,810,000	$2,280,000	$5,690,000	$87,700,000	$55,640,000
Wages	$18,260,000	$570,000	$2,390,000	$54,310,000	$39,720,000
Employment	343	31	45	---	---
NEW LOCATION - FOUR-LANE ALTERNATIVES - 92PD, $E_{(4)}$, $F_{(4)}$ AND $G_{(4)}$					
Annual Output	$205,820,000	$9,000,000	$24,370,000	$543,760,000	$395,620,000
Value Added	$97,610,000	$5,010,000	$13,440,000	$269,720,000	$191,360,000
Personal Income	$95,680,000	$10,250,000	$27,340,000	$471,550,000	$310,240,000
Wages	$115,360,000	$1,480,000	$13,330,000	$305,790,000	$233,370,000
Employment	2160	138	272	---	---
NEW LOCATION - TWO-LANE ALTERNATIVES - $E_{(2)}$, $F_{(2)}$ AND $G_{(2)}$					
Annual Output	$122,210,000	$10,020,000	$22,780,000	$420,630,000	$283,510,000
Value Added	$57,970,000	$5,580,000	$12,530,000	$213,680,000	$140,270,000
Personal Income	$56,950,000	$10,250,000	$25,060,000	$366,760,000	$224,940,000
Wages	$68,420,000	$2,620,000	$12,070,000	$222,970,000	$158,530,000
Employment	1283	138	254	---	---

Source: Wilbur Smith Associates

Annual output, also known as economic activity, is the total value of each good or service produced by the industry during the year as a result of highway construction and highway use. Value added is the value of the corridor firm's output minus the value of the inputs they purchase from other firms. Personal income consists of the total increases in payroll costs paid by local industries due to the improved highway, plus income from self-employment, other property income and transfer payments. Wages include increases in payroll costs plus income from self-employment. Employment is the total number of new jobs attributable to the highway improvement.

Initially, the construction of a build alternative provides an influx of goods and services to the area. Investment in the project provides a stimulus to the local and state economy, resulting in increased demand for intermediate and final goods and investment in capital stock to meet the increased demand. Once the construction period is over, the demand for goods is reduced and investment in capital stock declines. Due to inventory surpluses, especially of capital stock, the state and local economy will experience a period of adjustment, during which output and other indicators of the economy may fall below the baseline forecast for the area. Once the economy has adjusted the benefits of the new or improved highway to the economy can be seen. The benefits steadily increase as the user benefits from a new or improved roadway bring new development to the area and improve the operations of companies using the roadway network.

As shown on Table 8-3, the discounted cumulative value added is greatest for the four-lane full build alternatives at $191,360,000. For the years 2000 and 2020, value added is also greatest for the four-lane full build, however due to the recovery process mentioned above, in the year 2010, the two-lane full build alternatives have a slightly higher Value Added. The increase in jobs is also greatest for the four-lane full build alternatives, not only for the Cumulative Benefits, but also each year. Employment increases are 2160 jobs in the year 2000, 138 jobs in the year 2010, and 272 jobs in the year 2020.

8.2.3 TRANSPORTATION USER BENEFIT AND ECONOMIC IMPACT ANALYSIS

There are many methods with which to evaluate the performance of alternative transportation strategies. The two analytical approaches presented in this section – Transportation User Benefit Analysis and Economic Impact Analysis – each yield various results that quantify transportation performance.

The Transportation User Benefit Analysis suggests that the full build alternatives (92PD, $E_{(4)}$, $F_{(4)}$, $G_{(4)}$, $E_{(2)}$, $F_{(2)}$, $G_{(2)}$) will yield the largest overall benefit measured in terms of delay savings, reduced vehicle operation cost and reduced accident cost. As a measure of the relationship of these benefits to the project cost, the highest benefit-cost ratio and internal rate of return correspond to the widening alternatives ($W_{(2)}$, $W_{(4)}$m, $W_{(4)}$) and the two-lane full build alternatives ($E_{(2)}$, $F_{(2)}$, $G_{(2)}$). The largest Net Present Values result from the two-lane full build alternatives ($E_{(2)}$, $F_{(2)}$, $G_{(2)}$), followed by the less expensive of the four-lane full build alternatives (92PD and $E_{(4)}$).

In addition to the benefits to the transportation users, the Economic Impact Analysis determines economic benefits to the region. Reductions in costs for operating motor vehicles, in personal travel time, or accidents will translate into tangible economic benefit to individuals, business and industry. The benefit may be realized in terms of Value Added, the value of industry output minus the value of the inputs they purchase from other firms, or Employment, an increase in jobs within the region. The economic benefits to the state of Connecticut in terms of value added and employment are greatest with the four-lane full build alternatives (92PD, $E_{(4)}$, $F_{(4)}$, $G_{(4)}$), followed by the two-lane full build alternatives ($E_{(2)}$, $F_{(2)}$, $G_{(2)}$), with the widening alternatives ($W_{(2)}$, $W_{(4)}$m, $W_{(4)}$) exhibiting the least economic benefit.